

## Records of Planorbidae new for Ethiopia (Gastropoda, Pulmonata).

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Some results from a survey of the distribution of freshwater Gastropoda in Ethiopia have been reported previously (BROWN 1964, 1965). Further collections were made by the author between July and September, 1965, when living material was obtained of 4 species which have not been recorded previously from Ethiopia, namely *Bulinus (Bulinus) reticulatus* MANDAHL-BARTH, *Anisus coretus* (BLAINVILLE), *Gyraulus bicarinatus* MANDAHL-BARTH and *Arminiger crista* (LINNAEUS). A locality is given in the present note also for *Bulinus (Physopsis) abyssinicus* (MARTENS) which has not been recorded from Ethiopia since the last century (BOURGUIGNAT 1885). *Bulinus reticulatus* and *B. abyssinicus* have been reported to serve as intermediate hosts of *Schistosoma haematobium* in Western Aden Protectorate and Somalia respectively.

Material has been deposited in the Experimental Taxonomy Section of the Zoology Department, British Museum (Natural History); facilities in that institution made available by Dr. C. A. WRIGHT are gratefully acknowledged. Duplicate specimens of *Bulinus reticulatus* and *Gyraulus bicarinatus* have been deposited in the World Health Organisation Snail Identification Centre, Charlottenlund, Denmark. I am indebted to the Haile Sellassie University, Addis Ababa and to Mitchell Cotts (Ethiopia) Ltd. for support and facilities, and to Dr. M. V. PROSSER and Dr. G. F. SANTI for valuable assistance.

### ***Bulinus (Bulinus) reticulatus reticulatus* MANDAHL-BARTH, 1954.**

37 km S. of Gondar on Gorgora road, Begemeder Province, Ethiopia. Temporary pool at edge of field. — Coordinates: E 37° 20' N. 12° 20' Altitude: approximately 1880 m (6170 ft). Leg. D. S. BROWN & M. V. PROSSER. Collectors' no. 65/56. 23.viii.65. 7 specimens. In company with living *Bulinus scalaris* (DUNKER) and *B. truncatus sericinus* (JICKELI).

This Ethiopian locality appears to be the most northerly record in Africa for *B. reticulatus*, which is known to occur in Kenya, Tanganyika and the Rhodesias (MANDAHL-BARTH 1957) and South Africa (VAN EEDEN & OBERHOLZER 1965). The subspecies *wrighti* MANDAHL-BARTH 1965, present in Western Aden Protectorate, is distinguished by having on the lateral radular teeth very large mesocones which are almost completely fused with the endocones (WRIGHT 1963). An Ethiopian specimen has lateral teeth with the endocones and mesocones separate, and therefore appears to belong to the nominate subspecies.

***Anisus coretus*** (BLAINVILLE, 1826).

Northwest shore of Lake Zwai, Arussi Province, Ethiopia. Swamp with abundant aquatic vegetation. — Coordinates: E. 38° 45' N. 8° 10'. Altitude: approximately 1750 m (5740 ft). Leg. D. S. BROWN 7, ix. 65. Collector's no. 65/66. 60 specimens.

River entering the northeast shore of Lake Awasa and forming the boundary between Arussi and Sidamo Provinces, Ethiopia. Slowly flowing water with abundant aquatic vegetation. — Coordinates: E. 38° 30' N. 7° 10'. Altitude: approximately 1750 m (5740 ft). Leg. D. S. BROWN, 12.viii.65. Collector's no. 65/29. 7 specimens. In company with living *Biomphalaria sudanica* (MARTENS), *Anisus natalensis* (KRAUSS), *Segmentorbis angustus* (JICKELI), *Lentorbis* sp., *Bulinus* (*Bulinus*) sp., *Lymnaea natalensis* KRAUSS, and *Sphaerium* sp.

The shell of *Anisus coretus* shows some resemblances to a small specimen of *A. natalensis* but the structure of the penis and prostate gland is different in the two species (WRIGHT 1965). Besides Ethiopia and Cameroon, *A. coretus* is known to occur in eastern South Africa (BROWN, in press). Many more localities for this species will probably be discovered by the study of the anatomy of small specimens of *Anisus*.

***Gyraulus bicarinatus*** MANDAHLE-BARTH, 1954.

Western shore of Lake Zwai at 4 m depth, Arussi Province, Ethiopia. On bottom deposit of fine gravel and silt. — Coordinates: E. 38° 45' N. 8° 0'. Altitude: approximately 1750 m (5740 ft). Leg. D. S. BROWN & M. V. PROSSER. 11.viii.65. Collector's no. 65/28. 9 specimens. In company with living *Bulinus* (*Bulinus*) sp.

Eastern shore of Lake Awasa at 3-4 m depth, Sidamo Province, Ethiopia. On bottom deposit of fine gravel and silt. — Coordinates: E. 38° 30' N. 7° 10'. Altitude: approximately 1750 m (5740 ft). Leg. D. S. BROWN & M. V. PROSSER. 12.viii.65. Collector's no. 65/29. 100 specimens. In company with living *Bulinus* (*Bulinus*) sp. of the *truncatus* species group (BROWN 1965) and *Melanoides tuberculatus* (MÜLLER). No living specimens were found amongst emergent vegetation at the edge of Lake Awasa or Lake Zwai.

*G. bicarinatus* was originally described from Lake Albert and has otherwise been recorded only from Upper Pleistocene deposits near Lake Edward (ADAM 1957).

***Armiger crista*** (LINNAEUS).

Cha Cha River, 14 km west of Debra Berhan, Choa Province, Ethiopia. Rock pools with clumps of *Elodea* sp. — Coordinates: E. 39° 25' N. 9° 45'. Altitude: approximately 2500 m (8200 ft). Leg. D. S. BROWN. 5.viii.65. Collector's no. 65/26. 11 specimens. In company with living *Biomphalaria pfeifferi* (KRAUSS), *Bulinus truncatus sericinus*, *Anisus natalensis*, *Lymnaea truncatula* (MÜLLER), *Valvata* sp., *Ancylus fluviatilis* MÜLLER, *Pisidium* sp., and *Sphaerium* sp.

Recorded in northwest Africa from Algeria (BOURGUIGNAT 1864) and as a Quaternary fossil from the central Sahara (SPARKS & GROVE, 1961), but apparently not known to occur elsewhere in Africa or in the Arabian Peninsula.

***Bulinus (Physopsis) abyssinicus*** (MARTENS, 1866).

Marsh beside Awash River at Assaita, Wallo Province, Ethiopia. — Coordinates: E. 41° 25' N. 11° 35'. Altitude: approximately 350 m (1150 ft). Leg. D. S. BROWN & G. F. SANTI. 20.iii.66. 85 shells, 50 living specimens. In company with living *Bulinus*

*forskali* (EHRENBERG), *Anisus* sp., *Lymnaea natalensis*, *Ferrissia* sp., and *Gabbia subbadiella* (BOURGUIGNAT).

The type locality of *Bulinus abyssinicus* was originally described as 'southern Abyssinia', but the species is not known to occur in the southern provinces of present-day Ethiopia. A record by BOURGUIGNAT (1885) of '*Physopsis*' *abyssinicus* from Lake Haoussa, Ethiopia is accompanied by descriptions of *P. meneiki* collected in the same locality, and *P. soleilleti* from the Awash River. I have not been able to ascertain the exact position of Lake Haoussa, in spite of the fact that the inland delta of the Awash River lies in an area which at the present time is called the Haussa region. There are several lakes in this region, but as local hydrographical conditions are unstable the original lake Haoussa may exist no longer. The locality recorded here lies approximately 25 km west of the lakes in the Haussa region.

The Ethiopian specimens from Assaita and those from Somalia described by MANDAHl-BARTH (1957 and 1957a) have shouldered whorls and corrugated sculpture on the apex which are characters found in no other member of the

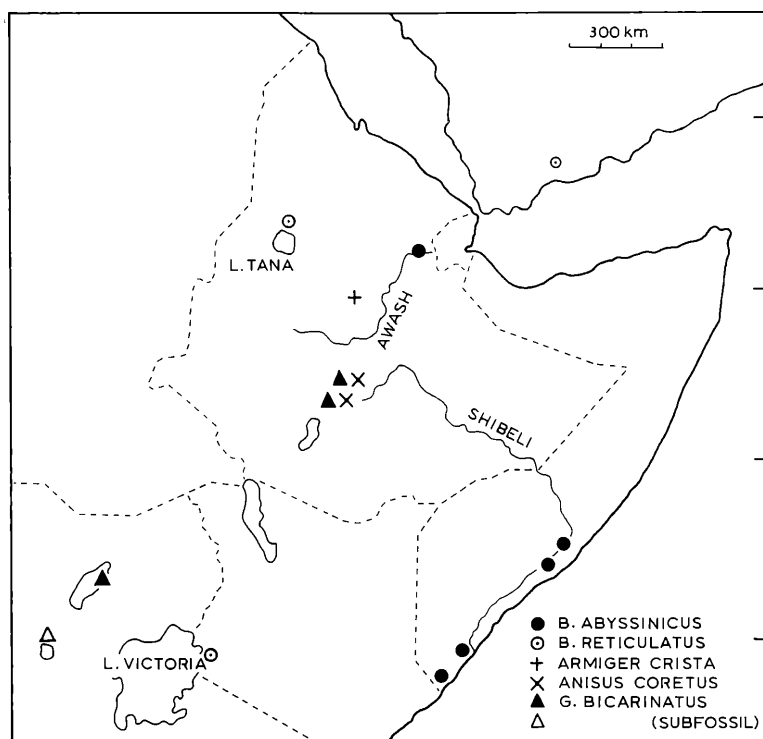


Fig. 1. North eastern Africa including Ethiopia and adjacent territories. Localities in Ethiopia are newly recorded; other localities for *Bulinus abyssinicus* from MANDAHl-BARTH (1957a, 1960), *B. reticulatus* from WRIGHT (1963) and MANDAHl-BARTH (1954), *Gyraulus bicarinatus* from MANDAHl-BARTH (1954) and ADAM (1957).

subgenus *Physopsis*. The species *soleilleti* and *meneliki* were placed tentatively in the synonymy of *Bulinus abyssinicus* by MANDAHL-BARTH (1957), who later (1965) listed that species only from southern Somalia. None of the shells from Assaita have so short a spire, or are as attenuated, as the shells of *Physopsis soleilleti* illustrated by BOURGUIGNAT. The study of further material therefore appears necessary to determine whether the subgenus *Physopsis* is represented in eastern Ethiopia by one or more forms.

### Geographical Distribution.

The molluscs newly recorded for Ethiopia have varied geographical distributions (Fig. 1). *Armiger crista* belongs to a group of freshwater forms with palae-arctic relationships that have not been recorded further south in Africa; in addition to *A. crista* the genera *Valvata* and *Ancylus* are represented in Ethiopia by living forms (BROWN 1965). Conversely, *Anisus coretus* and *Gyraulus bicarinatus* are known to occur only in sub-Saharan Africa, where the distribution pattern of *A. coretus* is that of a member of the tropical fauna (BROWN, in press). Another type of distribution pattern is shown by the occurrence of *Bulinus reticulatus* in the Arabian Peninsula, Ethiopia, central and southern Africa at moderately high altitudes in apparently isolated areas of distribution; in South Africa it has been found most frequently in the temperate climatic region.

The subgenus *Bulinus* (*Physopsis*) is restricted to sub-Saharan Africa, extending in the northeast into the Sudan, and into the Ethiopian plateau north of Lake Tana where *B. (P.) africanus ovoidens* (BOURGUIGNAT) is present. That subspecies also occurs in a more southerly area of distribution in Kaffa Province, western Ethiopia, and it seems likely that further localities may be discovered in southwestern Ethiopia that could provide a connection with its range in Kenya and Uganda. In comparison, *B. (P.) abyssinicus* has a restricted range and it has not been found in the Rift Valley to the south of the Awash River, an area which has been investigated with some thoroughness. Therefore, it appears unlikely that there is, or has been, a western connection between the present areas of distribution of *B. abyssinicus* in eastern Ethiopia and southern Somalia. In the east, the drainage systems of the Awash and Shibeli Rivers are separated by mountain ranges and arid areas from which *B. abyssinicus* is apparently absent. This isolation between the Ethiopian and Somali populations suggests that they are relicts of a range that was formerly more extensive in the Horn of Africa, probably during a period when rainfall was greater than at present.

### Susceptibility to *Schistosoma haematobium*.

Human cases of infection with *S. haematobium* are reported by LEMMA (1965) from near Assaita, the locality for *Bulinus abyssinicus* reported in the present paper. It is probable that *B. abyssinicus* serves as the intermediate host in that area because the only other species of *Bulinus* known to occur there, *B. forskali*, is unlikely to do so.

Specimens of *Bulinus reticulatus wrighti* from Western Aden Protectorate shed cercariae after being infected in the Laboratory with an Aden strain of

*S. haematobium*, and the snail is believed to serve as an intermediate host under natural conditions (WRIGHT 1963a). *B. reticulatus reticulatus* has not, however, been recorded as an intermediate host in Africa.

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