

**Studies on Larval Stages of Digenetic Trematodes
of *Melanopsis praemorsa* L. Snail
from Azraq Oasis, Jordan**

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Introduction

Several digenetic trematodes have been described from various aquatic vertebrates in Azraq Oasis (Madi, 1976). The intermediate hosts of many of these trematodes are still unidentified.

According to Scates (1968) and Nelson (1973), there are seven species of snails in Azraq. *Lymnaea auricularia* is the only snail from Azraq which has been examined for larval stages of digenetic trematodes. *Fasciola gigantica* cercariae, echinostome cercariae, xiphidiocercariae, longifurcate cercariae and brevifurcate schistosome cercariae were reported from this snail (Saliba, 1977; Lutfy *et al.*, 1978; Saliba and Othman, 1980).

Melanopsis praemorsa is one of the most prevalent snails present in the fresh water bodies of Jordan (Saliba, personal communication). In Azraq, it is very common on the edges of Oasis waters close to the springs. Therefore, it is expected that it may serve as an intermediate host for digenetic trematodes of vertebrates in

Azraq. Ullman (1954) reported nine different types of cercariae found in *M. praemorsa* collected from Yarkon River, Palestine. These included two types of *Cercaria microcotylae*, two types of *C. virgulae*, a *Cotylocercous* cercariae, a xiphidiocercaria, a *Cercariaem* cercaria, *C. vivax*, and *C. orospinosa*. However, the latter was the only one described. Additionally three types of cercariae were encountered in snails from Megiddo springs in the Yizre'el Valley: two xiphidiocercariae and a furcocercous cercaria (Lengy and Stark, 1971). The present study describes two types of cercariae encountered in specimens of *M. praemorsa* collected from two water bodies in Azraq. For description of the Azraq Oasis review Ismail *et al.* (1978).

Materials and Methods

A total of 1579 *M. praemorsa* snails were collected from two sites near the Water Pumping Stations of Northern and Southern Azraq during the period from May to September 1981. Collection and examination of snails for cercariae were carried out as described by Saliba *et al.* (1978). Observations on the larval trematodes recovered were made on live, unstained or vitally stained (0.5% neutral red or 0.5% methylene blue) specimens, as well as on

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specimens fixed either in F.A.A. solution or in 70% ethanol, and subsequently stained in acetocarmine.

Measurements were taken on live and fixed larval trematodes, and a minimum of 10 specimens were measured. Drawings were made using a camera lucida.

Results

Two different types of cercariae were

found in *M. praemorsa* snails, namely, a tailless cercaria and a pleurolophocercous cercaria.

1. The Tailless Cercaria (Fig. 1):

This cercaria was found in 66 and 20 of 848 and 731 *M. praemorsa* snails collected from water bodies of Northern and Southern Azraq, respectively. Measurements, in microns, on live and fixed cercariae, respectively, were as follows: body length 171-281 and 120-174; body width 86-141

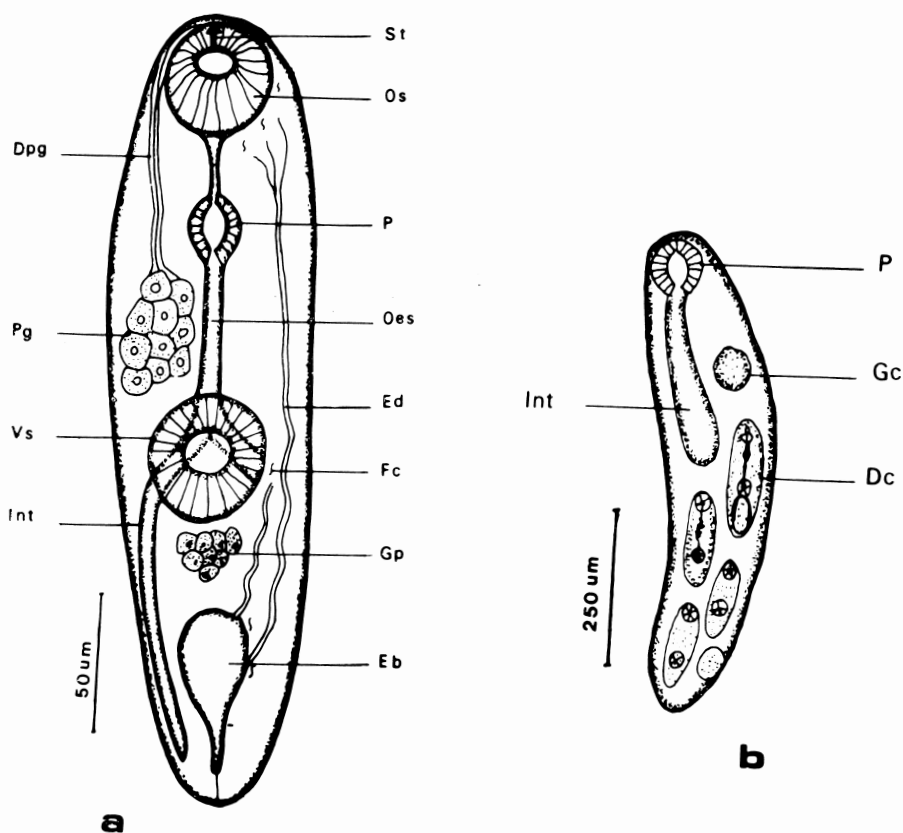


Fig. 1 a. Frontal view of tailless cercaria.
b. Cercariae developing within redia.

Key to Lettering of Figures

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|-----------------------|-------------------------|--------------------------------|
| Ao: adhesive organ | Dc: developing cercaria | Dpg: duct of penetration gland |
| Eb: excretory bladder | Ec: excretory canal | Ed: excretory duct |
| Es: eye spot | Fc: flame cell | Ff: fin-fold |
| Gc: germ cell | Gp: genital primordium | Int: intestine |
| Lp: lateral process | Oes: oesophagus | Os: oral sucker |
| p: pharynx | Pg: penetration gland | Rg: refractile gland |
| St: stylet | Vs: ventral sucker | |

and 75–120. The tail is undeveloped.

The body of the cercaria is covered with a tegument 1–4 μm thick. The tegument is covered evenly with delicate crenations. Fine spines were detected at the posterior end of the body and the internal edge of the acetabulum.

The spherical and muscular oral sucker is 45–60 μm in diameter and bears, at its anterior edge, a relatively small stylet 6–8 μm long. The spherical acetabulum, 45–63 μm in diameter, is located in the posterior half of the body and is usually protruding above the level of the body surface.

The digestive system consists of a mouth that leads posteriorly into a narrow prepharynx which passes through a muscular pharynx at 30 μm from the posterior border of the oral sucker. The pharynx is 30 μm in diameter and connects with a long oesophagus that is 75 μm long and 11 μm wide. The oesophagus bifurcates at the level of the acetabulum into two intestinal caeca that extend to the posterior extremity of the body.

The excretory system is conventional. The pearshaped excretory bladder is relatively large (90 by 30 μm) and is located centrally at the posterior end of the body. It opens into a terminal excretory pore at the posterior margin of the body. The bladder receives 4 main excretory ducts. The two medial ducts could not be detected beyond the level of the acetabulum, while the two external ducts could not be detected beyond the pharynx. Neither could the smaller collecting tubules be traced. However, 12 flame cells were found distributed symmetrically on both sides of the body. The flame cell formula is 2 [(2)+(1)+(1)+(1)+(1)]=12.

The genital primordium consists of a dense cluster of cells located between the acetabulum and the excretory bladder.

The glandular system is made up of two groups of penetration glands on both sides of the body between the acetabulum and

the pharynx. It was possible to count 10 glands in each group. The four glandular ducts, two on each side, open at the anterior margin of the body. Granulated cystogenous cells are distributed all over the body.

This cercaria is an inactive swimmer. When it emerges from the snail it swims for a short time in a whip-like manner. Later, it settles down on the bottom of the dish where it performs intermittent creeping movements.

Shedding of cercariae occurs usually during the night. It was noticed that when cercariae creep out of the snail they aggregate on the tentacles before they pass into the water. The emerged cercariae survive only for a few hours, then die without encystment.

Cercariae developed within sausage-shaped rediae varying greatly in size. The largest redia was 1224 μm long by 184 μm wide, while the smallest was 367 by 153 μm . The redia possesses a spherical pharynx (54–64 μm in diameter) and a rhabdocoel gut (282–428 μm long by 73–147 μm wide). Rediae usually contain 1–4 fully-developed cercariae, 4–7 developing cercariae, and germ cells.

2. *The Pleurolophocercous Cercaria* (Fig. 2):

This cercaria was found in eight (four from each site) out of the 1579 *M. praemorsa* snails collected. Measurements, in microns, on live and fixed cercariae, respectively, were as follows: body length 147–269 and 160–185; body width 49–116 and 62–75; tail length 282–404 and 318–345, tail width (without fin-fold) 25–37 and 25–30.

The body of the cercaria varies from pyriform to oval in shape and is covered with a thin tegument (about 2 μm thick). The anterior third of the body is covered with minute spines. Larger spines (about 4 μm long) are mainly present at the anterior edge.

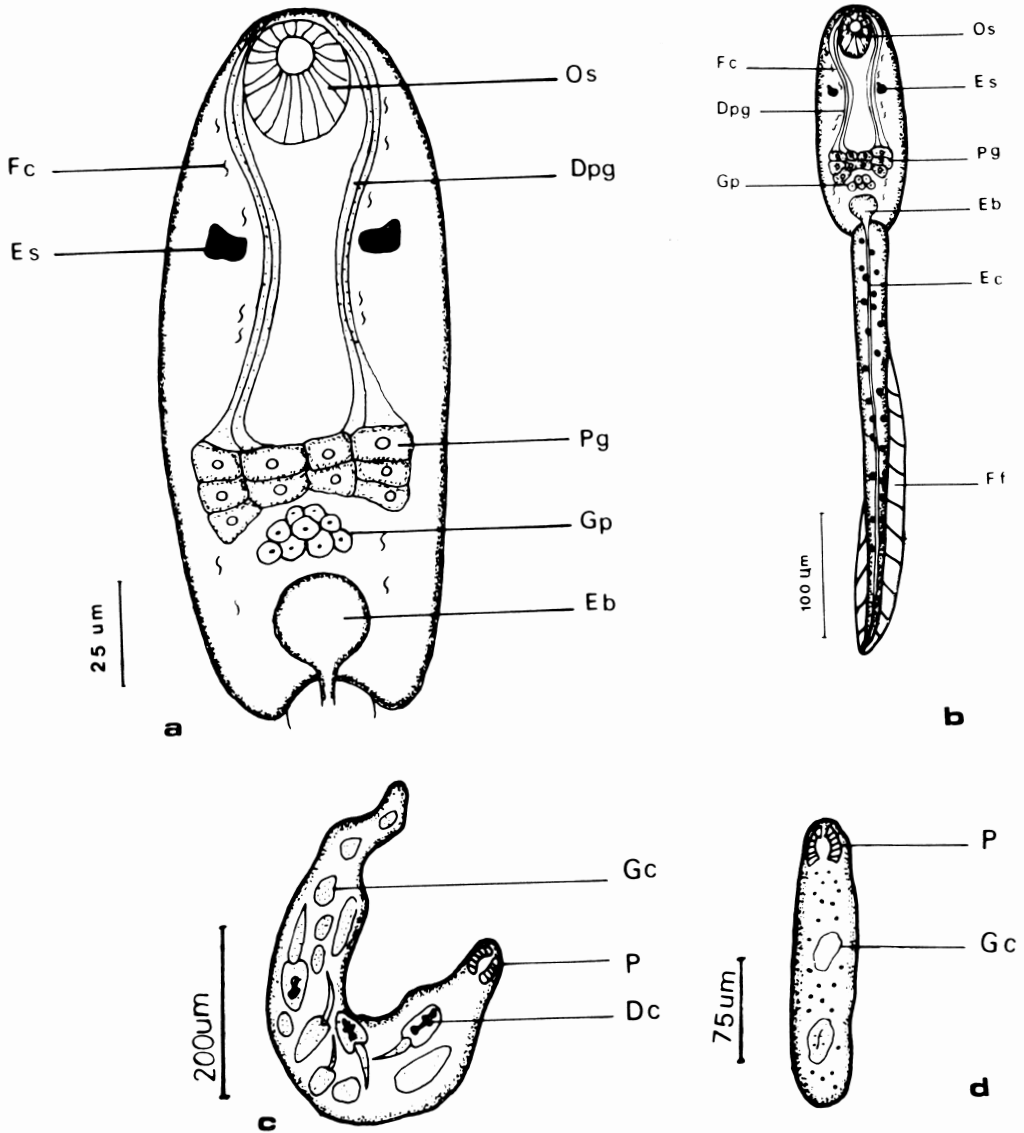


Fig. 2 a. Details of systems of pleurolophocercous cercaria.
 b. Frontal view of cercaria.
 c. Large redia with cercariae.
 d. Small redia.

The tail, about twice as long as the body, is provided with a fin-fold (about 18 μm wide) which covers the distal two-thirds of one side of the tail and the distal third of the other side.

The eye spots, one on each side of the body, are irregularly shaped, darkly-pigmented, measuring roughly 10–12 by 10–12 μm, and are located at about 60 μm from the anterior extremity.

The oral sucker is oval in shape (42–24 μm) and lies subterminally at the anterior end. No traces of an oesophagus, a pharynx, a gut, or an acetabulum were found.

The excretory system consists of a spherical excretory bladder which is located centrally at the posterior extremity of the body and leads into a caudal excretory canal. The latter runs through the center of the tail to open at its tip. The main excretory ducts and the smaller collecting tubules were not detected. However, 14 flame cells are demonstrable and are distributed symmetrically on both sides of the body, but not in the tail. The flame cell formula is $2 [(1)+(1)+(2)+(1)+(1)+(1)]=14$.

The genital primordium consists of a mass of cells abutting the anterior margin of the excretory bladder.

The glandular system is made up of five pairs of penetration glands located above the genital primordium. The ducts of glands group into two duct bundles, one on each side of the body. The two bundles continue anteriorly and open at the anterior margin of the oral sucker.

This cercaria is a very rapid swimmer. It swims in all directions by the action of the tail. When motion ceases, the cercaria slowly sinks down to the bottom. During rest periods, the cercaria is roughly pipe-shaped with the tail held vertically above the contracted heart-shaped body.

Cercariae show thigmotaxis, tending to concentrate along the edge of the dish. They also show positive phototaxis.

Shedding of cercariae occurs mainly in the day time. At room temperature (about 27°C), cercariae swim actively for about 24 hours. The life span of the cercaria is about 36–48 hours.

This cercaria develops within sausage-shaped rediae varying greatly in size and possessing a spherical to oval pharynx. There seemed to be two populations of rediae, large rediae with a small pharynx,

and small rediae with a relatively large pharynx. The smaller rediae (171–220 μm long by 43–67 μm wide with a pharynx 24–36 μm in diameter) contained germ cells only. Larger rediae (664–918 μm long by 61–155 μm wide with a pharynx 21–33 μm in diameter) contained both germ cells and developing cercariae.

Discussion

This is the first report of a natural infection of *M. praemorsa* snails with two types of cercariae in Jordan. The cercariae recovered from this snail belong to two different groups of cercariae. The tailless cercaria belongs to a group of cercariae designated by Lühe (1909) as "*Cercariae*", in which the tail is undeveloped. Lühe divided this group into two types, "*Cercariaeum sensu stricto*", which develops in rediae of unbranched sporocysts and *Leucochloridium*, which develops in branched sporocysts. Sewell (1922) divided Lühe's "*Cercariaeum*" group into two groups: "*Mutabile*", which develops in rediae, and "*Helicis*", which develops in sporocysts. The tailless cercaria recovered in this study clearly belong to the "*Mutabile*" group. Moreover, the presence of a stylet in this cercaria indicates that it belongs to a subgroup of "*Mutabile*" cercariae designated by Dubois (1929) as *Cercaria helveticum*.

Cercariae of the "*Mutabile*" group develop into trematodes belonging to the Monorchidae (Yamaguti, 1958). One of these trematodes, *Asymphylodora tincae*, was reported from a species of carp, *Barbus canis*, from Azraq (Madi, 1976). However, the cercaria of *A. tincae* is *Cercaria paludinae impurae* which uses *Bithynia tentaculata* snails as an intermediate host (Filippi, 1854; Broek and Jong, 1979), and which is different from the tailless cercaria encountered from *M. praemorsa* in Azraq: it is larger in size; it has no stylet; it has 14 flame cells instead of 12; and its caeca

do not extend to the posterior extremity of the body. Thus, further experiments are needed to recover the adult fluke of this cercaria to properly identify it and determine its life cycle.

The other cercaria recovered from *M. praemorsa* belongs to a group of cercariae designated by Sewell (1922) as "*Pleurolophocerca*", in which the acetabulum is absent and the tail is provided with a cuticular fin-fold. This cercaria is different from the pleurolophocercous cercaria, *C. orospinosa*, from *M. praemorsa* described by Ullman (1954) in several aspects: it has five pairs of penetration glands instead of seven; it has 14 flame cells instead of 16; its tail is partially covered with a fin-fold and its rediae lack rhabdocoel gut. Cercariae of the "*Pleurolophocerca*" group develop into trematodes belonging to the family Heterophyidae (Dawes, 1968). Lutfy and Madi (1980) reported the occurrence of metacercariae of a heterophyid, *Pygidiopsis genata*, in *Tilapia zillii*, a fresh water fish from Azraq. The relationship between *P. genata* and the "*Pleurolophocerca*" cercaria encountered from *M. praemorsa* is not known. Further studies are needed to determine whether such a relationship exists, although it is expected.

Summary

Two cercariae are described from the fresh-water snail *Melanopsis praemorsa* L., collected from two sites in Azraq Oasis during 1981. One of the cercariae is a tailless cercaria belonging to the *Mutabile* group, while the second is a pleurolophocercous cercaria. Details are presented on the morphology and behavior of the cercariae as well as on their development within the snail. The relationships between these cercariae and adult trematodes reported from the fresh-water vertebrates in Azraq are discussed.

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ヨルダン Azraq Oasis の巻貝 *Melanopsis praemorsa* L. から検出された
吸虫類幼虫についての研究

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1981年間にヨルダン Azraq Oasis の淡水産巻貝 *Melanopsis praemorsa* L. から検出された2種のセルカリアについて記載した。1種は *Mutabile* 群に属する無尾セルカリアであり、もう1種は *Pleurolopho-*

cercous セルカリアであった。それらの形態、行動さらには具体内での発育について詳細をのべた。またこれらセルカリアと同地区の淡水産脊椎動物から報告されている成虫との関係をのべた。