Digenetic trematodes and cestodes of *Clarias gariepinus* (Burchell, 1822) in Lebowa, South Africa, with taxonomic notes

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Specimens of the freshwater fish *Clarias gariepinus* belonging to different age groups were sampled seasonally over a period of two years from eight dams and a river, and examined for digenetic and cestode parasites. They were found to be infested with metacercariae of *Euclinostomum heterostomum* and *Diplostomum mashonense*, a mature *Glossidium pedatum*, and two mature cestodes, *Polyonchobothrium clarias*, and *Proteocephalus glanduliger*. The prevalence, intensity and mean intensity of each of these parasites is given as well as a review of the taxonomic status of *Afromacroderoides lazerae*.

Voorbeelde van *Clarias gariepinus* behorende tot verskillende ouderdomsgroepe is oor 'n tydperk van twee jaar seisoenlikse vir wurmparasiete ondersoek. Gasheervoorbeelde is uit agt verskillende damme en 'n rivier versamel. Daar is bevind dat hierdie gasheere besmet was met metaserkariee van *Euclinostomum heterostomum* en *Diplostomum mashonense*, volwasse *Glossidium pedatum*, sowel as met twee spesies van volwasse lintwurms, naamlik, *Polyonchobothrium clarias* en *Proteocephalus glanduliger*. Die voorkomssyfer, besmettingsintensiteit en gemiddelde intensiteit van besmetting met hierdie parasiete is bepaal en die taksonomiese status van *Afromacroderoides lazerae* word bespreek.

Keywords: Aquaculture, cestodes, *Clarias gariepinus*, parasites, trematodes

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Introduction

*Clarias gariepinus* has been the object of various investigations in an attempt to select the most suitable indigenous freshwater fish for aquacultural purposes in South Africa (Safriel & Bruton 1984). It was specifically selected because it has a wide distribution in this country and it is known to survive relatively adverse conditions in nature such as muddy water and extremely low oxygen concentrations. It is also tolerant to water temperatures ranging from 8°C to 35°C, a wide salinity range (0-10%), a wide pH range and high sibling densities (Safriel & Bruton 1984). In northern South Africa it is accepted as food fish and, as a result, regarded as an excellent aquaculture candidate. However, diagnosis and treatment of parasitic diseases was identified as one of the fields which still needs to be researched (Safriel & Bruton 1984).

The purpose of this survey was to establish the natural digenetic trematode and cestode fauna of this fish species in Lebowa, South Africa. The prevalence, intensity and mean intensity of these parasites was also recorded.

Several parasites of *Clarias gariepinus* have been recorded in South Africa: Boomker (1984) described a new species, *Phyllodistomum bavuri*; Lombard (1968) recorded a *Clinostomum* species; Prudhoe & Hussey (1977) reported two types of *Diplostomum* metacercariae, a *Neodiplostomum* metacercaria, a *Euclinostomum* metacercaria and a new species, *Phyllodistomum vanderwaaldii*. In addition to the parasites listed above Van As & Basson (1984) included the parasites which will be discussed in this paper in their checklist of freshwater fish parasites from South Africa.

Material and methods

The sites sampled are the same as those for nematode parasites of *Clarias gariepinus* (Mashego & Saayman 1981). Three hundred and thirty seven fish of different age groups were collected using beach seine-nets and gill nets. Fish specimens were transported live to the laboratory where they were killed immediately before being examined for parasites. The latter were fixed in hot formal-acetic-alcohol and preserved in 70% ethyl alcohol to which 5% glycerine had been added. The parasites were not pressed between slides during fixation. Wholemount slides were made after staining in Mayer’s Paracarmine, while sections were stained in Delafield’s Haematoxylin and in Eosin. They were dehydrated in upgrading strengths of alcohol and mounted in Canada Balsam. Material of *Diplostomum* larvae described by Prudhoe & Hussey (1977) from the cranial cavity of *Clarias gariepinus* were studied and type specimens of *Afromacroderoides lazerae* Khalil, 1972 were compared with those of *Glossidium pedatum* from the present survey.

Three different species of digenetic trematodes and two species of cestodes were collected during this survey. The localities from which these parasites were collected are given in Table 1, while Table 2 summarizes the prevalence, intensity and mean intensity of these parasites in the study area.

Results and discussion

Digenea

*Euclinostomum heterostomum* (Rudolphi, 1809)

Two metacercariae were collected from fish from Buffeldoorrn and Seshgeo dams (Table 1) during
autumn. The parasites were found encysted in the muscles ventro-lateral to the dorsal fin, immediately below the skin. The metacercariae of E. heterostomum from South African fish were described and figured by Britz, Saayman & Van As (1984), Mönnig (1926) and Prudhoe & Hussey (1977).

Comparison of the present material of E. heterostomum with other metacercariae recorded by Britz et al. (1984), Fischthal & Kuntz (1963), Prudhoe & Hussey (1977) and Ukoli (1966), revealed that the present material is larger (13.2 mm compared with 5.8-10.5 mm) and possesses more posterior-lateral branches to each intestinal caecum (15-17) than the other material (8-13). In addition, the junction of the uterus and the uterine sac is towards the middle of the latter in the present material and at the anterior end of the uterine sac in the other material. However, the number of diverticula to each caecum is the same as those of the metacercaria of Eucilinostomum sp. idet. described by Prudhoe & Hussey (1977), but the latter specimen is much larger being 19.3 mm long and 5.4 mm wide, compared with 13.2 mm and 4.9 mm respectively.

The present metacercariae of E. heterostomum were first identified as E. dollfusi Fischthal & Kuntz, 1963 (Mashego 1977) because they are similar to the adult specimens of the latter, especially with regard to size, number of posterior-lateral branches to each intestinal caecum (15-17), and the position of the junction between the uterus and uterine sac, which is towards the middle of the latter.

The superfamily Clinostomoidea was recently revised and its systematics analysed by Feizullaev & Mirzoeva (1983). These authors recognize E. heterostomum (Rudolphi, 1809) as the only valid species, and thus both E. dollfusi and E. vanderkuypi of Fischthal & Kuntz (1963) are regarded as synonyms of heterostomum. However, in the key to the identification of this species, these authors state that the gonads are located in the third quarter of the body. In the present material they are consistently found in the last quarter of the body. This is regarded merely as a variation and not of any specific taxonomic value.

Infestations of fish by these metacercariae will have a detrimental effect on fish culture. Since these parasites are encysted in the muscles, they are likely to render fish unattractive and unacceptable for human consumption; especially in heavy infestations which are likely to occur in ponds with a high fish density if the intermediate snail host is present.

Although human infestations by members of the genus Eucilinostomum (Clinostomatiidae) have not yet been reported, records of human infestations by members of a closely related genus, Clinostomum (Clinostomatiidae), exist (Yamashita 1938; Witenberg 1944; Hirai, Ooiso, Kifune, Kiyota & Sakaguchi 1987). This probably resulted from eating uncooked fish.

**Table 1** The localities (x) of the different digenean and cestodan parasites of *Clarias gariepinus* in Lebowa, South Africa

<table>
<thead>
<tr>
<th>Locality</th>
<th>Euclinostomum heterostomum</th>
<th>Diplostomum mashonense</th>
<th>Glossidium pedatum</th>
<th>Polonychobothrium clarias</th>
<th>Proteocephalus glanduliger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buffeldoon Dam</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Coetzeebraid Dam</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Krokodilshewel Dam</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Lepellane Dam</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Namakgale Dam</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Olifants River</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Piet Gouws Dam</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Seshego Dam</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Turflap Dam</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

**Table 2** The prevalence, intensity and mean intensity of the different digenean and cestodan parasites of *Clarias gariepinus* in Lebowa, South Africa

<table>
<thead>
<tr>
<th>Parasite</th>
<th>Prevalence %</th>
<th>Intensity</th>
<th>Mean Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euclinostomum heterostomum</td>
<td>0.59</td>
<td>1-1</td>
<td>1</td>
</tr>
<tr>
<td>Diplostomum mashonense</td>
<td>93</td>
<td>1-4321</td>
<td>2391</td>
</tr>
<tr>
<td>Glossidium pedatum</td>
<td>33</td>
<td>1-3000</td>
<td>62</td>
</tr>
<tr>
<td>Polonychobothrium clarias</td>
<td>64</td>
<td>1-200</td>
<td>23</td>
</tr>
<tr>
<td>Proteocephalus glanduliger</td>
<td>3</td>
<td>1-17</td>
<td>7</td>
</tr>
</tbody>
</table>
with these metacercariae yielded adult trematodes, which were afterwards found to be present in grey heron, *Ardea cinerea* (Beverley-Burton 1963). The parasites collected during this survey were found to be similar to those described by Beverley-Burton (1963) except for minor variations which are of no taxonomic significance.

The present material of *D. moshonense* is similar to those described by Prudhoe & Hussey (1977) from *C. gariepinus* in the relative size of the oral and ventral suckers. It differs, however, in the extent of the constriction into fore- and hindbody, as well as the shape, size and situation of the reproductive organs. Prudhoe & Hussey (1977) did not describe the excretory and digestive systems and, as a result, these systems cannot be compared. In addition, their material was not well preserved making comparisons with the present material difficult.

The prevalence, intensity and mean intensity of metacercariae of *D. moshonense* in *C. gariepinus* is given in Table 2. The frequency of infestation of this parasite in most of the localities sampled was found to be as high as 100%.

Ten of the fish hosts from Seshego Dam were kept in large glass aquaria for four weeks of observation before being killed and examined. Despite the heavy infestation by metacercariae of *D. moshonense* no abnormal behaviour was observed and the fish were found to be in good health and condition.

*Glossidium pedatum* Looss, 1899

This parasite was collected from the posterior third of the intestine and from the rectum of fish hosts from seven of the nine localities sampled (Table 1). The prevalence, intensity and mean intensity of *G. pedatum* on *Clarias gariepinus* is given in Table 2.

*G. pedatum* was first reported by Looss (1899) from *Bagras bayad* Forskal, 1775 and *B. docmac* (Forskal, 1775) (Bagridae) from the Nile River at Cairo. Although Looss's (1899) description was very brief, it was accompanied by a clear and detailed diagram. Fischthal (1973) recorded and redescribed *G. pedatum* from the intestine of *Clarias mssambicus* (= *C. gariepinus*) in Ethiopia providing additional morphological information. Although his redescription is not accompanied by an illustration it corresponds to Looss's (1899) description and agrees largely with the material from this survey except that Laurer's canal does open on the dorsal surface in the present material.

During this survey it was noted that there is some similarity between the present material and *Afromacroderoides lazerae* Khalil, 1972 from the intestine of *Clarias lazera* Cuvier and Valenciennes, 1840 collected from the White Nile near Khartoum, Sudan. The type specimens of *A. lazerae* were obtained and examined.

It was found that Khalil's (1972) description, figure and type specimens correspond to the description and figure of *G. pedatum* (Fischthal, 1973; Looss, 1899). A comparison of the present material of *G. pedatum* and the type specimens of *A. lazerae* confirmed their similarity. The present material revealed that the position of the vitellaria varied in different individuals. It extends from the level of the ventral sucker to any point between the latter and the posterior end of the animal. In Khalil's (1972) specimens the vitellaria are limited to the area between the ventral sucker and the posterior border of the anterior testis. In addition *A. lazerae* is slightly larger than the present material, but the local material showed that specimens from different localities differed in size.

It appears that Khalil (1972) erred by considering the shape of the body, the position of the genital pore, the extension of the intestinal caeca, the posterior extension of the uterus and the position of the gonads of *A. lazerae* as typical features of members of the family Allocreadiidae Stossich 1903. These features of *A. lazerae* are typical of the family Plagiorchididae Lühe, 1901 (Yamaguti 1958).

It is our considered opinion, therefore, that *A. lazerae* be designated a synonym of *Glossidium pedatum* Looss, 1899. This is the first record of *G. pedatum* south of the Equator.

*Cestoda*

*Polyonchobothrium clarias* (Woodland, 1825)

*P. clarias* was recorded from the gallbladders and intestines of hosts from eight of the nine sampling localities (Table 1). Those found in the gallbladders were generally larger than those from the intestines and were restricted to young fish (0 age group) from Buffeldoor, Krookolareuwel and Lepellane dams. Specimens were always attached to the main bile duct with their strobila protruding into the gallbladder. Apart from having more and smaller hooks, the specimens from the gallbladders are morphologically similar to those from the intestines. Measurements of the hooks of the various specimens are within the range given by Tadros (1968). Those parasites found in the intestines occur in all age groups of fish hosts from the localities sampled, with the exception of Namakale Dam. The prevalence, intensity and mean intensity of *P. clarias* in *Clarias gariepinus* is given in Table 2.

*Polyonchobothrium clarias* seems to be widely distributed in African freshwater fish (Tadros 1968), but, as far as could be ascertained, has not yet been recorded from the gallbladder. The life cycle of this parasite is unknown. Its occurrence in the gallbladders of young fish as well as its prevalence in the present study area suggest that it might play an important role in clarid culture in this area.

*Proteocephalus glanduliger* Janicki, 1928

These parasites were collected from hosts from four of the nine sampling localities (Table 1). Specimens of *P. glanduliger* were always found embedded in the epithelial lining of the small intestine of *Clarias gariepinus*. The parasites were usually completely covered by the mucous lining of the intestine. However, on rare occasions, the last two proglottides were found protruding above the mucous lining. The presence of
these parasites is indicated by the extensive haemorrhage caused in the area surrounding their point of attachment. Because they cause internal bleeding, these parasites could have profound negative influence on clarid fish farms in South Africa.

The life cycle of this parasite is not known. It was originally recorded by Janicki (1928) from *Clarias angelilarius* (Linnaeus, 1762) in Egypt. *P. glanduliger* was found only in mature fish and its prevalence, intensity and mean intensity are given in Table 2.

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References


