

Freshwater snails of Jordan

Z. S. AMR & M. ABU BAKER

Abstract: A total of 17 species of freshwater snails has been recorded from Jordan. These species are included in eight families under 12 genera (*Theodoxus*, *Bithynia*, *Valvata*, *Semisalsa*, *Pseudamnicola*, *Melanoides*, *Melanopsis*, *Lymnaea*, *Physella*, *Gyraulus*, *Planorbis* and *Bulinus*). The freshwater snail fauna of Jordan represents a mixture of faunal elements derived from Palaearctic, Afro-tropical and Mediterranean origins.

Key words: Freshwater snails, Gastropoda, Jordan, taxonomy, zoogeography, arid environments.

Introduction

Despite the limited water bodies and the aridity of Jordan, 17 species of freshwater snails inhabit its aquatic habitats. BURCH & AMR (1990) had summarised our knowledge on the freshwater snails of Jordan. Scattered reports discussed the freshwater snails of Jordan, especially those that are considered as intermediate hosts for schistosomiasis and fasciolosis (ABDEL-AZIM & GISMANN 1956, SALIBA et al. 1976, 1980, LUTFY et al. 1978, SALIBA & OTHMAN 1980, ARBAJI et al. 1998). Other faunistic studies gave records for several species of freshwater snails from various localities in Jordan (SCATES 1968, SCHÜTT 1982, 1983).

The formation of freshwater bodies in Jordan is a result of the local topography, soil types and climate, and are classified into permanent, seasonal or ephemeral (MALLET & AMR 1990). Permanent water bodies consist of natural springs that are most common in the Mediterranean mountains and discharge westwards into the Jordan Valley. Three main rivers, The Jordan, Yarmouk and Zarqa drain into the Dead Sea at various levels. Most of the freshwater snail fauna is concentrated within these permanent water bodies.

In this review, we discuss the freshwater snail fauna of Jordan, their ecology, distribution and their role in the transmission of trematodes. A brief account of the changes

of the current populations due to habitat alternations is highlighted.

Freshwater snail fauna of Jordan

The freshwater snail fauna of Jordan consists of 17 species belonging to 8 families under 12 genera (*Theodoxus*, *Bithynia*, *Valvata*, *Semisalsa*, *Pseudamnicola*, *Melanoides*, *Melanopsis*, *Lymnaea*, *Physella*, *Gyraulus*, *Planorbis* and *Bulinus*). These species represent a mixture of faunal elements derived from Palaearctic, Afro-tropical and Mediterranean origins. Nevertheless, some species have a narrow distribution and are confined to Jordan and Palestine.

Class Gastropoda

Subclass Prosobranchia

Family Neritidae

Theodoxus (Neritaea) jordani
(SOWERBY 1844) (Fig. 1)

This is one of the most ornamented freshwater snail species in Jordan. Within the same population, different patterns of striations as well as coloration were observed. *Theodoxus jordani* is confined to some localities in the Jordan Valley and along the Jordan and Yarmouk rivers. It prefers clear and fast running water. Snails are usually submerged and attached to stones located within turbulent parts of the

water body. It was collected from the East Ghore Canal as well as from the secondary and tertiary irrigation canals. An isolated population in Azraq oasis was also recorded (BURCH & AMR 1990).

The *jordani* complex consists of three isolated subpopulations; *niloticus* in the Nile River, *jordani* in the Levant rift valley and *euphraticus* in Mesopotamia (ROTH 1987). Furthermore, ROTH (1984) showed that the characteristics of the operculum provide a good base for the systematics of this species. SCHÜTT et al. (1983) discussed the relationships between the plio-pleistocene snails of the Jordan and the Orontes valleys. They stated that this species is very adaptive and variable, to the point that shells of the living forms can not be grouped into geographical subspecies. Further studies discussed the biogeographic relationship of this species in the Middle East (ALOUF 1998).

In Jordan, ABDEL-HAFEZ & ISMAIL (1983) recovered several larval trematodes from *Th. jordani* collected from Yarmouk River.

Theodoxus macrii
(SOWERBY 1844) (Fig. 2)

BURCH & AMR (1990) recognised *Th. macrii* as a separate species from *Th. jordani* since the two nominal species are clearly distinguishable among the examined Jordanian specimens. On the other hand, DEGAN (1971) considered *Th. jordani* and *Th. macrii* as the same species. His conclusion was based on the opercular apophyses and the shape of the central teeth of the radula. *Theodoxus macrii* is smaller than *Th. jordani*, with uniformly black or dark purple colour and without a constriction of the body whorl (BURCH & AMR 1990). Further studies are required to clarify its systematic status.

This species inhabits clear springs and fast running water. It is most common in the springs and streams in the Mediterranean ecozone, and the Jordan Valley.

Family Bithyniidae

Bithynia philalensis (CONRAD 1852)
(Fig. 3b)

This species is confined to Palestine, Jordan, Lebanon and Syria. This is a poly-

morphic species with several synonyms (SCHÜTT et al. 1983). It is usually found in stagnant water, swamps and small ponds along the Jordan Valley and Azraq.

Family Valvatidae

Valvata saulcyi BOURGUIGNAT 1853 (Fig. 4)

Little is known about the ecology of this species. It was collected from Azraq, Jarash, Wadi Es Sir, Yarmouk River and Wadi Rum (SCHÜTT 1983, BURCH & AMR 1990). Its distribution extends from Syria, Jordan, and Palestine to southern Sinai.

Family Hydrobiidae

Semisalsa contempta
(DAUTZENBERG 1894)

This hydrobiid inhabits springs and swamps that are slightly saline. It is usually found submerged under water and attached to aquatic vegetation. Its distribution is confined to Jordan, Palestine and Syria (BURCH & AMR 1990).

Semisalsa longiscata
(BOURGUIGNAT 1856)

This small snail is only known from the saline swamps of Azraq oasis. *Semisalsa longiscata* is a halophylic snail as its habitat suggests. It was reported from brackish waters of the Syrian coastal area (SCHÜTT et al. 1983).

Pseudamnicola solitaria
TCHERNOV 1971 (Fig. 5)

This is another halophylic hydrobiid inhabiting swamps and streams around the Dead Sea area (SCHÜTT 1983, BURCH & AMR 1990). *Pseudamnicola solitaria* is an endemic species to Jordan and Palestine.

Pseudamnicola gaillardotii
(BOURGUIGNAT 1856)

This species was collected from several localities along the Jordan Valley as well as northern Jordan. Individual snails were found submerged and attached to roots of aquatic vegetation. SCHÜTT (1982) gathered all known described taxa of this genus reported from Lebanon and considered them as *Pseudamnicola gaillardotii* due to the undifferentiated anatomical features present among these species.

Family Thiariidae

Melanoides tuberculata (MÜLLER 1774) (Fig. 6)

This thiarid snail is associated with saline freshwater bodies, including springs, streams and swamps. This is a common species in the Jordan Valley and around the Dead Sea basin. Also, it was collected from Azraq oasis (BURCH & AMR 1990). *Melanoides tuberculata* has a wide range of distribution throughout much of Africa into Asia and Australia. This species is active mostly at night, hiding beneath decaying plants and stones or burying itself in the mud during the day (LIVSHITS & FISHELSON 1983).

Melanopsis praemorsa buccinoidea (OLIVIER 1801) (Fig. 7b)

This is the most common species inhabiting clear and fast running water in the Mediterranean ecozone. This species is mostly associated with *Theodoxus macrii*. It differs from the other subspecies, *M. p. costata*, by its smooth shell. SCHÜTT (1983) referred to the Jordanian specimens as *M. p. ferussaci* ROTH 1839, a synonym for this taxon (KINZELBACH 1987). Further more, KINZELBACH (1987) stated that two forms of the smooth-shelled *M. praemorsa* occur in the Levant: *M. p. buccinoidea* in the Levant coast, Palestine and Jordan, and *M. p. olivieri* in eastern Anatolia.

Melanopsis praemorsa costata (OLIVIER 1804) (Fig. 7a)

This subspecies is the ribbed form of *M. praemorsa*. This form was collected from the Jordan and Yarmouk Rivers and from other habitats along the Jordan Valley (BURCH & AMR 1990). The colour of the shell may vary from tan to very dark brown or black.

ISMAIL & ABDEL-HAFEZ (1987a) studied the population dynamics of this subspecies along the Yarmouk River. They also reported on nine different forms of cercaria for digenetic trematods. Several studies focused on the natural infection of this snail with various types of cercaria from Azraq and other parts of the country (ISMAIL et al. 1983, ISMAIL & ABDEL-HAFEZ 1983, 1984, 1987b, ISMAIL & BDAIR 1987, 1989).

Subclass Pulmonata

Family Lymnaeidae

Lymnaea (Radix) natalensis KRAUSS 1848 (Fig. 8b)

This species was referred to as *L. auricularia* in previous publications. BURCH & AMR (1990) adopted a system where the genus *Lymnaea* is subdivided into two subgenera: *Radix* and *Fossaria*. *Lymnaea (Radix) natalensis* belongs to the *Lymnaea (Radix) auricularia* complex, however, it differs from the former species by the lack of pronounced columellar plait on the shell as well as other anatomical features (BURCH & AMR 1990).

This snail inhabits marshes, swamps and other forms of steady water bodies in Azraq oasis and the Jordan Valley. It was proven to be the intermediate host snail for the transmission of *Fasciola gigantica* in Azraq (SALIBA et al. 1978, SALIBA & OTHMAN 1980). Other larval trematodes were recovered from *Lymnaea natalensis* (LUTFY et al. 1978).

Lymnaea (Fossaria) trunculata (MÜLLER 1774) (Fig. 3a)

This species is found along mud irrigation canals either buried in mud or attached to algal growth (BURCH & AMR 1990). It seems that this is a temperate species since it was reported from several localities within the Mediterranean ecozone. Its occurrence in the Jordan Valley is limited. In Jordan, little is known about the role of this snail in the transmission of fasciolosis.

Family Physidae

Physella acuta (DRAPARNAUD 1805) (Fig. 8a)

This is a common species in stagnant and steady water bodies in the Jordan Valley. It can tolerate high levels of water pollution. It was exclusively collected from sites along the Jordan Valley in high densities. Large and small snails as well as egg masses are attached to plastic sheets or similar substratum. This species is highly associated with *Bulnius truncatus* in the Jordan Valley.

Family Planorbidae

Gyraulus piscinarum (BOURGUIGNAT 1852)

This species was collected from springs and swamps within the Mediterranean ecozone of Jordan, Yarmouk River as well as from remote and isolated areas. It was found to breed in a small spring in Wadi Rum. It is usually attached to *Chara* sp. or filamentous algae.

Planorbis planorbis (LOCARD 1883)

This discoid species inhabit ponds, pools and steady water bodies with abundance of aquatic vegetation. The Azraq population is declining drastically and may become extinct if water extraction continues. This species can be differentiated from *Gyraulus* by the presence of a keel or sharp angulation at the periphery of its whorls (BURCH & AMR 1990).

Bulinus truncatus (AUDOUIN 1827)

This species received more attention than any other freshwater species in Jordan due to its role in the transmission of urinary schistosomiasis (ABDEL-AZIM & GISMANN 1956, SALIBA et al. 1976, 1980, ARBAJI et al. 1998). This species was incriminated as the intermediate host for indigenous cases in Jordan (ARBAJI et al. 1998).

Bulinus truncatus was found to inhabit all types of ecozones of Jordan. Since 1975 and until the present, a total of 60 sites were identified in four Governorates to harbour this snail. Most of the known populations were concentrated along the Jordan Valley and the Yarmouk River (Balqa and Irbid Governorates), other major sites includes Zarqa River, King Talal Dam and Jarash Roman Pools (Zarqa and Jarash Governorates). An additional site in the southeastern Wadi Rum desert was found to harbour this snail (ARBAJI et al. 1998).

Snails were collected from underneath rocks, floating vegetation, submerged objects (plastic sheets and containers) or around the edges.

Discussion

Remarkable changes of water utilisation patterns are continuing to occur in Jordan, this is exemplified by water extraction from the underground aquifers in remote and arid

environments in the Eastern Desert and Wadi Rum area to meet the demand for the expanding modern agriculture and drinking water. Several major changes have occurred within the past four decades including construction of dams in different parts of the kingdom (Karamah and King Talal Dam), and changes in watercourses of natural water bodies. Such changes allow the expansion of the distribution range of some species by offering suitable breeding habitats (e.g. *B. truncatus* and *Ph. acuta*). On the other hand, some of these changes may be detrimental for species that require fast running and clear water (*Melanopsis* sp.). In Azraq oasis for example, entire populations of *P. planorbis*, *M. turberculata* and *Melanopsis* sp. were eliminated from dried pools in north Azraq due to excessive water extraction. Similarly, many populations of *Melanopsis praemorsa* and *Theodoxus* sp. vanished in many localities in the Jordan Valley due to habitat modifications.

The freshwater snail fauna of Jordan consists of 17 species and represents a mixture of faunal elements derived from Palaearctic (*Lymnaea* and *Bithynia*), Afrotropical (*Melanooides*, *Physella* and *Bulinus*) and Mediterranean (*Melanopsis* and *Semisalsa*) origins. Nevertheless, some species have a narrow distribution and are confined to Jordan and Palestine.

The fresh water snails of the Middle East underwent several changes during the Miocene and the Pleistocene, especially among species of the genus *Melanopsis* (SCHÜTT et al. 1983, SCHÜTT 1988, BANDEL 2000). Two main groups of *Melanopsis* has settled the Levant area; from southern Anatolia and Euphrates (KINZELBACH 1987).

More studies are required to better understand faunal composition of the freshwater snails of Jordan and their ecology. Impact of man made activities on the dispersal and extinction of local populations should be evaluated.

Zusammenfassung

Die Süßwasserschnecken Jordaniens. Für Jordanien wurden 17 Arten von Süßwasserschnecken nachgewiesen. Diese Arten zählen zu 8 Familien in 12 Gattungen

(*Theodoxus*, *Bithynia*, *Valvata*, *Semisalsa*, *Pseudamnicola*, *Melanoides*, *Melanopsis*, *Lymnaea*, *Physella*, *Gyraulus*, *Planorbis* and *Bulinus*). Die Fauna der Süßwasserschnecken Jordaniens weist eine Mischung von Faunenelementen paläarktischer, afro-tropischer and mediterraner Herkunft auf.

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Fig. 1: *Theodoxus (Neritaea) jordani*: This is one of the most polymorphic freshwater snails in Jordan. Note the different striation and colour patterns.

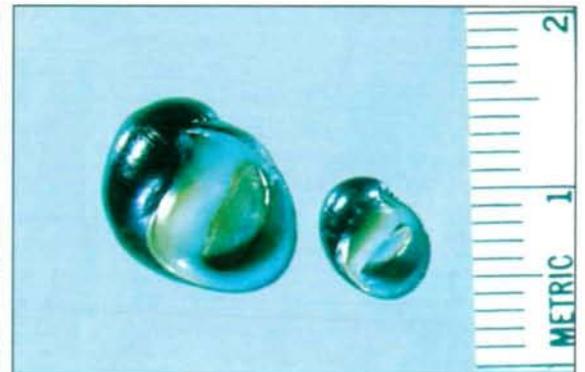


Fig. 2: *Theodoxus macrii*: It inhabits clear springs and fast running water. It is most common in the springs and streams in the Mediterranean ecozone, and the Jordan Valley.

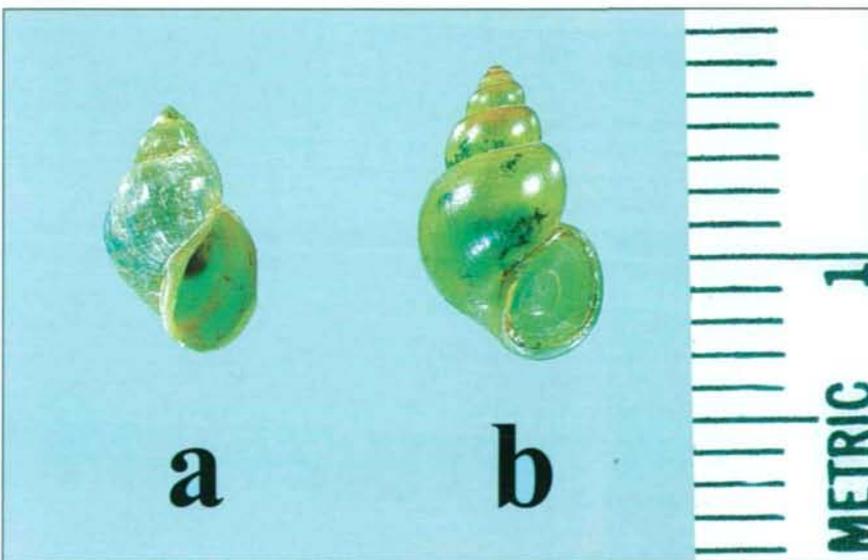


Fig. 3: **a:** *Lymnaea (Fossaria) trunculata*: A common snail in the mountainous areas of Jordan. This is an amphibious snail found in mud along irrigation canals.
b: *Bithynia philalensis*: An operculated freshwater snail with limited distribution in the Jordan Valley.



Fig. 4: *Valvata saulcyi*: This freshwater snail has been collected from diverse habitats including Azraq, Jarash, Wadi Es Sir, Yarmouk River and Wadi Rum.



Fig. 5: *Pseudamnicola* sp.: These little hydrobiids are mostly endemic to Jordan, Palestine and Syria. They are mostly submerged in water or attached to aquatic vegetation.



Fig. 6: *Melanoides tuberculata*: This thiarid snail is associated with saline aquatic habitats. It is a common species in the Jordan Valley and around the Dead Sea basin.

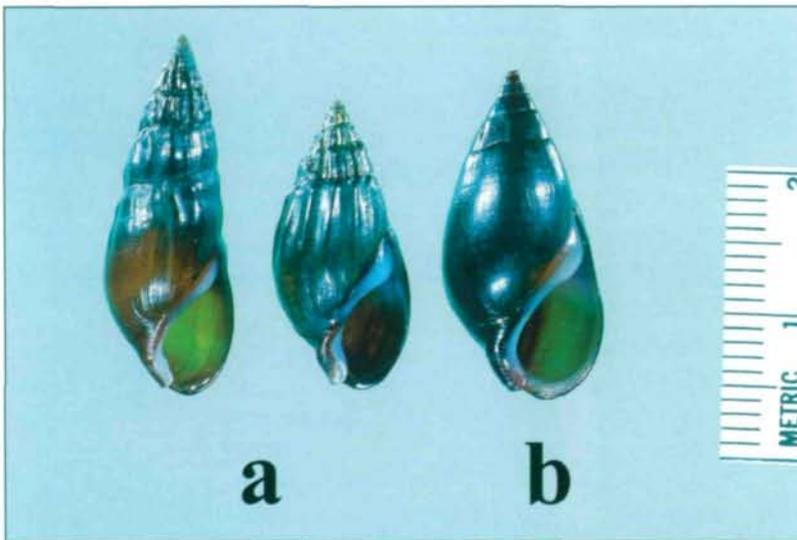


Fig. 7: a: *Melanopsis praemorsa costata*: This species is confined to the Jordan and Yarmouk Rivers. It exhibits different colours that range from light brown to deep dark.

b: *M. praemorsa buccinoidea*: A common species associated with clear and fast running water.

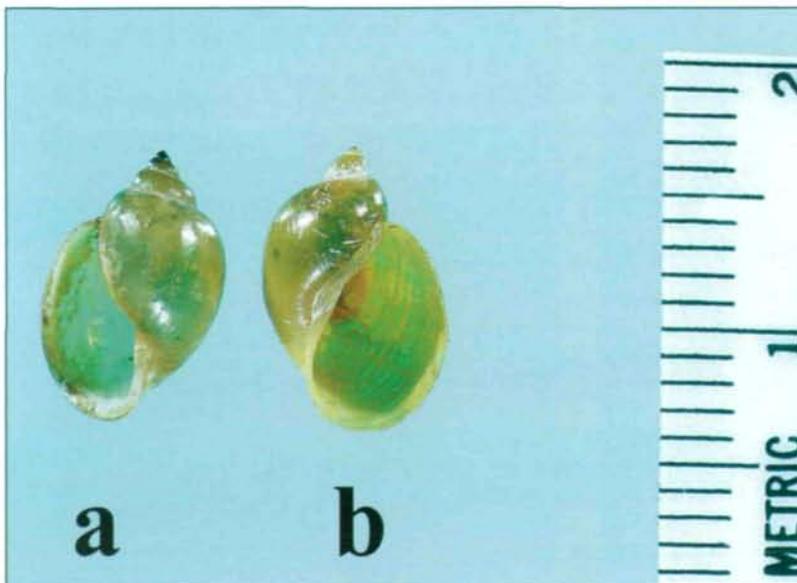


Fig. 8: a: *Physella acuta*: This snail is confined to the Jordan Valley. Associated with slow running water it was found along with *Bulinus truncatus*.

b: *Lymnaea (Radix) natalensis*: One of the largest pulmonates known from Azraq Oasis and the Jordan Valley. This species is the known intermediate host for fascioliasis in Jordan.