

***Scutogyrus longicornis* PAPERNA AND THURSTON, 1969
(ANCYROCEPHALIDAE) MONOGENEAN GILL PARASITE OF CAGE
CULTURED RED TILAPIA (*Oreochromis* sp.) FROM KENYIR LAKE,
MALAYSIA**

SURZANNE MOHD AGOS AND MARINA HASSAN*

Higher Institution Centre of Excellence (HiCoE), Institute of Tropical Aquaculture and Fisheries, Universiti Malaysia Terengganu, 21030 Kuala Nerus, Terengganu, Malaysia.

*Corresponding author: marina@umt.edu.my

Submitted final draft: 9 September 2020

Accepted: 5 December 2020

<http://doi.org/10.46754/jssm.2021.08.014>

Abstract: Monogeneans are ectoparasites and they cause serious problem in fish and aquaculture worldwide. There is a lack of information on monogenean infections in fish and aquaculture at the Kenyir Lake. The fish were collected using floating net cage cultures at the Kenyir Lake site. The gills were removed and observed for monogenea. The monogenea was collected and permanent slides were prepared for identification. Later, their morphology was observed under a microscope, the image was captured and drawn using a camera lucida attached to the microscope. The monogenean gill parasite *Oreochromis* sp is from genus *Scutogyrus*. The genus was distinguished based on the shape and the size of the sclerotized parts of the haptor (anchor and marginal hook) and the species determination was based on their copulatory organs (accessory piece, penis, heel and vagina). *Scutogyrus longicornis* are characterised by a dorsal transversal bar enlarged laterally at its median portion, with two very long auricles which are hollow at its base and by its ventral transversal bar, arched, rigid and supporting one large, thin oval plate marked by fan-shaped median thickenings. The *Scutogyrus longicornis* described in this subject area are specific to Cichlid fish. There were new reports about *Scutogyrus longicornis* infecting fish from Kenyir Lake and the parasites are considered an introduced species.

Keywords: Monogenea, *Scutogyrus longicornis*, *Oreochromis* sp., morphology, Kenyir lake.

Introduction

Monogeneans are ectoparasites that latch onto the body and gills of freshwater and marine fish. Most of them are extremely host-specific (Whittington *et al.*, 2000). They are recognised as a major problem for fish and aquaculture worldwide (Park, 2009; Abidi *et al.*, 2011). Commonly, the severity of the infection relates to inadequate sanitation, crowding and deterioration of water quality (Abidi *et al.*, 2011). Little is known about monogenean infections of fish in Kenyir Lake. Kenyir Lake is the largest tropical man-made lake in Southeast Asia.

The *Oreochromis* sp is not a native species and was introduced to the lake. However, the *Oreochromis* sp has established itself Malaysia, since its introduction from Indonesia in 1944, while red hybrid tilapia was introduced from Thailand (Ang *et al.*, 1989). Monogenean

parasites are of great interest to ecologists because of their simple life cycle and are considered as important marine health indicators as the parasite is sensitive to any changes in water quality.

However, some of the species are considered dangerous pests from an aquaculture point of view because of their high pathogenicity and the fact that they can cause heavy rates of mortality among fish stocks.

A *Scutogyrus longicornis* infection among *Oreochromis* sp farmed at Kenyir Lake has caused heavy mortality rates among the fish stocks and slowed the growth rates of infected fish.

There has been an acute lack of reports on monogeneans found at Kenyir Lake. Agos *et al.*, (2016) reported skin lesions which are similar to other monogenean infections observed from

Oreochromis sp. That was the first and only report of a monogenean, *Scutogyrus longicornis* infection among the introduced fish species *Oreochromis* at Kenyir Lake. This study, used the *Oreochromis* sp to determine the severity of the infection and redescribe the effects of a *Scutogyrus longicornis* infection in cage-cultured system.

Materials and Methods

A total of 121 *Oreochromis* sp of different sizes were randomly sampled from different cages at Como River, Kenyir Lake. Specimens of *Oreochromis* sp. were obtained from floating net cages and were kept in a tank with aerated water. The fish were then examined within an hour of landing. The gills were removed, placed in petri dish and observed under a dissecting microscope. The monogenean was collected using pointed needles and placed on a clean slide. Then, the monogenean was transferred on a drop of ammonium picrate-glycerin to examine its important structures (Morsy *et al.*, 2018).

Internal organs were flattened with a drop of 10% of Sodium dodecyl sulfate (SDS) and then left on the slide for 1 minute. The sample was covered with a cover slip. The prepared permanent slides were observed under 10X, 40X and X100 magnification using a compound microscope (Leica DM 750).

Drawings were made with the aid of a Lucida camera attached to the Leica DM 750 compound microscope. For identification, the structural part of sclerotised parts of the haptor and the copulatory organ were measured and image captures were done by using an Advanced Research Microscope (NIKON Eclipse 80i).

Average measurements were taken in micrometers followed by the range parentheses. The identification of the monogenean was done according to keys from Pariselle and Euzet (2009). The morphological terminology follows Douëllou (1993) and the numbering of haptor parts was adopted from ICOPA IV (Euzet & Prost, 1981).

Results

Scutogyrus longicornis (Paperna & Thurston, 1969)

Host : *Oreochromis* sp. (Red tilapia)

Site : Gills

Locality : Como River, Kenyir Lake (N 05° 01' 57.7", E 102° 50' 36.4")

Genus *Scutogyrus* belongs to Family Ancyrocephalidae (Figure 1). They have three pairs of cephalic glands, two posterior ocellae with lenses and two small anterior ocellae, but sometimes absent. Their intestinal caeca joined posteriorly without diverticula. They have two pairs of anchors, one dorsal and one ventral. Dorsal transverse bar highly arched, enlarged laterally, winged, having in its median portion two very long auricles that are hollow at their bases. Ventral transverse bar, arched, rigid, supporting one large, thin oval plate marked by fan-shaped median thickenings and fourteen uncinuli. Testis were at median, posterior to the body. Vas deferens dextral, not encircling intestinal caeca. Seminal vesicle presents with one prostatic reservoir. Male copulatory complex with penis and accessory piece and median pre-testicular ovary. Vaginal opening sub-lateral, dextral with vagina in tubular shape, sclerotized and seminal receptacle presents.

Description: Adults (Figure 2): 256 long, dorsal anchor (DA) with root fused to shaft, blade regularly arched: a = 32.00 ± 2.15 (29.00-34.00), blade length, b = 24.00 ± 2.15 (21.00-26.00), shaft length, c = 9.00 ± 0.64 (8.00-10.00), guard length, d = 11.00 ± 0.94 (10.00-12.00), blade point length, e = 10.00 ± 1.16 (9.00-11.00). Dorsal transverse bar (DB) : bar total length, x = 34.00 ± 3.81 (30.00-39.00), distance between auricles, y = 15.00 ± 1.53 (13.00-17.00), bar thickness, w = 5.00 ± 0.58 (4.00-5.00), auricle total length, h = 44.00 ± 3.91 (41.00-49.00). Ventral anchor (VA) : anchor total length, a = 34.00 ± 1.84 (31.00-35.00), blade length, b = 30.00 ± 2.89 (27.00-33.00), shaft length, c = 5.00 ± 1.12 (4.00-6.00), guard length, d = 8.00 ± 0.98 (7.00-9.00), blade point length, e = 13.00 ± 1.56 (11.00-15.00). Ventral transverse bar

(VB) arched and rigid: length of one branch, $x = 41.00 \pm 4.62$ (35.00-45.00), bar thickness, $w = 4.00 \pm 0.64$ (3.00-5.00). Uncinulus or marginal hook: I = 17.00 ± 1.25 (15.00-17.00), II = 20.00 ± 2.72 (18.00-24.00), III -VII = 30.00 ± 2.04 (27.00-31.00). Penis slightly arched, tubular: $Pe = 47.00 \pm 5.67$ (40.00-53.00); with a poorly developed heel: $He = 3.00 \pm 2.13$ (2.00-6.00). Accessory piece with small enlargement at base terminates in 2 opposing unequal and straight outgrowths: $Ap = 14.00 \pm 1.75$ (12.00-15.00), $St = 29.00 \pm 7.96$ (23.00-41.00). Sinuous vagina a narrow tube: vagina total length, $V = 41.00 \pm 5.15$ (36.00-48.00), vagina diameter, $v = 4.00 \pm 0.34$ (3.00-4.00).

Remarks: *Scutogyrus longicornis* infected *Oreochromis* sp in this study was first reported in Kenyir Lake, Malaysia. The species of this monogenean was described by Pariselle and Euzet (1995b) from the gills of *Oreochromis niloticus* from Lake George and Albert, Uganda with the description of morphology similar to the same monogenea found from *Oreochromis*

spp in Kenyir Lake. It has been reported from various cichlid fishes from Uganda, Zimbabwe and Bangladesh (Douëllou, 1993; Pariselle & Euzet, 1995b; Ferdousi & Chandra, 2002).

Discussion

The morphological description and measurements of these monogenea from the gill of tilapia is *Scutogyrus longicornis* corresponded to *Cichlidogyrus longicornis longicornis* described also from *O. niloticus* by Pariselle and Euzet (1995b) and to *C. longicornis* described by Douëllou (1993) on *O. mortimeri*. Wu *et al.*, (2007) proposed to treat *Scutogyrus* sp. as synonym of *Cichlidogyrus* sp., and Pouyaud *et al.*, (2006) suggested that *Cichlidogyrus* sp. should be split into different genera. According to Pariselle and Euzet (2003), the length of each examined sclerite, will be standardized by dividing its total length by the total length of uncinuli pair II, which retain its size from larval to adult stages during development in ancyrocephalid monogenean.



Figure 1: A; *Scutogyrus longicornis* (Paperna & Thurston, 1969) (400X total magnification) B; Opisthaptor hooks on the large, thin oval plate, fan-shaped and C; Copulatory organ (1000X total magnification)

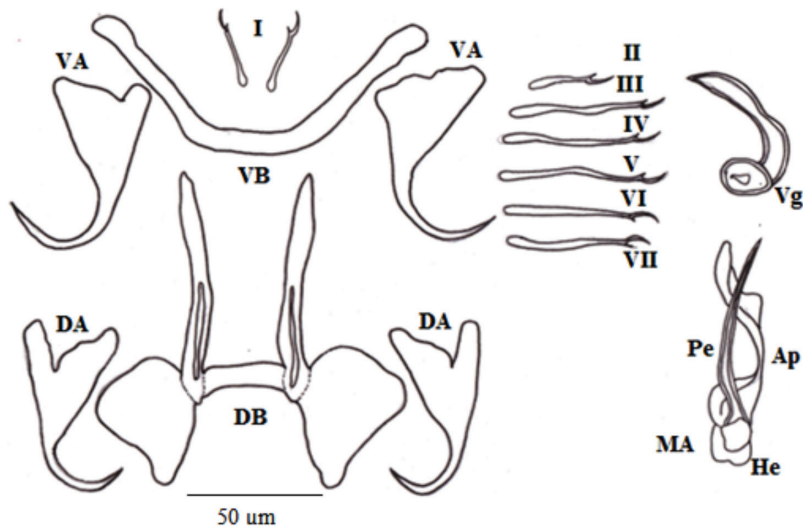


Figure 2: Sclerotised parts of *Scutogyrus longicornis* (Paperna and Thurston, 1969); (DB) Dorsal transverse bar; (DA) Dorsal anchor; (VB) Ventral transverse bar; (VA) Ventral anchor; (I-VI) Uncinuli; (MA) Male Apparatus; (Ap) Accessory piece; (He) Heel; (Vg) Vagina. Scale bar: 50 µm

The name *Scutogyrus* was proposed to point out the shield-like shape (*scutus* in Latin) of the ventral transverse bar. It was certain that *Scutogyrus* sp. is very close to *Cichlidogyrus* sp., particularly in the presence of auricles on the dorsal transverse bar. Both genera were gill parasites of cichlids, but a detailed scrutiny of the haptor showed some important divergences between the two genera. A very long auricle and lateral outgrowths of the dorsal transverse bar and rigidity of the ventral transverse bar supported a large sclerotized plate on *Scutogyrus* sp.

The anatomical differences of the haptor translate into functional specialties of this organ and thus suggest an original attachment of *Scutogyrus* sp. on the gill of the host fish. Their penis and vagina were short with penis length measuring less than 70 µm. The accessory piece ending in pincers with one component hooked and the other blunt with no extension.

The genus *scutogyrus* was found only on *Oreochromis* and *Sarotherodon* hosts thus making this genus as a good biological tag for these two Tilapiine genera and probably a good example of co-evolution between host and

parasite (Pariselle & Euzet 1995). In Kenyir Lake, the *Scutogyrus* sp. was only found on *Oreochromis* and are possibly host-specific. However, its presence still poses a big risk to our native fishes because *S. longicornis* was reported in other fish species too (Natividad *et al.*, 1986; Bondad-Reantaso & Arthur, 1990).

Normally, parasites followed their hosts when they were introduced (Natividad *et al.*, 1986; Bondad-Reantaso & Arthur, 1990). Different hosts possessing same parasitic fauna. Two species of the genus *Scutogyrus* sp., have been found on various species of fishes; *Scutogyrus longicornis* on *O. niloticus* (type host), *Oreochromis aureus*, *Oreochromis mortimeri*, *Sarotherodon galilaeus* and *T. zillii* and *Scutogyrus gravivaginus* on *Oreochromis leucostictus* (type host), *Oreochromis variabilis* and *O. mortimeri*. In the same way, *O. mortimeri* possesses, in addition to *S. longicornis* and *S. gravivaginus*, *Cichlidogyrus halli*, *C. sclerosus*, *C. tilapiae* and *S. longicornis*, which are known from *O. niloticus* and occasionally three other species (*Cichlidogyrus dossoui*, *Cichlidogyrus karibae* and *Cichlidogyrus zambezensis*) described by Douellou (1993).

The spreading of this monogenean parasite to South East Asia was possibly from the introduction of tilapia fish cultures in Asia. Many species of monogenean also have been recorded to provoke important losses of fish cultures (Montero *et al.*, 2004). Most of the problems have occurred in intensive culture conditions, but there are few cases that have occurred in natural populations (Thoney & Hargis, 1991). Khalil and Polling (1997) listed 51 *Cichlidogyrus* sp. occurring throughout Africa (Natividad *et al.*, 1986; Bondad-Reantaso & Arthur, 1990).

Conclusion

The monogenean *Scutogyrus* sp. described in this research area are specific to Cichlid fishes and are considered as introduced parasites not native to the Kenyir Lake ecosystem. A study of the parasites taxonomy, accurate identification and seasonal influence over monogenean communities is important and needs more serious attention.

Acknowledgements

We would like to thanks to the staff of Institute of Tropical Aquaculture and Fisheries (AKUATROP) for their technical assistance. We also thank to AKUATROP laboratory management for their support with this research.

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