

RESEARCH PAPER

Gyrodactylus angorae (Monogenea: Gyrodactylidae): First Occurrence on the Body of Two Nemachilid Fishes from Iraq

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ABSTRACT:

The monogenean *Gyrodactylus angorae* Ergens & Ibragimov, 1979 was identified on the skin, fin and gills of two nemacheilid loaches *Oxynoemacheilus zarzianus* Freyhof & Geiger, 2017 and *Eidinemacheilus proudlovei* Freyhof, Abdullah, Ararat, Hamad & Geiger, 2016 from Tabin Stream, Sulaimani Prvince, Kurdistan Region, Iraq for the first time. The description and measurements of this parasite are given in the present study. The prevalence and mean of intensity were also shown.

KEY WORDS: *Gyrodactylus angorae*, Monogenea, Nemacheilidae, Tabin Stream.

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1.INTRODUCTION :

Stone loaches or Nemacheilidae are small fishes found in freshwaters of Asia, Europe, and northeast Africa (Coad 2017). Due to their small size and low economic value, nemachilid fishes are poorly known group of freshwater fishes (Kottelat 2012; Mafakheri *et al.* 2015). The Euphrates and Tigris river drainages are the major hotspot of nemachilid loach species (Freyhof *et al.* 2019). In Iraq Nemacheilidae is the second largest freshwater fish family after Cyprinidae. There are 13 known nemachilid fish species were reported (Code 2010; Freyhof & Abdullah 2017; Abdullah *et al.*, 2020).

Gyrodactylus Nordmann, 1832 is a genus of the Mono-pithocotylean monogenean trematode, belonging to the family Gyrodactylidae which is worldwide distribution, they are hermaphroditic, viviparous, one-host direct life cycle. Generally permanent ectoparasites on the body surface, fins and gills of fresh, brackish and marine water fishes attached by posterior adhesive organ, they possess a high degree of host-specificity (Margolis & Kabata 1984; Bakke *et al.* 2004; Woo 2006; Buchmann 2012). According to Bakke *et al.* (2002), *Gyrodactylus* have high species richness but low morphological and biological diversity. Many different species of *Gyrodactylus* were found on a single fish host species. While, some other gyrodactylid species was host specific.

The major identification characters of *Gyrodactylus* are presence of opisthaptor which equipped with one pair of large median hooks and 16 marginal hooks. The most prominent feature of this genus is presence of developed embryo in the uterus. Sometime, the embryo may have own

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embryo (Buchmann 2012). The identification of *Gyrodactylus* at the species level depends on the morphology and measurements of the attachment organs (Mo & Appleby 1990).

This worm (*Gyrodactylus*) may harm its host by injuries the epithelial cells during attachment process as a result of inserting their marginal hooks and the median hooks into the epidermis in addition to its feeding activities and the consequence of secondary bacterial infections. *Gyrodactylus* is the causative agent of gyrodactylosis in fishes, this disease has been reported worldwide. It is characterized by epithelial damage, excessive mucous secretion, and producing potential hemorrhagic lesions (Johnsen & Jensen 1991; Buchmann, 2012). In addition, *Gyrodactylus* can directly transfer between hosts as adults, and leading to records of accidental transfers. Within the last this is creating confusion in the literature of fish parasite (Harries *et al.* 2004).

In Iraq, the first gyrodactylid species was known principally from early work by Ali & Shaaban (1984), in which they reported *Gyrodactylus elegans* on the gills of *Cyprinus carpio* and *Planiliza abu* (reported as *Liza abu*). After that, many *Gyrodactylus* species have been recorded from freshwater fishes in different Iraqi water bodies (Ali *et al.* 1988; Mhaisen *et al.* 1990; Al-Zubaidy 1998; Abdullah & Mhaisen 2004; Abdullah & Abdullah 2013; Kritsky *et al.* 2013a; Abdul-Ameer & Atwan 2017; Sheyaa & Abdul-Ameer 2019; Abdul-Ameer & Sheyaa 2020). According to Mhaisen (2021) there are 55 different *Gayrodactylus* species are known in Iraq. However, there is no any report regarding the parasitic fauna of nemachilid fish in Iraq.

In the present study, the occurrence of *Gyrodactylus angorae* from skin, fins and gills of two nimachilid fish collected from Tabin Stream in Sulaimani Province, Kurdistan Region-Iraq was reported for the first time in Iraq. Furthermore, the parasite description and measurements have been also depicted.

2. MATERIALS AND METHODS

2.1. Study area

Tabin Stream is located in Surdash Region in Sulaimani Province, Kurdistan Region-Iraq. It is located between Sulaimani City and Dukan District. It is bounded by Daban-Halaj Mountains

from the north, Yakhian Mountains from the east, Bardazaro Mountain from the south and by Qashan Mountain from the west (Fig. 1).

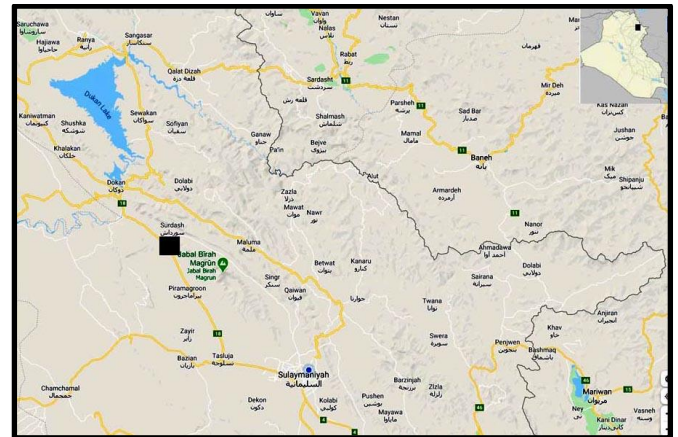


Figure 1: Location of the study area (marked with black square) in Sulaimani Province, Kurdistan Region-Iraq.

2.2 Sampling

A total of 45 stone loaches belonging to family Nemacheilidae (*Eidinemacheilus proudlovei* (n=38) and *Oxynoemacheilus zarzianus* (n=7)) were collected from Tabin Stream near Kanishok Village (N 35.83360 E 45.1045440) in Sulaimani Province, Kurdistan Region-Iraq by using electro-shock device (SAMUS 1000, Made in Poland). The fish were placed in a container with local stream water and transported to the parasitological laboratory as soon as possible and examined to detect the parasites. The fishes were identified according to Freyhof *et al.* (2016), and Freyhof & Geiger (2017).

2.3 Specimen preparation

In the laboratory, fish fins, body and gills were inspected under a dissection microscope. The gills of the fishes were removed and placed in a separate petridishes with only small amount of normal saline solution (0.9%). Pieces of the gill filaments were tied with a fine needle. After leaving the gills, the worms were removed from the petridishes by a plastic dropper and placed on a clean slide with a few drop of tap water. Then, the specimen covered with a cover slip with glycerin-gelatin. A piece of melted glycerin-gelatin (40°C) was dropped with cover slip on to

the worm. The cover slip was dried carefully with a blotting paper (Kritsky *et al.* 2004). The skin and fins scrape was smeared onto a clean microscope slide and examined directly under optical microscope. The measurements of the worms were done with the aid of ocular micrometer. The parasite identification was recommended by Bykhovskaya-Pavlovskaya *et al.* (1962); Gussev *et al.* (1993); Pugachev *et al.* (2010). Photos were taken with Sony camera, 16.1

3. RESULTS AND DISCUSSION

In the current study, only monogenean parasites were recovered from two species of freshwater nemachilid fishes *Eidinemacheilus proudlovei* and *Oxynoemacheilus zarzianus* from Tabin Stream in Sulaimani Province in Kurdistan Region-Iraq. The study revealed that both fishes were infected with *Gyrodactylus angorae* (Table 1). The following is a brief account of this parasite:

Class: Monogenea Carus, 1863

Order: Gyrodactylidea Bychowsky, 1937

Family: Gyrodactylidae Cobbold, 1864

Gyrodactylus angorae Ergens & Ibragimov, 1979

Host: *Eidinemacheilus proudlovei* and *Oxynoemacheilus zarzianus*

Site of infection: Skin, fins and gills

Locality: Tabin Stream, Sulaimani Province, Kurdistan Region-Iraq.

Table (1) Prevalence of *Gyrodactylus angorae* and mean of intensity in nemachilid fish in the present study.

Host	Fish		Prevalence %	Mean intensity	Site of infection
	Examined	Infected			
<i>E. proudlovei</i>	38	2	5.2	7.5	Gill, skin, caudal fin
<i>O. zarzianus</i>	7	2	28.5	6.5	Gill, caudal fin

Description:

The worm is fusiform and the greatest width occurs at the uterus level when it contains an embryo, peduncle is short and tapering toward haptor. Cephalic lobes are well developed, cephalic glands composed of bilateral groups of

unicellular glands which are located anterolateral to the pharynx. Haptor is subcircular in shape. Body length is about 0.34-0.38 mm, total length of the marginal hooks is 0.017-0.019 mm, total length of anchors is 0.036-0.038 mm, main parts 0.020-0.023mm, point 0.022-0.024 mm and inner root 0.014-0.016 mm. Size of ventral bar is 0.003-0.004 x 0.013-0.016 mm, membrane 0.005-0.008 mm. Size of dorsal bar is 0.001-0.004 x 0.010-0.013 mm (Fig. 2).

The description and measurements of the present specimens are closely similar to those reported by Pugachev *et al.* (2010) for *Gyrodactylus angorae* found on fins and skin of *Oxynoemacheilus bergiana* (reported as *Barbatula bergiana*) from Lenkoranka River from Azerbaijan. This monogenean parasite was never been reported from any fish species in Iraq before. Therefore, the present parasite is considered as the first record in Iraq.

Among the viviparous gyrodactylids, *Gyrodactylus* von Nordmann, 1832 is the most diverse genus in the world, with in excess of 500 nominal species (Harris *et al.* 1983; Kritsky *et al.* 2013b). According to Mhaisen (2021), the monogenean *G. angorae* Ergens & Ibragimov, 1979 is not previously recorded from any fish species in Iraq before. Hence, this is the first record in Iraq. Both *Eidinemacheilus proudlovei* and *Oxynoemacheilus zarzianus* are considered here as the first two fish hosts for this monogenean in Iraq.

So far, 56 *Gyrodactylus* species are known from fishes of Iraq in addition to some unidentified *Gyrodactylus* species from 18 different fish host species in Iraq (Mhaisen, 2021). In addition, no any *Gyrodactylus* species was reported earlier from *Eidinemacheilus proudlovei* and *Oxynoemacheilus zarzianus* in Iraq. Also, in Kurdistan Region-Iraq 15 species of *Gyrodactylus* (*G. baicalensis*, *G. barbi*, *G. cyprinid*, *G. elegans*, *G. gobioninum*, *G. gussevi*, *G. katharineri*, *G. kherulensis*, *G. longoacuminatus*, *G. macracanthus*, *G. medius*, *G. molnari*, *G. shulmani*, *G. sprostonae* and *G. vicinus*) were reported from different fish species (Abdullah & Mhaisen, 2017). In addition, more surveys on nemachilid fish parasites are necessary in order to identify more species and to match the growing information on the parasitic fauna of

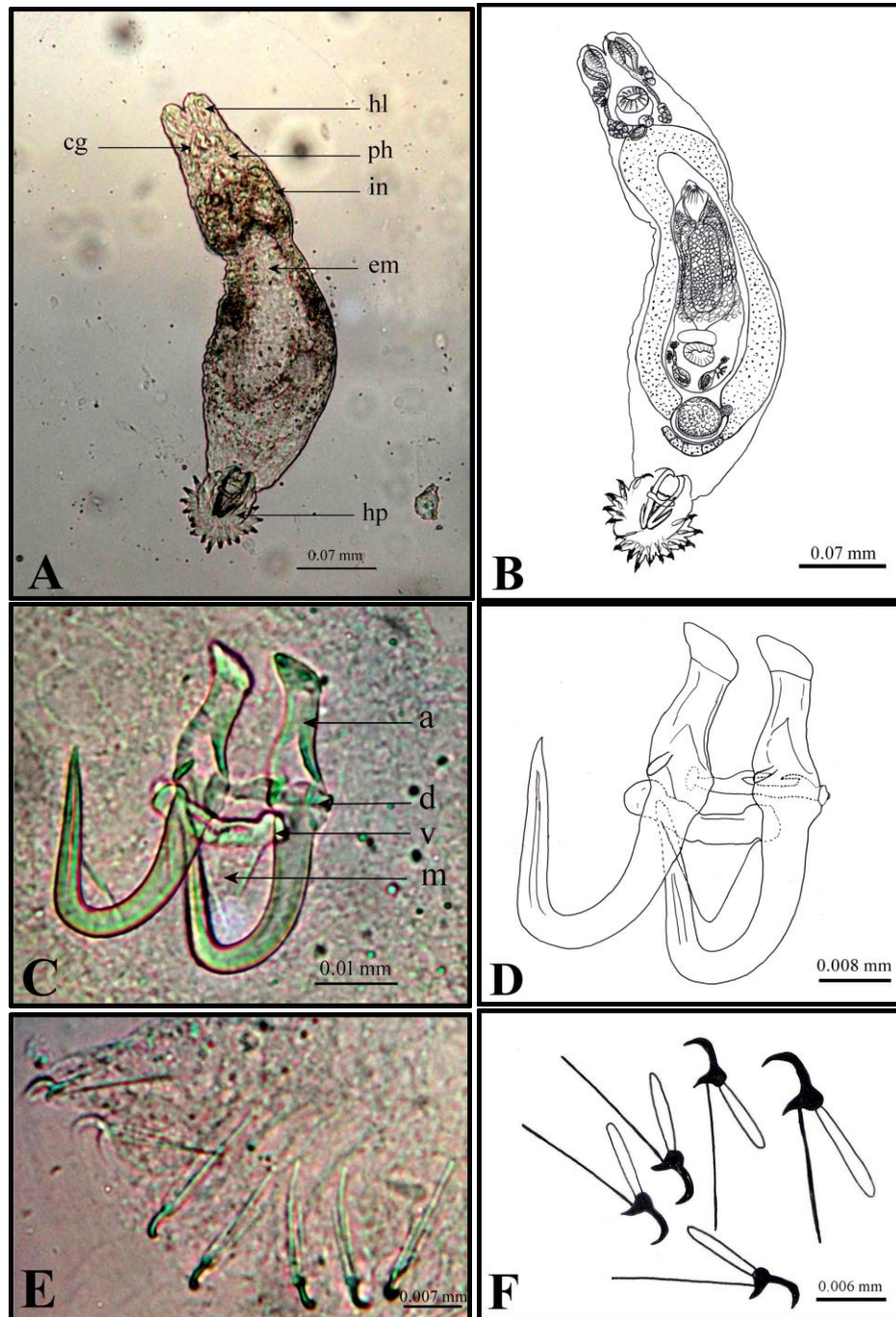


Fig. (2): **A:** Photomicrograph of *Gyrodactylus angorae* ventral view
B: Camera lucida of drawing of *Gyrodactylus angorae* ventral view
C: Photomicrograph of attachment apparatus
D: Camera lucida of drawing of attachment apparatus
E: Photomicrograph of marginal hooks (hooklets)
F: Camera lucida of drawing of marginal hooks (hooklets)
hl= head lob; **ph=** pharynx; **in=** intestine; **em=** embryo; **hp=** haptor;
cg= cephalic glands; **a=** anchor; **d=** dorsal bar; **m=** membrane; **v=** ventral bar

these types of fishes in Iraq. This is because Nemacheilidae regarded as the largest freshwater fish family after Cyprinidae in Iraq. Furthermore, the nimachilid fishes have a great biodiversity in Kurdistan Region of Iraq.

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