# Danish Bilharziasis Laboratory

A field guide to
African freshwater snails

3. North East African species
Second Edition

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Danish Bilharziasis Laboratory

WHO Collaborating Centre
for Applied Medical Malacology
and Schistosomiasis Control

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## PREFACE

The present Field Guide to the freshwater snails of North East Africa is a revised edition of the Field Guide prepared by Dr. G. Mandahl-Barth and published in 1973. The Field Guide includes all the species known from Egypt, the Sudan and Ethiopia. The snail fauna of this area is fairly well known, but new species are still being discovered, and the classification of some of the groups is not yet satisfactory, wherefore much more material must be collected and studied.

Complete acquaintance with technical terms, an ability to carry out a simple dissection and to produce a radula preparation are absolutely essential in order to achieve a reliable identification with the aid of this guide. Anyone unfamiliar with the terminology and procedure is referred to the "Introduction" and "Methodology for Snail Dissection and Preparation", both available from the Danish Bilharziasis Laboratory, which provide the necessary explanation and instruction.

Snails which cannot be identified through the use of this guide or for which a confirmation of identification is desired can be sent to the address below. Such specimens should be sent either preserved in 70% alcohol or live between layers of damp, but not wet, cotton wool as sample post and by air mail.

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## IDENTIFICATION OF FRESHWATER SNAILS

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

A The snail has an operculum which blocks the opening of the shell when the body is withdrawn. The shell is thick walled. The members of this group are called **Prosobranchs** PROCEED BELOW

B The snail does not have an operculum or lid. The shell is thin walled. All such snails belong to the group called **Pulmonates** PROCEED TO PAGE 12

From North East Africa approximately 57 species of freshwater snails are known, of which 17 species are prosobranchs and 40 species are pulmonates. Any records adding new information to the list are most welcome at the Danish Bilharziasis Laboratory. It is preferred that the actual specimens are mailed to the laboratory for confirmation of the identification made.

### PROSOBRANCHS

The freshwater prosobranchs are most easily recognized by the presence of the operculum and by the structure of the radula. In African freshwater prosobranchs the radula is taenioglossate, except in the family Neritidae, which has a rhipidoglossate radula. In comparison with the freshwater pulmonates, the prosobranchs have, in general, a stronger and heavier shell.

KEY TO PROSOBRANCH FAMILIES

1 A Shell discoid, depressed, globose or higher . . . 2
B Shell hemispherical . . . NERITIDAE (p. 3)

| | | | |
|---|---|---|---|
| 2 | A | Shell discoid . . . | PILIDAE (p. 4) |
| | B | Shell depressed, globose or higher . . . | 3 |
| 3 | A | Operculum corneous . . . | 4 |
| | B | Operculum calcareous . . . | 10 |
| 4 | A | Shell sinistral . . . | PILIDAE (p. 4) |
| | B | Shell dextral . . . | 5 |
| 5 | A | Operculum multispiral . . . | 6 |
| | B | Operculum concentric, with spiral nucleus or paucispiral . . . | 7 |
| 6 | A | Shell 20 mm high, with sculpture | POTAMIDIDAE (p.11) |
| | B | Shell 4 mm high, without sculpture | VALVATIDAE (p. 7) |
| 7 | A | Operculum concentric . . . | VIVIPARIDAE (p. 3) |
| | B | Operculum concentric with spiral nucleus or paucispiral . . . | 8 |
| 8 | A | Shell more than 6 mm high, operculum concentric with spiral nucleus or paucispiral . . . | THIARIDAE (p.10) |
| | B | Shell up to 5 mm high, operculum paucispiral . . . | 9 |
| 9 | A | Radula with basal denticles on the central tooth and without accessory plates between lateral and first marginal tooth . . | HYDROBIIDAE (p. 7) |
| | B | Radula without basal denticles on the central tooth and with accessory plates between lateral and first marginal tooth . . . | ASSIMINEIDAE (p. 8) |
| 10 | A | Shell more than 8 mm high, operculum concentric . . . | PILIDAE (p. 4) |
| | B | Shell less than 8 mm high, operculum concentric with spiral nucleus . . . | BITHYNIIDAE (p. 8) |



## FAMILY NERITIDAE

Shell strong, imperforate, hemispherical or somewhat higher, with a short, often concealed spire. The operculum is calcareous and paucispiral with basal apophyses on the inner surface. Shell often with a pattern. Radula rhipidoglossate. In North East Africa one genus of no medical importance.

### GENUS Theodoxus Montfort, 1810

The genus comprises a number of rather small species in Europe, the Middle East and North West Africa. One species is found in Egypt.

Theodoxus niloticus (Reeve, 1856)
Up to 8 x 8 mm. The shape of the shell and the dark transverse bands are distinctive. The species is common in the Nile and the canals of Egypt. Older records from the Blue and the White Nile need confirmation.

## FAMILY VIVIPARIDAE

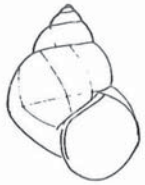
The corneous, concentric operculum and dextral, medium sized, conical shell are characteristic for the family. If soft parts are available, females can be recognized by the occurrence of developing young in the lower part of the oviduct and males by the enlarged right tentacle, which serves as the copulatory organ. The family comprises many genera and is found in all continents except South America. On the African continent two genera are found: Neothauma with one species, occurring only in Lake Tanganyika and Bellamya, see below.

### GENUS Bellamya Jousseaume, 1886

The genus comprises about 17 species on the African continent and several species in Southern Asia. In North East Africa only one species is recognized.

Bellamya unicolor (Olivier, 1804)

Up to 25 x 18 mm. The conical shell form and the fairly thin shell taken together are characteristic for this species. Common in both running and stagnant water. A more high spired form of this species occurs in Lake Tana, Ethiopia. This form was described as Bellamya abyssinicus.



FAMILY PILIDAE

Shell heavy, medium to very large in size. The operculum is concentric. The family has a worldwide distribution in fresh waters of the tropics. In Africa four genera occur naturally, two of which are confined to North East Africa. A fifth genus, Marisa, has been introduced to several laboratories in Africa for studies on its potential as a biological control agent of schistosome intermediate snail hosts. Since one species, Marisa cornuarietis, is being tried in field experiments it is included in this Field Guide.

KEY TO GENERA OF PILIDAE

| | | |
|---|---|---|
| 1 A | Shell discoid . . . | Marisa (p. 6) |
| B | Shell depressed or higher . . . | 2 |
| 2 A | Shell sinistral, operculum corneous . . | Lanistes (below) |
| B | Shell dextral, operculum calcareous . . | Pila (p. 5) |

GENUS Lanistes Monfort, 1810

Of all known African prosobranch freshwater snails this genus is the only one with a sinistral shell. Approximately 18 species are found in Africa including Madagascar.

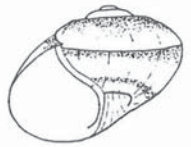


KEY TO SPECIES OF LANISTES

| | | |
|---|---|---|
| 1 A | Shell depressed, often carinate . . . | L. carinatus |
| B | Shell conical, not carinate . . . | L. ovum |

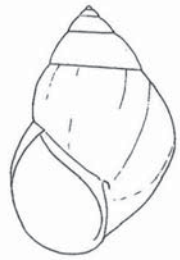
Lanistes carinatus (Olivier, 1804)

Up to 36 x 45 mm. Young specimens always have a sharp angle along the periphery and another around the wide open umbilicus. On the last whorl the former often disappears. Most often the shell has a greenish colour. The species is common in the Nile and in canals of the Sudan and Egypt. Also recorded from Ogaden in southeastern Ethiopia.



Lanistes ovum Peters, 1845

Up to 65 x 50 mm. Distinguishable from Lanistes carinatus by the lack of angles on the whorls. In the eastern part of Africa, the distribution is from the Sudan to northern Natal with discontinuities and the occurrence of several shell forms.

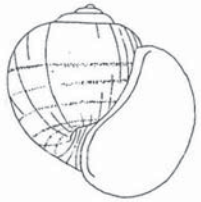


GENUS Pila Roding, 1798

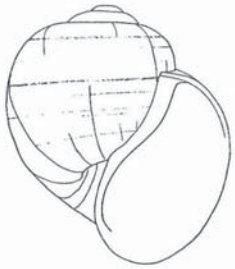
Members of this genus are characterized by the large globose and umbilicate shell and the calcareous, concentric operculum.

KEY TO SPECIES OF PILA

| | | |
|---|---|---|
| 1 A | Sutures deep, canaliculate, umbilicus rather wide. Spire pointed, rarely eroded . . . | P. speciosa |
| B | Sutures not canaliculate, umbilicus narrow or partly covered. Apex often eroded . . . | 2 |
| 2 A | Operculum with the greatest width near the lower third . . . | P. wernei |
| B | Operculum with greatest width near or slightly above the middle . . . | P. ovata |



Pila speciosa (Philippi, 1849)
Up to 105 x 100 mm. The very deep channelled suture (canaliculate) and the pointed apex are distinctive. A rare species recorded only from southeastern Ethiopia, northeastern Kenya and Somalia.

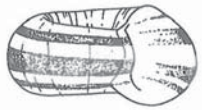


Pila wernei (Philippi, 1851)
Up to 127 x 125 mm. This is the largest African freshwater snail. Aperture and operculum are relatively narrower than in the following species. It has a rather scattered distribution in tropical Africa. Known from southern Sudan.

Pila ovata (Olivier, 1804)
Up to 57 x 45 mm, very variable in shape. The spire may be high or low and the umbilicus more or less open. The species has a scattered distribution in Egypt and the Sudan. It seems much more common in East Africa.

GENUS Marisa Gray, 1824

This genus is characterized by the large, discoid shell, coloured bands and corneous operculum. The genus, comprising only few species, is found in South America and the West Indies. It has been introduced to Africa for use in small scale field trials of biological control of Bulinus and Biomphalaria species.



Marisa cornuarietis (Linnaeus, 1758)
Up to 55 x 18 mm. The discoid shell distinguishes this species from all other African prosobranchs. The species is not recorded from natural habitats in North East Africa.



FAMILY VALVATIDAE

The shell is small, umbilicate and usually depressed. The operculum is multispiral and corneous. The family consists of a single genus, mainly found in northern, temperate and subtropical regions.

GENUS Valvata Müller, 1774

The multispiral operculum separates this genus from the other small African prosobranchs. In Africa one species, recorded only from North East Africa, is found.

Valvata nilotica Jickeli, 1874
Up to 3 x 4 mm in Egypt. Known from the Egyptian Nile and canals. In Ethiopia a more high-spired form occurs in the highlands.

FAMILY HYDROBIIDAE

The shell is small to very small, the operculum is corneous and paucispiral and usually the central tooth has basal denticles The family has a worldwide distribution and it is divided into a great number of genera. Five genera are known from Africa, but only one occurs in North East Africa.

GENUS Hydrobia Hartmann, 1821

The shell is small, less than 5 mm high, with a high conical spire. Two species are known from North East Africa.

KEY TO SPECIES OF HYDROBIA

1 A Whorls convex, sutures deep . . . H. ventrosa
  B Whorls rather flat, sutures shallow . . . H. musaensis

Hydrobia ventrosa (Montagu, 1803)
Up to 4.0 x 1.8 mm. A species found in brackish water in Europe. Now common in Lake Birket Qarun, Egypt.

Hydrobia musaensis (Frauenfeld, 1855)
Up to 5.0 x 2.5 mm. A number of probably identical species, described from Northern Egypt and Sinai, are here united under the oldest name. Found only in northern Egypt and Sinai.

FAMILY ASSIMINEIDAE

The shell is small, the operculum is corneous and paucispiral. Basal denticles on the central tooth are not present. Between the lateral and the first marginal tooth, an accessory plate is found. The family has a worldwide distribution. In Africa five genera are found. The family is not represented in North East Africa, but two species, both belonging to the genus Eussoia Preston, 1912, might be found in southern Ethiopia.

FAMILY BITHYNIIDAE

The shell is small, the operculum is calcareous with a spiral inner and a concentric outer part. The family is widely distributed except in America. Eight genera are known from Africa, two of these from North East Africa.

KEY TO THE GENERA OF BITHYNIIDAE

1 A Spiral part of operculum placed in the middle. Central tooth with 3-5 basal denticles on either side . . . Gabbiella
B Spiral part of operculum placed to one side. Central tooth with two basal denticles . . . Jubaia



GENUS Gabbiella Mandahl-Barth, 1968

The shell is small, the operculum is calcareous with a spiral inner part placed in the center and a concentric outer part. The genus is known only from Africa and consists of 23 species, two of which are found in North East Africa.

KEY TO SPECIES OF GABBIELLA

1 A The spiral part of operculum occupies almost half the diameter . . . G. senaariensis
B The spiral part of operculum occupies only a fourth of the diameter . . . G. adspersa

Gabbiella senaariensis (Küster, 1852)
Up to 7.5 x 4.5 mm. A species common in Egypt, the Sudan and Chad. In the southern part of the White Nile and in Uganda some smaller forms occur. These are of uncertain species status.

Gabbiella adspersa (Jickeli, 1874)
Up to 8.0 x 5.0 mm. Very similar to the preceding species, but the spiral part of the operculum is distinctive. Known only from Ethiopia.

GENUS Jubaia Mandahl-Barth, 1968

The shell is small, the operculum is calcareous and concentric with a spiral nucleus placed to one side. The central tooth has only one to two basal denticles. The genus comprises two species, one in Ethiopia and one in Somalia.

Jubaia aethiopica (Verdcourt, 1958)
Up to 4.9 x 3.6 mm. Known only from the type locality: Balleh Mersin, Ogaden, Ethiopia.

FAMILY THIARIDAE

The shell is high to very high and frequently sculptured. The operculum is corneous, either paucispiral or concentric, with a sometimes small spiral nucleus. The family has a worldwide distribution with many genera. In freshwaters of Africa 26 genera are recognized, two of which occur in North East Africa.

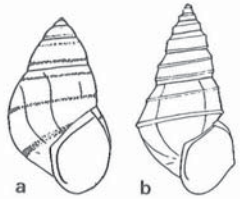
KEY TO GENERA OF THIARIDAE

| | | |
|---|---|---|
| 1 A | Conical shell . . . | Cleopatra |
| B | Turreted shell . . . | Melanoides |

GENUS Cleopatra Troschel, 1856

Shell medium sized, conical or ovate, smooth or with spiral ribs, in some species also with dark spiral bands. About 20 species are known, all from Africa. From North East Africa only one species is recorded.

Cleopatra bulimoides (Olivier, 1804)
Up to 22 x 9 mm. The typical form with smooth lower whorls (a) is common in the Nile, the canals of Egypt and of the Sudan. A form with well-developed spiral ribs and slender shell (b) is found in the Ethiopian highland.




GENUS Melanoides Olivier, 1804

The shell is turreted, usually with strong both spiral and transverse sculpture. The genus is found worldwide. In Africa 29 species are recognized, but only one from North East Africa.



Melanoides tuberculata (Müller, 1774)
Up to 47 x 14 mm. A very variable species with respect to size, development of sculpture and colour. It is partly parthenogenetic and viviparous. The species is widely distributed in Africa and is common in North East Africa.

FAMILY POTAMIDIDAE

Members of this family have a high spired, usually strongly sculptured shell. The aperture has a deep notch in the basal margin. The operculum is corneous and multispiral. Species of the family live in tropical brackish waters near the coast (estuarine). One species is also found in inland brackish waters of Egypt.

GENUS Pirenella Gray, 1847

The transverse ribs are intersected by spiral lines into nodules. Two species are known, one from the Mediterranean area and one from the coastal areas of the Indian Ocean.

Pirenella conica (Blainville, 1829)
Up to 20 x 7 mm. The shell is often brightly coloured with blue and brown spiral bands. The species is common along the Mediterranean coast. It is also found in Egyptian lagoons and in the lake Birket Qarun. The species is first intermediate host for the trematode Heterophyes heterophyes, an intestinal parasite of man.

## PULMONATES

The freshwater pulmonates are distinguished from the prosobranchs by the absence of an operculum and by the radula, in which numerous small, rather uniform teeth are found. As a very general rule, freshwater pulmonates have more delicate shells than both the prosobranchs and the terrestrial pulmonates. The freshwater pulmonates can be distinguished from the terrestrial pulmonates by the number of tentacles; two and four respectively.

### KEY TO FRESHWATER PULMONATE FAMILIES

| | | | |
|---|---|---|---|
| 1 | A | Shell spirally coiled . . . | 2 |
| | B | Shell cap- or shield-shaped . . . | ANCYLIDAE(p.29) |
| 2 | A | Shell discoid . . . | PLANORBIDAE(p.15) |
| | B | Shell globose or higher . . . | 3 |
| 3 | A | Shell dextral . . . | LYMNAEIDAE(p.13) |
| | B | Shell sinistral . . . | 4 |
| 4 | A | Spire usually not sharply pointed, pseudobranch present, radula teeth in slightly curved rows, blood red . . | PLANORBIDAE(p.15) |
| | B | Spire sharply pointed, pseudobranch absent, radula teeth in V-shaped rows, blood colourless . . . | PHYSIDAE(below) |

### FAMILY PHYSIDAE

The medium-sized shell is sinistral, ovate or acuminate and often shiny. A pseudobranch is absent. The radula teeth are arranged in V-shaped rows. The blood is colourless. The family has a worldwide distribution, with the majority of the genera found in North America. In Africa two genera are found, one of these in North East Africa.



### GENUS Physa Draparnaud, 1801

The shell is ovate or acuminate with a pointed spire. The genus comprises several species in North America and a few from the Old World. One species is found in Northeastern Africa. It also occurs, probably introduced, in Central, Eastern and Southern Africa.

Physa acuta Draparnaud, 1805

Up to 15 x 9 mm. Often confused with species of Bulinus, but can be distinguished by 1) the lack of a pseudobranch, 2) the V-shaped rows of the radula, 3) the pointed apex, 4) the colourless blood and 5) the lack of microsculpture on the apex. The species is very common in Lower Egypt and is known from some localities in Ethiopia and the Sudan. It never acts as intermediate host for Schistosoma spp.

### FAMILY LYMNAEIDAE

The dextral, medium to large shell is characteristic for the family. Lymnaeid snails have a worldwide distribution with most species belonging to the genus Lymnaea. This genus is the only one represented in Africa

### GENUS Lymnaea Lamarck, 1799

Seven species are known from Africa, four of these occur in North East Africa, two from Egypt only. Lymnaeid snails may be confused with species of the SUCCINEIDAE, a land snail living in very moist environments. Species of Lymnaea are known as intermediate hosts for liver flukes of cattle (Fasciola spp.).

### KEY TO SPECIES OF LYMNAEA

| | | | |
|---|---|---|---|
| 1 | A | Spire much shorter than aperture . . . | 2 |
| | B | Spire as high as or a little smaller than aperture . . | 4 |

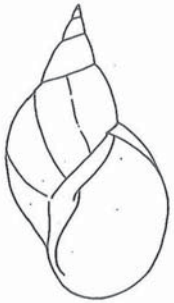
2 A Shell very thin, four tentacles (land snail) . Succinea sp.
B Shell more heavy, two tentacles, transverse lines are well developed . . . 3

3 A Shell without spiral lines . . . L. natalensis
B Shell with distinct spiral lines . . . L. columella

4 A Whorls of spire flat, shell up to 60 mm high . . . L. stagnalis
B Whorls of spire convex, shell up to 15 mm high . . . L. truncatula

Lymnaea truncatula (Müller, 1774)
Up to 10 x 5 mm. The small size and convex whorls are distrinctive. A species found in Europe and Northern Africa, including Egypt and Ethiopia. It has been introduced to many Southern African countries. The species is an intermediate host for Fasciola hepatica, a liver fluke possibly occurring in Southern Africa.

Lymnaea stagnalis (Linnaeus, 1757)
Up to 60 x 25 mm. The high spire with flat whorls is distinctive. Probably introduced from Europe to Egypt, where it has been recorded once from Wadi el Natroun.



Lymnaea natalensis Krauss, 1848
Up to 25 x 15 mm. The short spire and large aperture distinguish this species from the preceding. The lacking spiral sculpture distinguishes it from the following species. The species is very widespread in Africa and occurs commonly in North East Africa. The species is the only intermediate host for the giant liver fluke of cattle in Africa: Fasciola gigantica.



Lymnaea columella Say, 1817
Up to 17 x 9 mm. This species is easily confused with the preceding species, but closely running spiral lines are characteristic for Lymnaea columella. The species is originally American, but has been introduced to both Europe and Africa. In North East Africa it is only recorded from Egypt. It is an intermediate host for Fasciola hepatica.

## FAMILY PLANORBIDAE

Small to medium sized snails, which have two, long slender tentacles and red blood. The shell form varies from discoid (the majority of the genera) over globose to turreted. The family has a worldwide distribution and is divided into three subfamilies, of which two occur in Africa.

### KEY TO SUBFAMILIES OF PLANORBIDAE

1 A Shell discoid or lentiform . . . PLANORBINAE(below)
B Shell globose or higher . . . BULININAE(p.23)

### SUBFAMILY PLANORBINAE

All native African species of this subfamily have a discoid or lentiform, dextral shell. The subfamily has a worldwide distribution and consists of many genera. In Africa 12 genera are known. These are, for practical purposes, divided into the small planorbids (shell height less than 2 mm) and the large planorbids (shell height more than 2 mm).

### KEY TO GENERA OF PLANORBINAE

1 A Shell more than 2 mm high . . . 2
B Shell less than 2 mm high . . . 4

2 A Shell 2-3 mm high, often with a distinct angle below the periphery . . . Planorbis(below)
B Shell higher than 3 mm without peripheral angle . . . 3

3 A A preputial gland absent Shell up to 8 mm high . . . Biomphalaria(p.17)
B A preputial gland present Shell up to 14 mm high . . . Helisoma(p.18)

4 A Shell lentiform . . . 5
B Shell discoid . . . 6

5 A Shell with 3-9 internal septa . . . Segmentorbis(p.22)
B Shell without or with incomplete internal septa . . . Lentorbis(p.21)

6 A Shell less than 0.8 mm high . . . 7
B Shell more than 0.8 mm high . . . 8

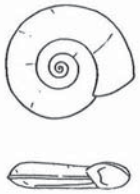
7 A Whorls rapidly increasing, shell very small (0.5 x 3 mm) . . . Armiger(p.19)
B Whorls slowly increasing, shell up to 0.8 x 4.8 mm . . . Afrogyrus(p.19)

8 A Penis with a long stylet . . . Gyraulus(p.21)
B Penis with sclerotized tip . . . Ceratophallus(p.20)

GENUS Planorbis Geoffroy, 1767

The flat, medium sized, dextral shell with a keel along or just below the periphery, is distinctive. The genus comprises a few European species, one of which is found in North Africa.

Planorbis planorbis (Linnaeus, 1758)
Up to 2.5 x 11 mm. The Egyptian specimens are rather small and the keel below the periphery may disappear near the aperture. Common in Lower Egypt, live specimens have not been recorded from the Sudan and Ethiopia





GENUS Biomphalaria Preston, 1910

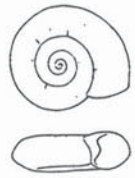
The medium sized, relatively high, dextral shell is characteristic for the genus. It may be confused with species of Helisoma, but the absence of a preputial gland in Biomphalaria is distinctive. The genus is found in South and Central America, Arabia and Africa. Approximately 30 species are recognized, of these 10 in Africa and three in North East Africa. Some of the African species of Biomphalaria are very difficult to separate, both on morphological and on enzymic evidence. Most of the African species of the genus act as intermediate hosts for Schistosoma mansoni, a parasite causing intestinal schistosomiasis in man.

KEY TO SPECIES OF BIOMPHALARIA

1 A Full-grown shell consists of 4.5-5 rapidly increasing whorls. Diameter of umbilicus smaller than height of shell . . . B. pfeifferi
B Full-grown shell consists of 5.5- 6.5 more slowly increasing whorls. Diameter of umbilicus as large as or larger than height of shell . . . 2

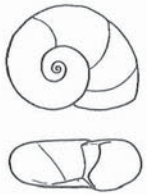
2 A The whorls are rounded on the upper side apart from the last third of the ultimate whorl which is flattened. Umbilicus usually not much larger than height of shell . . . B. alexandrina
B The whorls are flat on the upper side Umbilicus 1.5 times as large as height of shell . . . B. sudanica

Biomphalaria alexandrina (Ehrenberg, 1831),
Up to 4.8 x 14.2 mm. It is a rather heterogeneous species, some populations show resemblance to B. pfeifferi, and others to B. sudanica. Common in Egypt as far south as El Minya and also found near Khartoum in the Sudan.

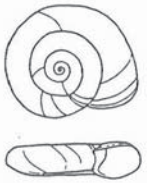


With the construction of the Aswan High Dam the species has colonized the Nile River up to the Dam, below which it was found in 1979. The species is the intermediate host for Schistosoma mansoni in Egypt.

Biomphalaria pfeifferi (Krauss, 1848)
Up to 5.5 x 16 mm. A very widespread and variable species. Common in the Sudan and Ethiopia, but not recorded from Egypt. It is the most important intermediate host for S. mansoni in tropical Africa.



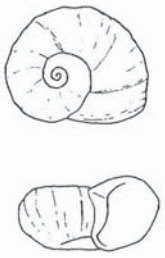
Biomphalaria sudanica (Martens, 1870)
Up to 4.2 x 15.1 mm. The flat shell with the very large umbilicus is characteristic. The species is found in southern Sudan and in Ethiopia . It is an intermediate host for S. mansoni.



GENUS Helisoma Swainson, 1840

The medium sized, high and dextral shell is characteristic for the genus. In contrast to Biomphalaria, a preputial gland is present. The genus is American and comprises many species. One species has been introduced to several African countries including Egypt.

Helisoma duryi (Wetherby, 1879)
Up to 9.5 x 20 mm. The high shell and flat whorls of the umbilicus separate this species from species of Biomphalaria, though some individuals might appear as intermediate. In such cases the presence or absence of the preputial gland and prostatic duct is distinctive. In North East Africa the species is found in Lower Egypt. It is used in experiments as a biological control agent against African intermediate host snails of schistosomiasis.





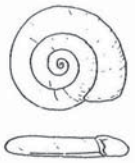
GENUS Afrogyrus Brown & Mandahl-Barth, 1973

The slowly increasing whorls, the small, very flat shell, together with the cap-like stylet of the penis, are distinctive. The genus is only found in Africa and comprises six species, two of which are found in North East Africa.

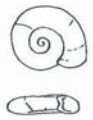
KEY TO SPECIES OF AFROGYRUS

| | | |
|---|---|---|
| 1 A | Shell up to 5 mm in diameter . . . | A. coretus |
| B | Shell less than 3 mm in diameter . . . | A. oasiensis |

Afrogyrus coretus (Blainville, 1827)
Up to 0.8 x 4.8 mm. Mainly a West African species with a scattered distribution in Eastern Africa. Known from some localities in the Sudan and in Ethiopia.



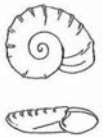
Afrogyrus oasiensis (Demian, 1962)
Up to 0.7 x 2.5 mm. This species might represent a dwarf form of A. coretus. Known only from the Dakhla and Kharga oases in Egypt.



GENUS Armiger Hartman, 1843

The rapidly increasing whorls and small, very flat shell together with the cap-like stylet of the penis, are distinctive. The genus comprises only a few species, mainly in northern temperate regions. One species is found in Ethiopia.

Armiger crista (Linnaeus, 1758)
Up to 0.5 x 3.0 mm. Specimens without transverse ribs and specimens with transverse ribs are often found together. The species is European, but is known from one locality near Debra Berhan, Ethiopia.



GENUS Ceratophallus Brown & Mandahl-Barth, 1973

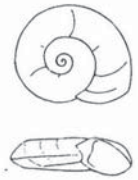
The long sclerotized tip of the penis is characteristic for the genus. The small shell can have either slowly or rapidly increasing whorls. The genus is entirely African and includes 12 species. In North East Africa three species are recorded.

KEY TO SPECIES OF CERATOPHALLUS

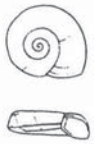
| | | |
|---|---|---|
| 1 A | Whorls are slowly increasing. No distinct angle below the periphery . . . | C. natalensis |
| B | Whorls are rapidly increasing with a distinct angle below the periphery . . . | 2 |
| 2 A | Shell about 5 mm in diameter with 4 whorls. No angle above the periphery . . . | C. blanfordi |
| B | Shell 3.5 mm in diameter with 4 whorls. A more or less distinct angle is found above the periphery . . . | C. bicarinatus |

Ceratophallus natalensis (Krauss, 1848)
Up to 1.3 x 5.8 mm. A species common in Eastern Africa from Ethiopia and the Sudan to South Africa.

Ceratophallus blanfordi Brown, 1973
Up to 1.3 x 5.2 mm. Easily confused with the preceding species, but at the same size it has one whorl less. The angle below the periphery is also distinctive. Known only from Lakes Ashangi and Haik in Ethiopia.



Ceratophallus bicarinatus (Mandahl-Barth, 1954)
Up to 1.1 x 3.7 mm. Differs from the preceding species by the smaller size and more pronounced angles. Found in Lake Albert, Uganda, Lake Chad and Lakes Zwai and Awassa in Ethiopia.



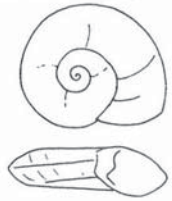


GENUS Gyraulus Charpentier, 1837

The long stylet on the penis is distinctive. The genus comprises a great number of species from all parts of the world. Three species are known from the African continent, two from North East Africa.

KEY TO SPECIES OF GYRAULUS

| | | |
|---|---|---|
| 1 A | Shell only with growth lines . . . | G. ehrenbergi |
| B | Shell costulate i.e. with fine transverse ribs regularly arranged . . . | G. costulatus |



Gyraulus ehrenbergi (Beck, 1837)
Up to 1.7 x 6.8 mm. The slowly increasing whorls and the smooth shell are characteristic. Recorded only from Lower Egypt, where it is common.

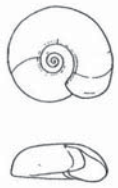


Gyraulus costulatus (Krauss, 1848)
Up to 1.4 x 5.5 mm. The rapidly increasing, costulate whorls with a peripheral angle separate this species from all other African planorbid snails. The species is widely distributed in tropical Africa and it is recorded from the Sudan and Ethiopia.

GENUS Lentorbis Mandahl-Barth, 1954

The lentiform shell without or only with traces of septa is characteristic for the genus. Three species, all African, are known. One species occurs in North East Africa.

Lentorbis junodi (Connoly, 1922)
Up to 1.7 x 5.5 mm. In shell form this species is very similar to Segmentorbis angustus. The lack of a flagellum in L. junodi is distinctive. The species has a scattered distribution in Eastern Africa. Recorded from a few localities in Ethiopia and southern Sudan.



GENUS Segmentorbis Mandahl-Barth, 1954

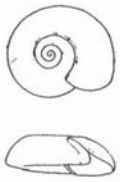
The lentiform shell with several septa in the last whorl is characteristic of the genus. Five species, all from Africa, are known, three of these occur in North East Africa.

KEY TO SPECIES OF SEGMENTORBIS

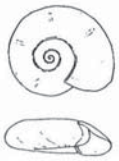
1 A Shell 3 times as wide as high . . . S. angustus
B Shell 3.5 - 4 times as wide as high . . . 2

2 A Last whorl bluntly carinate, no spiral lines present . . . S. eussoensis
B Last whorl sharply carinate, spiral lines present . . . S. kanisaensis

Segmentorbis angustus (Jickeli, 1874)
Up to 2.0 x 5.5 mm. Shell usually reddish brown with 4-9 septa. Can be confused with L. junodi, but differs from this species by the presence of a flagellum on the penis sheath. Widely distributed in tropical Africa. In North East Africa known from southern Sudan and Ethiopia.



Segmentorbis eussoensis (Preston, 1912)
Up to 1.5 x 5.3 mm. Shell height is less than for S. angustus, with a more open umbilicus and 5 septa. Described from northern Kenya, but never refound there. Individuals conforming to this species are known from Kosti, the Sudan and Ismailiya, Egypt.



Segmentorbis kanisaensis (Preston, 1914)
Up to 1.2 x 4.6 mm. The lower shell, with a distinct angle at the periphery, and the spiral microsculpture are distinctive. The species is common in most of tropical Africa including Ethiopia and the Sudan.



SUBFAMILY BULININAE

In African species the shell is medium sized, sinistral, globose, ovate or higher. In the Asian genus Indoplanorbis, occurring in Southeast Asia, Socotra, and recently found in Nigeria, the shell is discoid.

GENUS Bulinus Müller, 1781

The genus is easily identified by the sinistral shell and the presence of a pseudobranch. Forty species of Bulinus are presently recognized. These are divided into four species groups according to morphological and anatomical characters. While it is fairly easy to identify an individual to species group, a reliable identification to species may require the use of cytological or enzymic characters.

KEY TO THE SPECIES GROUPS OF BULINUS

1 A Shell globose or ovate with a spire shorter than aperture. Height of shell less than twice the width . . . 2
B Shell turriculate, spire in full-grown specimens higher than aperture. Height of shell larger than twice the aperture . . . forskalii-group

2 A Microsculpture reticulate, columellar margin broadly reflexed. Full-grown shell less than 7 mm. Inhabitants of temporary water . . reticulatus-group
B Microsculpture not reticulate, columellar margin not distinctively broadly reflexed. Full-grown shell height more than 7 mm. Inhabitants of more permanent water . . . 3

3 A Columella more or less truncate. Microsculpture, if present, consists of spirally arranged short transverse lines or dots. A kidney ridge usually present . . . africanus-group

B Columella not truncate. Microsculpture consists of transverse ribs. A kidney ridge is always absent . . . tropicus/truncatus-group

Forskalii-group

This group comprises 6 African species. The two North East African species have not so far been shown to transmit S. haematobium in East and North East Africa but transmission of S. bovis is known.

KEY TO THE SPECIES OF THE FORSKALII-GROUP

1 A Whorls of spire usually with a shoulder angle. Penis sheath same length as preputium . . . B. forskalii

B No shoulder angle on the upper whorls. Penis sheath twice as long as preputium . . B. scalaris

Bulinus forskalii (Ehrenberg, 1831)
Up to 14 x 4 mm. The high spired shell, usually with a shoulder angle on the upper whorls, makes it easy to recognize this species. The species is found widespread all over Africa in both temporary and permanent waters.

Bulinus scalaris (Dunker, 1845)
Up to 11.5 x 4.4 mm. The relatively broader shell without shoulder angle separates it from the B. forskalii. Known from Ethiopia to Namibia; has a very scattered distribution, but is always found in temporary waters.



Reticulatus-group

This group comprises the most primitive members of the genus Bulinus. In North East Africa one species, which can act as intermediate host for S. haematobium, is found.

Bulinus reticulatus Mandahl-Barth, 1954
Up to 7 x 5 mm, often smaller. The broadly reflexed not adnated columellar margin and the reticulate microsculpture are distinctive. It has a scattered distribution from Ethiopia to South Africa. It is easy to overlook as it typically inhabits very temporary water bodies. Probably best found during the end of the rainy season.

Africanus-group

This group comprises 7 African species, at least 5 of which are known to act as intermediate hosts for S. haematobium. In addition S. bovis and S. mattheei are transmitted through members of the species group. From North East Africa 5 species are known.

KEY TO THE AFRICANUS-GROUP

1 A Umbilicus widely open, columellar margin broadly reflexed . . . B. umbilicatus

B Umbilicus narrowly open or closed, columellar margin comparatively narrow . . . 2

2 A Shell whitish, with shouldered whorls. Somalis and eastern Ethiopia . . . B. abyssinicus

B Shell brownish, whorls not shouldered . . . 3

3 A Penis sheath distinctly longer and much wider than preputium. Immature specimens cannot be identified with certainty . . . B. africanus

B Penis sheath not longer and not much wider than preputium . . . 4

4 A Full-grown shell 10-15 mm high, almost without microsculpture and almost obsolete truncation . . . B. ugandae

B Full-grown shell 15-20 mm high, with more or less pronounced microsculpture and usually with distinct truncation . . . B. globosus

Bulinus umbilicatus Mandahl-Barth, 1973

Up to 15 x 11 mm. Young specimens have no renal ridge and a feeble truncation only. The mesocones of the first lateral tooth are somewhat arrowhead-shaped. The open umbilicus and the broadly reflexed columellar margin are distinctive. Distributed through the northern savannah belt from Darfur to Mauritania. Its status as intermediate host is unknown.

Bulinus africanus (Krauss, 1848)

Up to 22 x 14 mm. The long and wide penis sheath is distinctive and the only reliable character. Widely distributed in Eastern Africa; rare in North East Africa. Important host for S. haematobium, S. bovis and S. mattheei.

Bulinus abyssinicus (Martens, 1866)

Up to 17.6 x 10.7 mm. The light coloured shell, the shouldered whorls and peculiar corrugated sculpture are distinctive, but all these characters are not always present in the same shell. Its distribution is restricted to Somalia, Eastern Ethiopia and perhaps North Eastern Kenya. Intermediate host of S. haematobium.



Bulinus globosus (Morelet, 1866)

Up to 20 x 13 mm. The short, slender penis sheath and the obtuse apex of the shell are distinctive. Widely distributed in Africa south of the Sahara. In North East Africa it is recorded from the southern part of Sudan. Important intermediate host of S. haematobium.

Bulinus ugandae Mandahl-Barth, 1954

Up to 16 x 11 mm. The smallest of the species in this group. The obsolete truncation and very slight or completely lacking microsculpture are distinctive. In East Africa known only from Uganda and the swamps around Lake Victoria. A larger form occurs in the Sudan and Ethiopia. It is the only member of this group which is not intermediate host to S. haematobium.

Tropicus/truncatus-group

A microsculpture consisting of transverse ribs on the upper whorls is the most characteristic, positive character. Otherwise this group can be defined as not possessing the characters of the other three groups. The group consists of 17 species, which are very much in the need of a revision. Four species, which without doubt are valid, occur in North East Africa. However, in Egypt only B. truncatus. In Ethiopia and Somalia they present a great problem of identification using morphological characters and knowledge of chromosome numbers is necessary. Only in Ethiopia all four species are found.

KEY TO SPECIES OF THE TROPICUS/TRUNCATUS GROUP

1 A Snail found in Egypt or Sudan . . . B. truncatus

B Snail found in Ethiopia . . . 2

| | | |
|---|---|---|
| 2 A | Chromosome number 2n = 36 . . . | B. natalensis |
| B | Chromosome number 2n = 72 . . . | B. truncatus |
| C | Chromosome number 2n = 108 . . . | B. hexaploidus |
| D | Chromosome number 2n = 144 . . . | B. octoploidus |

Bulinus natalensis (Küster, 1841)
Up to 13.2 x 9.6 mm. A diploid species (2n = 36) showing great variability in shell form. It has a wide distribution in Eastern Africa from Natal in South Africa to Ethiopia and it might be found in the southern part of the Sudan. It is not known to transmit Schistosoma spp. in nature.

Bulinus truncatus (Audouin, 1827)
Up to 14.6 x 10 mm. A tetraploid species (2n = 72), also very variable in shell form. It is distributed throughout Africa to at least southern Malawi and Zambia. It is commonly found in North East Africa. In Egypt and the Sudan it is the intermediate host for S. haematobium, but it does not seem to transmit this parasite in Ethiopia. It is also an intermediate host for S. bovis in the Sudan and Kenya.

Bulinus hexaploidus Burch, 1972
Up to 14.5 x 9.5 mm. A poorly known, hexaploid (2n = 108) species. It occurs only in the highlands of Ethiopia. Nothing is known as to the role of this species as intermediate host for Schistosoma sp.

Bulinus octoploidus Burch, 1972
Up to 14.4 x 8.5 mm. A poorly known, octoploid (2n = 144) species. It occurs only in the highlands of Ethiopia. It may be an intermediate host for S. bovis.



FAMILY ANCYLIDAE

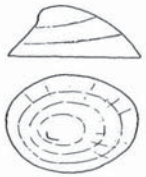
The small, cap- or shield-shaped shell distinguishes this family from all other African freshwater snail families. The family has a worldwide distribution and is represented in Africa by three genera. All three genera are found in North East Africa. Due to lack of proper material and lack of anatomical differences, the systematic status of the species of this family is far from satisfactory.

KEY TO GENERA OF ANCYLIDAE

| | | |
|---|---|---|
| 1 A | Shell cap-shaped with radially punctate apex . . . | Burnupia |
| B | Shell with radially striate apex . . . | 2 |
| 2 A | Shell cap-shaped, 6-10 mm long . . . | Ancylus |
| B | Shell shield-shaped, up to 5 mm long . . . | Ferrissia |

GENUS Burnupia Walker, 1912
The cap-shaped shell with radially punctuated apex distinguishes this genus from the following. Several species are recorded from Africa, one from Ethiopia.

Burnupia kempi (Preston, 1912)
The shell is up to 4.2 mm long, 3.2 mm wide and 1.2 mm high and has a more or less pronounced radial sculpture. The species is found in Ethiopia and East Africa.



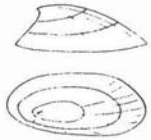
GENUS Ancylus Müller, 1774
The genus has a cap-shaped shell with radially striate apex. The species are the largest of the African ANCYLIDAE. The genus comprises a few species found mainly in Europe. In Africa three species are found, one species in North Africa and two species only in Ethiopia.

KEY TO SPECIES OF ANCYLUS

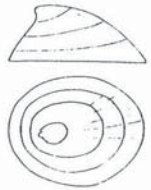
1 A Base of shell nearly circular, apex blunt . . . 2
B Base of shell with almost straight sides, apex sharply pointed . . . A. ashangiensis

2 A Apex projecting backwards, usually forming a hook . . . A. fluviatilis
B Apex obtuse and not projecting . . . A. regularis

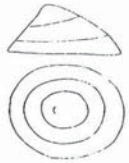
Ancylus ashangiensis Brown, 1965
The shell is up to 7.8 mm long, 4.0 mm wide and 2.8 mm high. It is only known from the type locality as empty shells.



Ancylus fluviatilis Müller, 1774
The shell is up to 8.3 mm long, 7.0 mm wide and 3.5 mm high. It is found in Ethiopia above 2200 meters altitude.



Ancylus regularis Brown, 1973
The shell is up to 7.3 mm long, 5.8 mm wide and 3.0 mm high. Rather common in streams of the Ethiopian highland.



GENUS Ferrissia Walker, 1903

The small to very small shield-shaped shell with radially striate apex is distinctive. The genus has a worldwide distribution. Several species have been described from Africa. In North East Africa two species are recognized.



KEY TO SPECIES OF FERRISSIA

1 A Front and back end equal in size; the sides are slightly curved . . . F. isseli
B Front end broader than back end; sides straight . . . F. clessiniana

Ferrissia isseli (Bourguignat, 1866)
The shell is up to 3.2 mm long, 2.3 mm wide and 1.5 mm high. The species is known from Egypt, Ethiopia and East Africa.

Ferrissia clessiniana (Jickeli, 1882)
The shell is up to 5.0 mm long, 2.8 mm wide and 1.8 mm high. The species has been found in Egypt, Ethiopia and Kenya.