PARASITES OF *CLARIAS GARIEPINUS* (BURCHELL, 1822) (PISCES: CLARIIDAE) FROM THE MWANZA GULF, LAKE VICTORIA

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ABSTRACT

Seventeen species of parasites were recovered from 1071 Clarias gariepinus examined from the Mwanza Gulf of Lake Victoria. The parasite fauna comprised of four ectoparasites, a Monogenea, Hirudinea, crustacean and a Digenea; and fourteen endoparasites, five nematodes, five trematodes and three cestodes. Twelve parasite species were adults and five were larval forms. Ten were identified to species, six to genus and one to family level. Many species recorded are common to C. gariepinus, *a few, e.g.* Tylodelphys *species is a first record in fish of Africa, thus represents a new host record.* Spinitectus petterae *is reported for the first time in Tanzania, as such represents a new geographical citing. The proteocephalid cestode is also a new record in this host in Tanzania.*

INTRODUCTION

The catfish *Clarias gariepinus* (Burchell, 1822) is one of the favoured fish for aquaculture in Tanzania and Africa in general (Awachie & Ezenwaji 1981). *C. gariepinus* is an omnivorous fish and can survive in extremely harsh environmental conditions, a feature that has made it favourable for culture in many parts of the world (Peteri *et al.* 1992). The omnivorous habit of *C. gariepinus* can be an important link to parasites. With the growing interest in the development of fish culture in Africa, there is also an increase in the awareness on the role of parasites and diseases as major factors affecting fish farming (Paperna 1980). In Africa, this is even more important as stocks are often drawn from wild populations (Nkwengulila unpub. data). Information on parasite dynamics, pathogenicity and life history would be invaluable to stockers and for general farm management.

Fish parasites can seriously undermine yields, thereby causing great economic loss to fish farmers (Paperna 1980 Field & Irwin 1994). Furthermore, some fish parasites can be passed on to humans causing great discomfort and even morbidity (Oshimo & Kliks 1987). It is therefore imperative that, the parasites and diseases that afflict fishes in natural waters are investigated to form the basis for management of parasitic infections in fish farms.

To-date few studies are known on freshwater fish parasites in Tanzania. Earlier studies, particularly before the sixties were museum type collections recording occurrence and taxonomic status (Fuhrmann & Baer 1925, Baylis 1928). Recent studies include those by Paperna (1979), Mbahinzireki (1984), Nkwengulila (1995) and Mwita (2002). Few studies treated all helminths of a fish species (Mbahinzireki 1984, Nkwengulila upub. Data and Mwita 2002). The foregoing confirms the paucity of information on parasites of *C. gariepinus* in Tanzania. This paper reports on the parasite fauna of *C. gariepinus* in the Mwanza Gulf, Lake Victoria and compares it with that of the other members of the genus in Africa.

STUDY AREA

The Mwanza Gulf (Fig.1) is the largest gulf at the Southern end of Lake Victoria. It extends southwards for about 60 km with an

average width of 5 km and a surface area of about 500 km^2. The Gulf divides into two arms - the Stuhlman and Smith Sounds, at about 35 km from the entrance. The shoreline has a muddy bottom, is irregularly shaped and fringed by vegetation. The Gulf is a sub-littoral area, 6 m (South end and outside the bays) to 16 m deep (north end). The coastline is hilly and covered with large granite rocks. A detailed description of L. Victoria including the Mwanza Gulf is available in Mbahinzireki (1984) and Witte & Van Densen (1995).

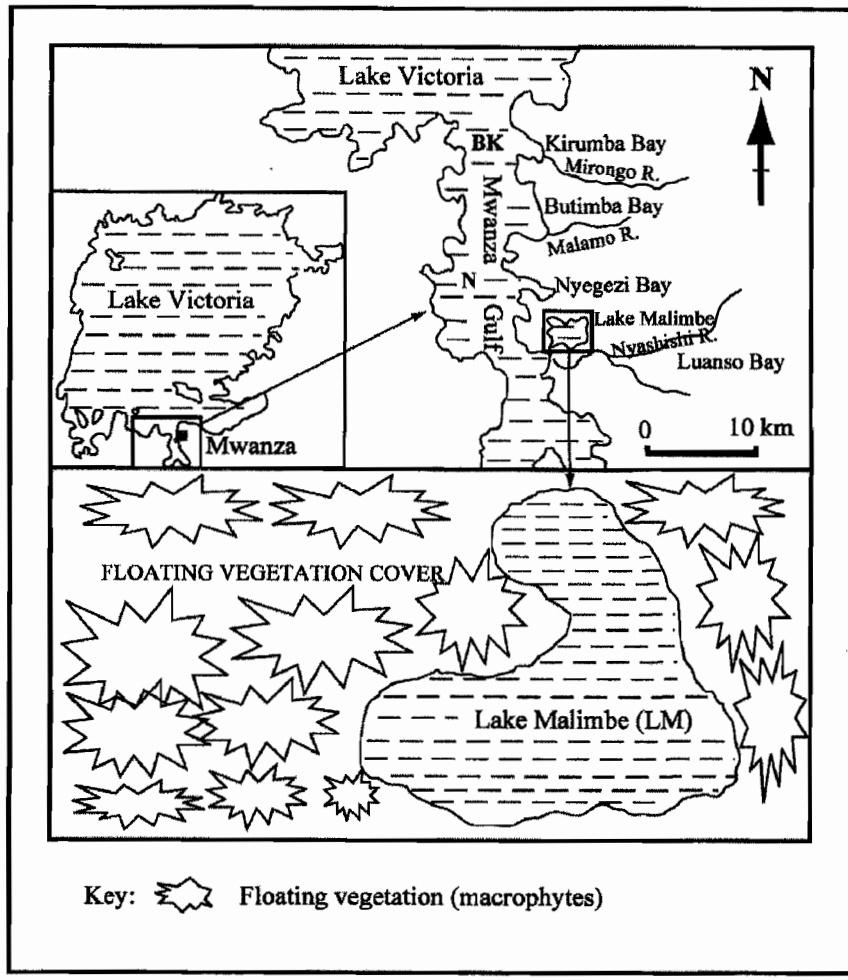

Figure 1: The Mwanza Gulf showing the three localities sampled [Butimba/Kirumba bays (BK), Nyegezi bay (N) and Lake Malimbe (LM)].

MATERIALS AND METHODS

Sampling was carried out from September 2000 to September 2001. Fish were caught by long-lines and hand-lines with baited hooks. Dead fish were transported in ice-cooled box and live fish in buckets filled with water from the lake, to the laboratory. Examination of fish for parasites, handling and processing of parasites followed standard procedures as by Moravec *et al.*

(1991). Identification was achieved with the help of keys such as Yamaguti (1961) and descriptions from the literature.

RESULTS

Seventeen (17) parasites species were recovered from 1071 *C. gariepinus* examined, including five nematodes, six trematodes, three cestodes and a Monogenea, a Hirudinea and a crustacean (Table 1). The ectoparasites were highly underrepresented. *Tylodelphys* species are reported for the first time on fish in Africa. *Spinitectus petterae* and the proteocephalid cestode are first records on *C. gariepinus* in Tanzania. A brief description is given for the four new records.

Table 1: Prevalence and site of infection of the parasites in the 1071 *Clarias gariepinus* from the Mwanza Gulf, Lake Victoria

Parasite	ni	Prevalence (%)	N	Site found
Nematoda				
Spinitectus petterae	14	1.3	52	Stomach
Procamallanus laevionchus	23	2.1	52	Stomach
Paracamallanus cyatopharynx	329	30.7	1176	Rectum
Contracaecum sp. †	47	4.4	899	Body cavity
Eustrongyloides sp. †	1	0.1	1	Body cavity
Cestoda				
Polyonchobothrium clarias	324	30.3	897	Bile system
Monobothrioides woodlandi	66	6.2	613	Duodenum
Proteocephalid	2	0.2	3	Duodenum
Adult Trematoda				
Astiotrema reniferum	59	5.5	333	S/ intestine
Allocreadium mazoensis	37	3.5	261	Duodenum
Eumasenia bangweulensis	63	5.9	361	S/ intestine
Larval Trematoda				
Diplostomum mashonense†	941	87.9	506,757	Brain cavity
Tylodelphys sp. †	327	30.5	32,163	Brain cavity
Clinostomum sp. †	10	0.9	82	Gills
Monogenea				
Gyrodactylus sp.	7	0.7	8	Skin
Crustacea				
Dolops ranarum	34	3.2	113	Oral cavity
Hirudinea				
Piscicolid leeches	29	2.7	98	Skin

ni = Number of hosts infected; N = Total number of parasites isolated; † Refers to larval forms /

***Tylodelphys* species X** (Fig. 2a)

The metacercariae were opaque, whitish, oval, fore body dorso-ventrally flattened continuous with a small conical hind body, and lacks lappets. Oval calcareous bodies fill the fore body, but are absent in the hind body. Total body length 0.940-1.18 mm x 160-240 µm wide. Oral sucker, sub-terminal, 48.0-57.6 µm x 60.0-70.5 µm, larger than ventral sucker that is round, 25.3-34.5 µm x 23-36.8 µm; lies behind the middle of body length. Brandes organ, longitudinally oval 82.8-117.3 µm x 43.7-69 µm with a longitudinal fissure. The alimentary tract is well-developed, intestinal caeca long and narrow, reach the posterior edge of the Brandes organ. The primordial of reproductive organs was not visible.

***Tylodelphys* species Y** (Fig. 2b)

Morphologically, very similar to *Tylodelphys* X, 0.624-0.860 mm x 0.165-0.250 mm. Fore body 280-306 µm long, without pseudosuckers, filled with oval calcareous bodies, which are absent in the hind body. The oral sucker is sub-terminal,

36.8-50.3 µm x 30.5-55.2 µm, larger than ventral sucker. Ventral sucker, round, 23-27.6 µm x 23-27.6 µm lies between 190 - 250 µm from the anterior end of body. The Brandes organ is oval, 69.2-80.5 µm x 42.3-73.6 µm. Intestinal caeca, long and narrow, end blindly at the posterior edge of the Brandes organ. The primordial of reproductive organs was not visible.

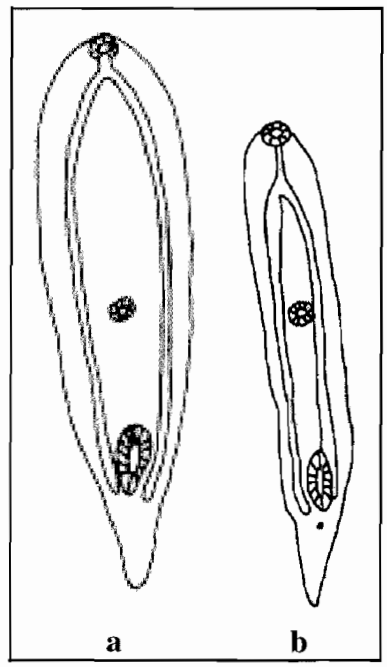

Figure 2: Metacercariae of *Tylodelphys* species recovered from the cranial cavity of *Clarias gariepinus* from the Mwanza Gulf, Lake Victoria - (a) *Tylodelphys* sp. X (b) *Tylodelphys* sp. Y.

Spinitectus petterae (Fig. 3)
Head retractile, oral opening oval and simple without teeth. Body length 2.951-5.788 mm, maximum width 111.6-213.9 µm. Pharynx cylindrical, relatively short, measures 111.6-251.1 µm long, oesophagus divided into muscular and long glandular parts. Muscular part 353.4-697.5 µm long and the glandular is 930-1302 µm long. The cuticle bears transverse rows of posteriorly directed spines. The first two rows of spines are closer together and interrupted laterally, forming two semi-circles with 40-42 spines. The number and size of spines decrease posteriorly, and the semi-circles become less evident. Males have a spirally coiled tail, 186-390.6 µm long. Spicules unequal in length; left measures 297.6-372 µm long, the right was not clearly visible. Ridges observed anterior to cloaca. The female has a straight vulva located in posterior part of the body. Uterus is filled with small, ovoid, thick-shelled eggs.

Proteocephalid cestode
Proteocephalid cestodes were recovered from the duodenum of a single fish. They were whitish in colour and clearly segmented. The scolex, 1.135 mm long by 1.543 mm wide was round and hook-less with four round suckers, 0.658 mm long by 0.545 mm wide. Posterior to the scolex was a 5.68 mm long unsegmented neck. The number of segments ranged from 97-160 (about 190

mm -1200 mm) in larger worms. Immature, anterior segments were broader than long whereas the mature, posterior ones were longer than broad. The ovary was not clearly visible.

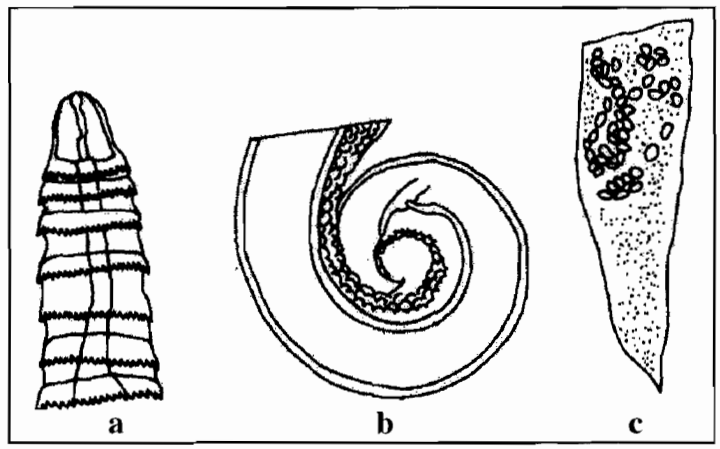

Figure 3: *Spinitectus petterae* (Nematoda) recovered from the small intestine of *Clarias gariepinus* from the Mwanza Gulf, Lake Victoria - (a) anterior end (b) male posterior end (c) female posterior end.

DISCUSSION

The results show six groups of parasites infect *C. gariepinus* including nematodes, cestodes, trematodes, a monogenean, a crustacean and a hirudinean. Most of these parasites have been reported from fishes in Africa. For instance, *Eumasenia bangweulensis* was first reported by Beverley-Burton (1962) from *C. mellandi* in Zimbabwe. *Eumasenia synodontis* from *Synodontis victoriae*, *Astiotrema reniferum* in *Bagrus docmac* from Lake Victoria and *Clarias lazera* in the Sudan (Khalil & Thurston 1973) and from *C. mossambicus* in Zambia and Zimbabwe (Beverley-Burton 1962). Trematodes of the genus *Allocreadium* Looss, 1900 have been recorded from *Haplochromis teegelaari* (Cichlidae) in Lake Victoria (Mbahinzireki 1984).

Tylodelphys metacercariae have been reported by Nkwengulila (unpub. data) from *Oreochromis* species from Mindu Dam and *C. gariepinus* from the Ruvu River in Tanzania. There are no published records of *Tylodelphys* species from fish of Africa. Only a single record exists of adult *T. clavata* from the kite *Buteo rufofuscus augur* Rüpp from the Democratic Republic of Congo (Dubois & Fain, 1956). *Tylodelphys* species have been reported from the vitreous humour of perch, *Perca fluviatilis* in England (Kennedy & Burrough 1977, Burrough 1978) and other fish in Europe (Niewiadomska 1963). *Tylodelphys* metacercaria recovered in the present study fall into two groups, similar in morphology but differ in size, a giant and a small form. The giant form resembles *T. clavata* whereas the small form resembles *T. excavata* as reported by Niewiadomska (1963). However, the present materials differ in terms of host species and anatomical locations in the host. Niewiadomska's materials came from the vitreous humour of an unnamed fish (*T. clavata*) and the spinal cord of a frog, *Rana esculenta* (*T. excavata*). The present materials are morphologically similar to those reported by Nkwengulila (unpub. data)

as well as in terms of the host fish and anatomical location in the fish host. It is, therefore, possible that they belong to the same species. Site fidelity in the fish hosts is typical of the members of the genus *Diplostomum* to which *Tylodelphys* are closely related. A specific identification will have to await further information, especially that emanating from life cycle studies.

Metacercariae of *D. mashonense* were originally described by Beverley-Burton (1963) from the cranial cavity of *C. mossambicus* and *C. mellandi* in Zimbabwe and Zambia. *D. mashonense* has also been described from *C. gariepinus* in Tanzania (Nkwengulila 1995), and reported from the same host in South Africa (Prudhoe & Hussey 1977, Mashego & Saayman 1989). *D. mashonense* seems specific to *C. gariepinus* in Africa, as it has never been recorded from any other fish. There are no records outside Africa. However, *D. tregenna* considered a synonym of *D. mashonense* (Sudarikov 1971) has been reported from the cranial cavity of *Clarias lazera* (Khalil 1963, Ogbe 1991). The taxonomy of *Clarias* species is still problematic (Eccles 1992). Recent views suggest that *C. gariepinus* and *C. lazera* are geographical variants of the same species. Morphologically, metacercaria of *D. mashonense* and *D. tregenna* are indistinguishable, this is typical of members of the genus (Niewiadomska 1996). However, *D. tregenna* was reported to invade the brain of its host (Ogbe 1991); *D. mashonense* does not (Beverley-Burton 1963, Nkwengulila 1995, Mwita 2002).

Clinostomum species show little host fidelity. They are known to infect many fish in Lake Victoria, including Cichlids and Siluroids (Paperna 1980). Magadza (1991) reported *Clinostomum* species from *Oreochromis* and *Tilapia* species in Lake Kariba, Zimbabwe.
Monobothrioides woodlandi was first described from the intestine of *C. mellandi* in Zambia (Mackiewicz & Beverley-Burton 1967). Similarly, Timbuka (unpub. data) recovered this cestode from *C. gariepinus* from Ruvu River in Tanzania. *P. clarias* (Cestoda) is common in African freshwater fish. Khalil & Thurston (1973) recovered it from *C. mossambicus* in Lake Victoria, Amin (1978) isolated it from *C. anguillaris* in Egypt, and Mashego & Saayman (1989) recorded it from the gallbladder of *C. gariepinus* in South Africa. Nkwengulila (unpub. data) and Timbuka (unpub. data) recorded this cestode from *C. gariepinus* in Tanzania.

Proteocephalids are common parasites of Siluroids in Africa. In the present study, these cestodes were isolated from under the mucous lining of the intestine of a single fish. Although several records of proteocephalids exist in Tanzania (Fuhrmann & Baer 1925, Mbahinzireki 1984, Nkwengulila unpub. Data, Timbuka unpub. data), it was not possible to assign the present material to any known taxon. Thus, further identification must wait for more information.

Paracamallanus cyathopharynx has been recorded from many clariids in Africa (Moravec 1974, Mwita 2002). *Procamallanus laevionchus* Wedl, 1862 was originally described from *Synodontis schaal* in Egypt. While *P. cyathopharynx* is specific to the Clariidae, *P. laevionchus* has a much wider host range including the Mormyridae, Characidae, Siluriidae, Tetraodontidae and Cichlidae (Moravec 1974, 1975). Mashego & Saayman (1989) and Boomker (1982) recorded *P. laevionchus* from the stomach of *C. gariepinus* in South Africa, Nkwengulila (unpub. data) and Timbuka (unpub. data) recorded it in *C. gariepinus* from the Ruvu River and Mindu Dam in Tanzania.

The genus *Spinitectus* Fourment, 1883, characterized by a rough cuticle with transverse rows of posteriorly directed spines, is common in freshwater fishes of Africa (Boomker, 1993). Boomker (1993)

first described *S. petterae* from the stomach of *C. gariepinus* in South Africa, the present material was also isolated from the stomach. The arrangement, size and number of spines form the basis for species determination in the genus. In terms of measurements, morphology and the location of the parasite in the host, the present material closely resembles *S. petterae* Boomker, 1993 and hence was assigned to the species.

Contracaecum species are not host specific, they are known from many fish in the Lake Victoria basin and elsewhere in Africa (Mbahinzireki, 1984; Boomker, 1994, Aloo, 2002). *Eustrongyloides* larvae have been reported in several genera of freshwater fish in and out of Africa. They infect many fish in Lake Victoria (Khalil & Thurston 1973, Mbahinzireki 1984).

Only one crustacean, *Dolops ranarum* Stuhlmann, 1891, was recorded in the present study. This crustacean has been reported on a number of fish species in Lake Victoria (Paperna 1980). *D. ranarum* infects many fish families including Clariidae, Bagridae and *Protopterus* species. Scaly fish such as the Cichlidae and Cyprinidae are sometimes infected (Fryer, 1961). Magadza (1991) recovered *D. ranarum* from the skin, buccal cavity and the gill chamber of *C. gariepinus*, *Synodontis zambezensis* and *Schilbe mystus* from Lake Kariba in Zimbabwe, and Ogutu-Ohwayo (1989) reported it on the Nile perch, *Lates niloticus* in Lake Kyoga, Uganda.

Paperna (1980) reported that piscicolid leeches commonly infect the smooth skinned fish (e.g. Siluriformes) in Lake Victoria. Leeches are difficult to identify and materials of the present study were not definitively identified. Monogeneans of the genus *Gyrodactylus* Von Nordmann, 1831 were also recorded but specific identification was not possible. Members of the genus *Gyrodactylus* have been reported by Paperna (1979) and Magadza (1991) in fish of Africa, but, the present material bears no resemblance to materials reported in these studies.

In conclusion, *C. gariepinus* is a host to a wide range of parasites. Seventeen species were recorded in the present study. Since twelve species were adults and only five were larval forms, this emphasises the high position of *C. gariepinus* in the trophic level within the Lake Victoria ecosystem. Many species recovered are common parasites of *C. gariepinus*, some, e.g. *Tylodelphys* species are reported for the first time on fish from Africa. The nematode *Spinitectus petterae* and the proteocephalid cestode represent new geographical citing. The study has confirmed the significance and the need for further studies on fish parasites.

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