

# **First Record of Two Species of the Genus *Cichlidogyrus* Paperna, 1960 (Monogenea, Ancyrocephalidae) in Iraq on Gills of Two Cichlid Fishes**

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## **Abstract**

The examination of gills of two species of cichlid fishes, viz the redbelly *Coptodon zillii* and the blue tilapia *Oreochromis aureus* from Al-Graiat location on the Tigris River at Baghdad city, revealed the presence of two monogenean species belonging to the genus *Cichlidogyrus* viz *C. sclerosus* and *C. tilapiae* for the first time in Iraq. This also represents the first record of the genus *Cichlidogyrus* from fishes of Iraq. The two species are distinguished by the differences in the shape and size of the sclerotized parts of their haptors and in their male copulatory organs. The descriptions and measurements of these parasites as well as their illustrations were given.

## **Keywords**

Monogenea, *Cichlidogyrus*, *Cichlidogyrus sclerosus*, *Cichlidogyrus tilapiae*, Cichlid Fishes, Iraq

## **1. Introduction**

Species of the genus *Cichlidogyrus* Paperna, 1960 belong to the family Ancyrocephalidae, order Dactylogyridea, class Monogenea and phylum Platyhelminthes (Gibson, 2015). Members of the genus *Cichlidogyrus* are ectoparasites occurring on the gills of cichlid fishes. This genus was described with the following characteristics: they are gill parasites of African Cichlidae and Nadidae, they have three pairs of cephalic glands, and eyes which include two posterior ocelli with crystalline lenses and two smaller inconsistent anterior ocelli. A median muscular pharynx is present and a simple intestinal caecum is joined posteriorly. There are two pairs of hamuli (gripi), one dorsal and one ventral; two transverse bars, dorsal with two auricles, ventral curved and articulated and 14 hooklets (unicinuli). The male reproductive system consists of a median posterior testis, a vas deferens on the right side and a seminal vesicle with one prostatic reservoir. The male copulatory complex comprises a penis and an accessory piece, occasionally with an auxiliary

plate. The female reproductive system consists of a median pre-testicular ovary, a submedian vaginal opening and a sclerotized vagina with a seminal receptacle (Roux and Avenant-Oldewage, 2010). *Cichlidogyrus* is the most diverse genus of Monogenea parasitizing cichlid fishes and distributed among a wide range of fishes, more than 40 species within 11 genera (Mendlová *et al.*, 2012). Roux and Avenant-Oldewage (2010) reported a list of 85 species in the genus *Cichlidogyrus*, collected worldwide. From this list, it is obvious that, although monogeneans are generally highly host-specific, there is a range of levels of host specificity within this group. Some parasites occur strictly on a single host species, in some cases, *Cichlidogyrus* is found on several fish species, in other cases, numerous species of *Cichlidogyrus* were found on a single host. Řehulková *et al.* (2013) stated that *Cichlidogyrus* communities on respective hosts display variable species richness, which ranges from 1 to 20 species per host species. The host specificity of these parasites is also variable, with 48 species considered as oioxenous (i.e. infesting only a single host species) and 35 species are considered as stenoxenous (i.e. infesting two or

more host species).

In Iraq, the cichlid fishes redbelly *Coptodon zillii* (Gervais, 1848) and the blue tilapia *Oreochromis aureus* (Steindachner, 1864) are exotic fishes which were introduced in the neighboring countries and find their way to inland waters of Iraq (Al-Faisal *et al.*, 2014).

As no previous record was given for any species of the genus *Cichlidogyrus* from the cichlid fishes of Iraq (Mhaisen, 2016), the present study is concerned with the first record of this genus in Iraq as it was found to be represented with two species (*C. sclerosus* and *C. tilapiae*) parasitizing gills of two species of cichlid fishes (*Coptodon zillii* and *Oreochromis aureus*).

## 2. Materials and Methods

Two species of tilapia, *C. zillii* and *O. aureus*, were collected from Al-Graiat location on the Tigris River at Baghdad city during the period from July to December 2015. Fishes were transported alive to the laboratory for parasitological examination. Gills were removed and examined with Mieji MT42001 microscope. Monogenean parasites were flattened and stained with aqueous neutral red. Permanent slides were prepared with glycerin. Drawings of the sclerotized pieces of the haptor and of the copulatory organs were made by using a camera Lucida. The morphological terminology followed that of Pariselle and Euzet (2004). The mean values of all measurements (all in  $\mu\text{m}$ ) employed in this paper (Fig. 1) are used in the description as in the following order: minimum-maximum (mean) values. Parasites identification was mainly made by using the key given by Pariselle and Euzet (2009) and on basis of Maneepitaksanti and Nagasawa (2012). Parasites are distinguished by the differences in the shape and size of the sclerotized parts of their haptors and in their male copulatory organs. Tilapias were identified based on Mutlak and Al-Faisal (2009) and their scientific and common names were used according to the Catalog of Fishes by Eschmeyer (2016). The information on the previous account records of parasites was checked by using the index-catalogue of parasites and disease agents of fishes of Iraq by Mhaisen (2016).

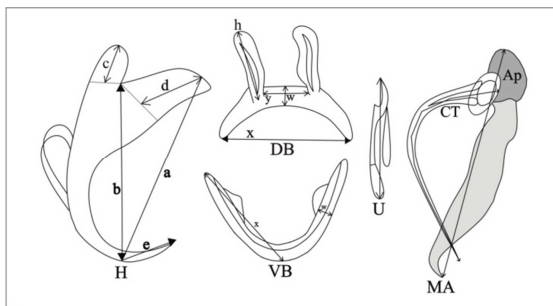


Fig. 1. Measurements used in the present study.

DB = dorsal transverse bar, h = length of auricle, w = maximum width, x = total length, y = distance between auricle; H = hamulus (gripus), a = total length, b = blade length. c = root length. d = shaft length, e = point length; MA = male apparatus, Ap = accessory piece length, CT = Copulatory tube (penis) total length; U = uncinuli length (hooklets); VB = ventral transverse bar, w = maximum width, x = length of one branch.

## 3. Results and Discussion

Two species of the genus *Cichlidogyrus* namely *C. sclerosus* and *C. tilapiae*, were found on the gills of two species of cichlid fishes, viz *C. zillii* and *O. aureus*. The following is a brief account on their description and measurements.

### 3.1. *Cichlidogyrus sclerosus* Paperna & Thurston, 1969

Both species of fishes in the present study were infected with this parasite. Ten out of 38 *C. zillii*, were infected. The prevalence of infection was 26 % and the mean intensity was 1.6. Three out of 21 *O. aureus* were infected, so, the prevalence of infection was 14.3 % and the mean intensity was 0.7. The measurements of this parasite were based on three specimens. The following is a brief description and measurements (all in  $\mu\text{m}$ ) of this parasite as shown in Fig. 2.

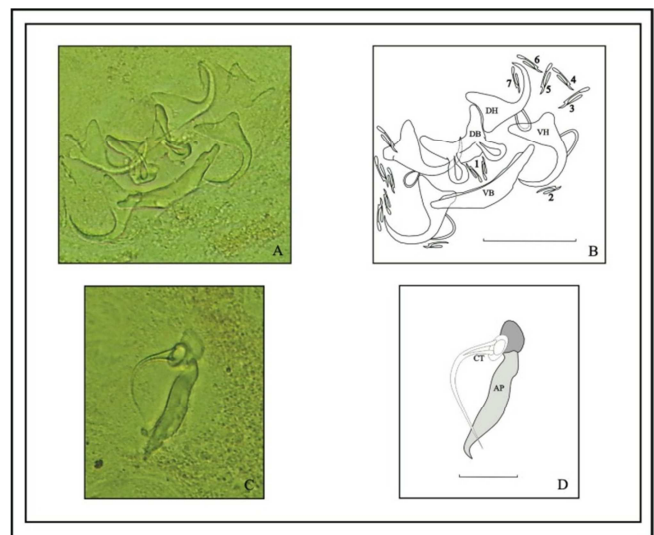


Fig. 2. *Cichlidogyrus sclerosus*.

A: Photomicrograph of haptor.

B: Camera Lucida drawing of haptor (Scale bar = 45  $\mu\text{m}$ )

C: Photomicrograph of male apparatus.

D: Camera Lucida drawing of male apparatus (Scale bar = 29  $\mu\text{m}$ )

Ap = accessory piece; CT = Copulatory tube; DB = Dorsal Hamulus; VB = Ventral Bar; VH = Ventral Hamulus; 1 to 7 = uncinuli (hooklets).

Body length 464-560 (512), width 126-224 (175). Haptor: ventral and dorsal hamuli of similar size and shape, with no distinct root, strongly curved shaft and presence of hamulus filament, total length 25-27 (26), blade 25-27 (26) and point 12-14 (13). Ventral transverse bar v-shaped with rounded ends, length of one branch 26-28 (27), maximum width 5-7 (6). Dorsal bar is large and x-shaped, branches wide, total length 27-31 (29), maximum width 7-9 (8), auricles pyriform with rounded ends 12-16 (14) long, distance between auricle 11-13 (12). Hooklets short; pair 2 shortest without base, other pairs with base; hooklet lengths 14-16 (15), 11-13 (12), 15-17 (16), 17-19 (18), 16-18 (17), 18-20 (19) and 15-17 (16), respectively for 1-7. Copulatory

organ very large with large serrated plate, copulatory tube thin and arched, 68-72 (70) long, with tapered end; accessory piece 47-53 (50) long.

### 3.2. *Cichlidogyrus tilapiae* Paperna, 1960

Four out of 38 *C. zillii* were infected with this parasite with a prevalence of 10.5 % and mean intensity of 1.5. This parasite was found on gills of the infected fishes. The measurements were based on three specimens of parasites. The following is a brief description and measurements (all in  $\mu\text{m}$ ) of this parasite as shown in Fig. 3.

Body length 510-539 (525), width 190-230 (210). Haptor: ventral and dorsal hamuli of similar shape but of different size. Ventral hamulus with broad base and shaft and with presence of hamulus filament, total length 28-30 (29), blade 25-27 (26), point 8-12 (10), outer root narrow 3-5 (4), inner root broad 11-15 (13). Ventral bar U-shaped with indented membrane and rounded ends, length of one branch 26-28 (27), maximum width 5-7 (6). Dorsal hamulus slightly longer, total length 36-38 (37), blade 25-27 (26), point 8-14 (11). Dorsal bar is slightly arched, branches pointed; total length 27-29 (28), maximum width 5-7 (6), auricles slender 12-14 (13) long, distance between auricles 12-14 (13). Hooklets small; pair 2 shortest without base, other pairs with short base; hooklet lengths 12-14 (13), 11-13 (12), 13-15 (14), 15-17 (16), 15-17 (16), 15-17 (16) and 14-16 (15), respectively for pairs 1-7. Copulatory tube straight and wider at base, 28-32 (30) long; accessory piece almost straight with sharp hook at terminal end, 32-36 (34) long.

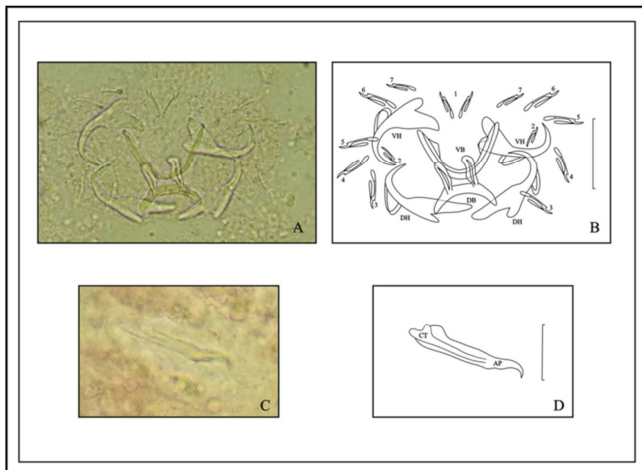


Fig. 3. *Cichlidogyrus tilapiae*.

A: Photomicrograph of haptor.

B: Camera Lucida drawing of haptor (Scale bar = 40  $\mu\text{m}$ ).

C: Photomicrograph of male apparatus.

D: Camera Lucida drawing of male apparatus (Scale bar = 22  $\mu\text{m}$ ).

Ap = accessory piece; CT = Copulatory tube; DB = Dorsal Bar; DH = Dorsal Hamulus; VB = Ventral Bar; VH = Ventral Hamulus; 1 to 7 = uncinuli (hooklets).

In Iraq, surveys of fish parasites of different water bodies resulted, so far, in recognition that the cichlid fishes *C. zillii* (= *Tilapia zillii*) are parasitized with only two species of

monogeneans belonging to the genera *Dactylogyrus* and *Gyrodactylus* (Al-Azebawe, 2010; Hamadi *et al.*, 2011).

According to Mhaisen (2016), the occurrence of the two parasites of the present study, *Cichlidogyrus sclerosus* and *C. tilapiae* represents their first record in fishes of Iraq as no previous record was given for these parasites from fishes of Iraq.

These parasites so far have been reported from various cichlid fishes in several countries. *C. sclerosus* was recorded from Nile tilapia gathered from three different fish farms, in southern Brazil (Jerônimo *et al.*, 2011) and on the gills of *Coptodon zillii* (= *Tilapia zillii*) from the Lake of 16 Tishreen Dam in Syria Dam (Dayoub and Salim, 2015). *C. tilapiae* was recorded from Egyptian fishes *T. nilotica* and *C. zillii* which were collected from the River Nile in Cairo (Ergens, 1981); *Oreochromis niloticus* in tributary of Amazonas River in Brazil (Jiménez-García *et al.*, 2001); *O. aureus* in Ivory Coast in West Africa (Pouyaud *et al.*, 2006) and from *O. niloticus* from the dam of Loumbila, Burkina Faso (Boungou *et al.*, 2008).

Both *C. tilapiae* and *C. sclerosus* were reported from various cichlid fishes; *O. morimeri* of Lake Kariba in Zimbabwe (Douëllou, 1993), African cichlid *T. rendalli* from Cuba (Mendoza-Franco *et al.*, 2006), *O. mossambicus* from two lakes of the Limpopo River System, South Africa (Madanire-Moyo *et al.*, 2011), *O. niloticus* from Uganda (Akoll *et al.*, 2012) and wild and cultured *C. zillii* from lake Manzalah in Egypt (Ibrahim, 2012).

## 4. Conclusion

In general, monogeneans have a direct life cycle and exhibit a high degree of morphological variability and species diversity. Moreover, they are highly host-specific compared to other groups of parasites. Species of the genus *Cichlidogyrus* are monogenean ectoparasites.

Members of the *Cichlidogyrus* genus are primarily parasites of fish of the family Cichlidae (Mendlová *et al.*, 2012).

In this study, two monogeneans belonging to the genus *Cichlidogyrus* namely *C. sclerosus* and *C. tilapiae* were recorded from gills of two species of exotic cichlid fishes, viz *Coptodon zillii* and *Oreochromis aureus* from Al-Graiat location on the Tigris River at Baghdad city. These parasites were recorded in other studies from various countries of the world from many species of fishes of this family. Result of this study confirms the recipe host-specific of the monogenean *Cichlidogyrus* to infect fishes of the family Cichlidae.

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