

First record of four species of the genus *Gyrodactylus* Nordmann, 1832 (Monogenea: Gyrodactylidae) from some Iraqi freshwater fishes

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Abstract

A total of 578 fishes, belonging to 19 species, were collected from Al-Graiat region on the Tigris River at Baghdad province during the period from July 2015 until the end of March 2016. The results showed the occurrence of eight species of the genus *Gyrodactylus* Nordmann 1832 (Monogenea: Gyrodactylidae). Among these parasites, four species were recorded for the first time in Iraq namely: *G. comephori*, *G. ibragimovi*, *G. macronychus* and *G. masu*. Also, seven species of fishes were regarded as new hosts for four species of the studied parasites. The description and measurements of these parasites were given as well as their illustrations.

Keywords: *Gyrodactylus comephori*, *Gyrodactylus ibragimovi*, *Gyrodactylus macronychus*, *Gyrodactylus masu*, Tigris River, Iraq.

أول تسجيل لأربعة أنواع من الجنس *Gyrodactylus* Nordmann, 1832

(الطفيليات أحادية المنشأ: العائلة كايرودكتليدي) من بعض أسماك المياه العذبة العراقية*

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المستخلص

تم جمع 578 نموذجاً من الأسماك، تعود إلى 19 نوعاً، من موقع الكريعات على نهر دجلة في محافظة بغداد خلال الفترة من تموز 2015 حتى نهاية آذار 2016. أظهرت النتائج وجود ثمانية أنواع من الديدان أحادية المنشأ العائدة للجنس *Gyrodactylus* Nordman 1832. سجلت أربعة أنواع من بين هذه الطفيليات لأول مرة في العراق وهي: *G. comephori*، *G. ibragimovi*، *G. macronychus* و *G. masu*. وعدت سبعة أنواع من الأسماك كمضيفات جديدة لأربعة أنواع من الطفيليات قيد الدراسة. تم إعطاء مواصفات وقياسات هذه الطفيليات بالإضافة إلى الرسم التوضيحي لكل منها.

* البحث مستل من رسالة ماجستير للباحث الثاني

Introduction:

Gyrodactylus species are monogenetic ectoparasites living on the skin, fins and gills of many marine and freshwater teleost fishes [21]. Species of this genus have high species richness but low morphological and biological diversity [9]. There are 409 potentially valid species names within the genus, recorded from 400 host species in a wide variety of fish families and orders [13]. As opposed to most monogeneans, members of the family Gyrodactylidae are viviparous. The young newborn contains

within its uterus several generations of embryos in sequential stages of development. This “Russian-Doll” mode of reproduction, termed hyperviviparity, combined with a rapid generation time (<24hrs at 25°C for the 1st born daughter in some species), can result in exponential parasite population growth on a single host [10]. The gyrodactylid transmission primarily relies on host to host contact, although parasites may also invade new hosts by drifting with water currents or clinging to the surface of the water and differences in water quality directly affect their infection processes [18]. On account of their exposure to various environments (reported from marine, freshwater and brackish habitats), they switch from one to other host, and have noticeable variation in their genetic compositions, which is necessary for their survival in that particular environment (4). A morphological identification method has been developed by Malmberg [14] mainly based on the hard parts of the haptor, with the marginal hook features being crucial for discrimination of very closely related species.

In Iraq, many *Gyrodactylus* species have been described from freshwater fishes from different water bodies. The first gyrodactylid species, *G. elegans*, was reported by Ali and Shaaban [5]. Later on, extensive investigations on fish parasites from different parts of Iraq resulted in recognition of some *Gyrodactylus* species for the first time in Iraq [20, 8, 15, 2, 3, 17, 7, 6].

The present investigation deals with the record of four monogenic species belonging to the genus *Gyrodactylus* viz: *G. comephori*, *G. ibragimovi*, *G. macronychus* and *G. masu* for the first time in Iraq infecting gills of some freshwater fishes.

Materials and Methods

A total of 578 fishes were collected from different locations along Tigris river near Al-Graiat region in Baghdad province during the period from July 2015 until the end of March 2016. Fishes were transported alive to the laboratory for parasitological examination. External examination of fins and skin were carried out. Skin and gill smears were microscopically examined. Parasites were isolated and then stained with aqueous neutral red and permanent slides were prepared with glycerin. Drawings of the sclerotized pieces of the haptor were made by using a camera Lucida. The morphological terminology (Fig. 1) and parasites identification was mainly done on basis of Pugachev *et al.* [19]. The mean values of all measurements (in mm) employed in this paper are used in the description as in the following order: minimum- maximum (mean) values. The fishes were identified according to Coad [11] and their scientific names were used according to Eschmeyer [12]. The information on the previous account records of parasites were checked with the index-catalogue of parasite and disease agents of fishes of Iraq by Mhaisen [16].

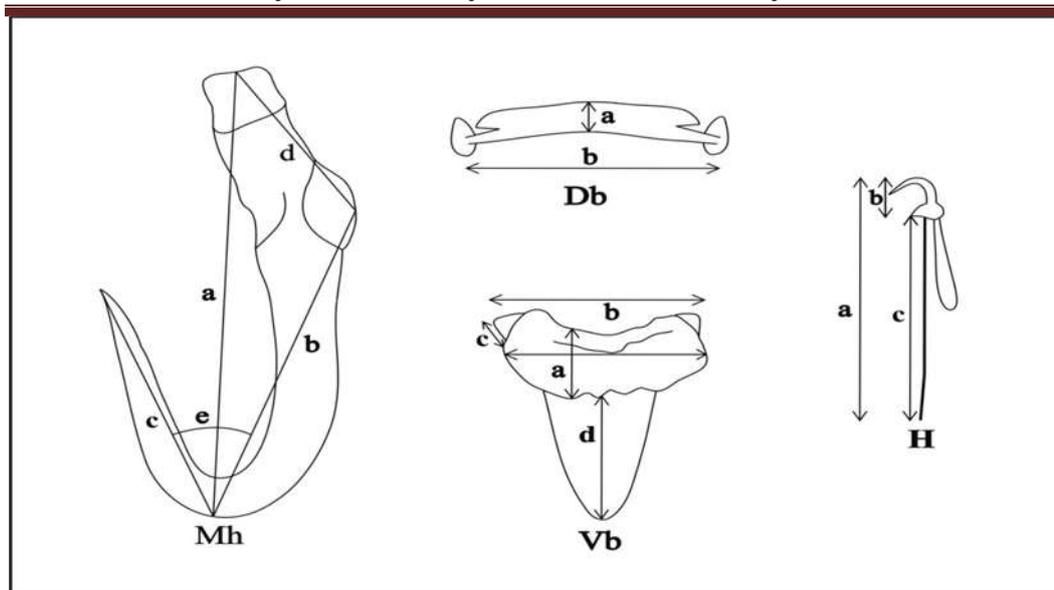


Fig. (1). Measurements used in the present study.

Mh = Median hook: a = Total length, b = Main part length, c = Point length, d = Inner root length, e = Angle between blade and point; Db = Dorsal transverse bar: a = Length, b = Width; Vb = Ventral transverse bar: a = Length, b = Width, c = Ear-like projection length, d = Membrane length; H = Hooklet: a = Total length, b = Hooklet length, c = Handle length.

Results and Discussion:

The inspection of fishes revealed their infection with eight species of *Gyrodactylus*. The distribution of these parasites, their location on fish hosts body, the prevalence and mean intensity of infection are summarized in Table (1). The following is an account on the description and measurements (in mm, based on three specimens for each species) of these parasites which were recorded here for the first time in Iraq.

Gyrodactylus baicalensis Bogolepova, 1950:

This parasite was isolated from gills of three species of fishes: *Luciobarbus barbulus* with a prevalence of 20% and mean intensity of 2, *Carasobarbus luteus* with a prevalence of 4.3% and mean intensity of 2.5 and *Cyprinus carpio* with a prevalence of 2.4% and mean intensity of 1, respectively (Table 1). This parasite was recorded for the first time in Iraq from *C. carpio* from Al-Wahda Fish Farm at Al-Suwaira and from Al-Latifayah Fish Farm [20]. According to the Mhaisen [16], *G. baicalensis* is so far recorded on nine different fish host species in Iraq not including *L. barbulus*. So, *L. barbulus* now represents a new host for *G. baicalensis* in Iraq.

Gyrodactylus comephori Bogolepova, 1950 (Fig. 2):

This species was obtained from gills of *Luciobarbus xanthopterus* with a prevalence of 7.1% and mean intensity of 4. This parasite was never reported from any fish species in Iraq before [16], therefore, the present parasite is considered as the first record in Iraq.

Body length is 0.42-0.48 (0.45). Total length of marginal hooks 0.031-0.035 (0.033), hooklet 0.007-0.009 (0.008). Total length of median hook 0.051-0.057

(0.054), main part 0.042-0.044 (0.043), point 0.021-0.023 (0.022), inner root 0.005-0.007 (0.006). Size of ventral bar 0.006-0.008 (0.007) x 0.023-0.025 (0.024), membrane 0.018-0.022 (0.02). Size of dorsal bar 0.002-0.0009 (0.001) x 0.015-0.017 (0.016).

The description and measurements of the present specimen are similar to those reported by Pugachev *et al.* [19] for *G. comephori* which was reported from gills of *Comephorus dybowskii* in Lake Baikal.

***Gyrodactylus ibragimovi* Ergens, 1980 (Fig. 3):**

This species was obtained from gills of *C. carpio* with a prevalence of 2.4% and mean intensity of 3. This parasite was never reported from any fish species in Iraq before [16], therefore, the present parasite is considered as the first record in Iraq.

Body length 0.25-0.29 (0.27). Total length of marginal hooks 0.025-0.03(0.027), hooklet 0.005-0.007 (0.006). Total length of median hook 0.052-0.06 (0.056), main part 0.046-0.048 (0.047), point 0.022-0.024 (0.023), inner root 0.014-0.016 (0.015). Size of ventral bar 0.006-0.007 (0.0065) x 0.017-0.019 (0.018), membrane 0.013-0.04 (0.035). Size of dorsal bar 0.001-0.003 (0.0015) x 0.018-0.02 (0.019).

The description and measurements of the present specimen are similar to those reported by Pugachev *et al.* [19] for *G. ibragimovi* which was reported from gills *Capoeta capoeta gracilis* from Lankoranka river (Azerbaijan).

***Gyrodactylus macronychus* Malmberg, 1957 (Fig. 4):**

This parasite was obtained from fins of *Coptodon zillii* with a prevalence of 7.9% and mean intensity of 1.7. This parasite was never reported from any fish species in Iraq before [16], therefore, the present parasite is considered as the first record in Iraq.

Body length 0.3-0.5 (0.4). Total length of marginal hooks 0.031-0.039 (0.035), hooklet 0.009-0.011 (0.01). Total length of median hook 0.076-0.092 (0.084), main part 0.053-0.056 (0.054), point 0.023-0.028 (0.025), inner root 0.015-0.021 (0.018). Size of ventral bar 0.006-0.008 (0.007) x 0.029-0.034 (0.031), membrane 0.019-0.021 (0.02). Size of dorsal bar 0.001-0.005 (0.003) x 0.015-0.027 (0.021).

The description and measurements of the present specimen are similar to those reported by Pugachev *et al.* [19] for *G. macronychus* which was reported from fins, skin, gills and nasal cavities of *Phoxinus phoxinus*, *P. percunurus* and *Rutilus rutilus lacustris*.

***Gyrodactylus markewitschi* Kulakowskaja, 1952:**

This parasite was found on gills of five species of fishes: *Arabibarbus grypus* with a prevalence of 8.3 and mean intensity of 2, *L. barbustus* with a prevalence of 20% and mean intensity of 3, *C. carpio* with a prevalence of 9.5% and mean intensity of 1.8, *C. luteus* with a prevalence of 2.2% and mean intensity of 2 and *C. zillii* with a prevalence of 5.3%, and mean intensity of 2 (Table 1).

This parasite was recorded for the first time in Iraq from *Varicorhinus trutta*, which is a synonym of *Capoeta trutta*, from Tigris River at Baiji town, Salah Al-Dien province [1]. After that, it was reported from eight different fish hosts in Iraq not includ-

ing *L. barbulus*, *C. luteus* and *C. zillii*. So, *L. barbulus*, *C. luteus* and *C. zillii* are now represent new hosts for *G. markewitschi* in Iraq [16].

***Gyrodactylus masu* Ogawa, 1986 (Fig. 5):**

This species was found on gills of both *C. zillii* with a prevalence of infection of 2.6% and mean intensity of 1 and *C. carpio* with a prevalence of 4.8% and mean intensity of 1 as well as from fins of *Mesopotamichthys sharpeyi* with a prevalence of 8.3% and mean intensity of 2. This parasite was never reported from any fish species in Iraq before [16], therefore, the present parasite is considered as the first record in Iraq.

Body length 0.7-0.76 (0.73). Total length of marginal hooks 0.028-0.034 (0.032), hooklet 0.005-0.007 (0.006). Total length of median hook 0.068-0.076 (0.072), main part 0.05-0.054 (0.052), point 0.034-0.038 (0.036) and inner root 0.025-0.027 (0.026). Size of ventral bar 0.007-0.009 (0.008) x 0.027-0.03 (0.028), membrane 0.017-0.021 (0.019). Size of dorsal bar 0.0031-0.0033 (0.0032) x 0.023-0.031 (0.027).

The description and measurements of the present specimen are similar to those reported by Pugachev *et al.* [19] from the fins, skin and gills of *Oncorhynchus masou* and *Parasalmo gairdneri* from fish farms in various localities of Japan.

***Gyrodactylus sprostonae* Ling, 1962:**

This parasite was recorded on gills of four species of fishes: *A. grypus* with a prevalence of 16.7 and mean intensity of 3.5, *Carassius auratus* with a prevalence of 9.1% and mean intensity of 1, *C. carpio* with a prevalence of 7.1% and mean intensity of 1.7 and *Planiliza abu* with a prevalence of 6.8% and mean intensity of 2.6 (Table 1).

This parasite was recorded for the first time in Iraq from *C. carpio* from Babylon (= Al-Furat) Fish Farm [8]. Now, it has 11 fish host species in Iraq not including *A. grypus* and *P. abu*. So *A. grypus* and *P. abu* are now representing new hosts for *G. sprostonae* in Iraq [16].

***Gyrodactylus tincae* Malmberg, 1957:**

This species was found on gills of *A. grypus* with a prevalence of 8.3 and mean intensity of 2. This parasite was recorded for the first time in Iraq from gills of *Cyprinion macrostomum* and *P. abu* (reported as *Liza abu*) from Euphrates River passing through Al-Qaim city, Al-Anbar province [7]. No further records in Iraq are available for *G. tincae* [16]. So, *A. grypus* is now considered as a new host for *G. tincae* in Iraq.

Acknowledgements:

Thanks are due to Prof. Dr. Furhan T. Mhaisen for his help in providing related information from his index-catalogue of parasites and disease agents of fishes of Iraq and for his critical reading of the manuscript.

Table (1): The Distribution of *Gyrodactylus* parasites on their fish hosts .

Parasites	Hosts	No. of fishes		Prevalence %	Mean intensity	Site of infection
		Examined	Infected			
<i>G. baicalensis</i>	<i>Luciobarbus barbulus</i> **	5	1	20	2	Gills
	<i>Carasobarbus luteus</i>	46	2	4.3	2.5	Gills
	<i>Cyprinus carpio</i>	42	1	2.4	1	Gills
<i>G. comephori</i> *	<i>Luciobarbus xanthopterus</i>	14	1	7.1	4	Gills
<i>G. ibragimovi</i> *	<i>C. carpio</i>	42	1	2.4	3	Gills
<i>G. macronychus</i> *	<i>Coptodon zillii</i>	38	3	7.9	1.7	Fins
<i>G. markewitschi</i>	<i>Arabibarbus grypus</i>	12	1	8.3	2	Gills
	<i>L. barbulus</i> **	5	1	20	3	Gills
	<i>C. luteus</i> **	46	1	2.2	2	Gills
	<i>C. zillii</i> **	38	2	5.3	2	Gills
	<i>C. carpio</i>	42	4	9.5	1.8	Gills
<i>G. masu</i> *	<i>C. zillii</i>	38	1	2.6	1	Gills
	<i>C. carpio</i>	42	2	4.8	1	Gills
	<i>Mesopotamichthys sharpeyi</i>	12	1	8.3	2	Fins
<i>G. sprostonae</i>	<i>A. grypus</i> **	12	2	16.7	3.5	Gills
	<i>Carassius auratus</i>	11	1	9.1	1	Gills
	<i>C. carpio</i>	42	3	7.1	1.7	Gills
	<i>Planiliza abu</i> **	118	8	6.8	2.6	Gills
<i>G. tincae</i>	<i>A. grypus</i> **	12	1	8.3	2	Gills

* New parasite record in Iraq.

** New host record in Iraq.

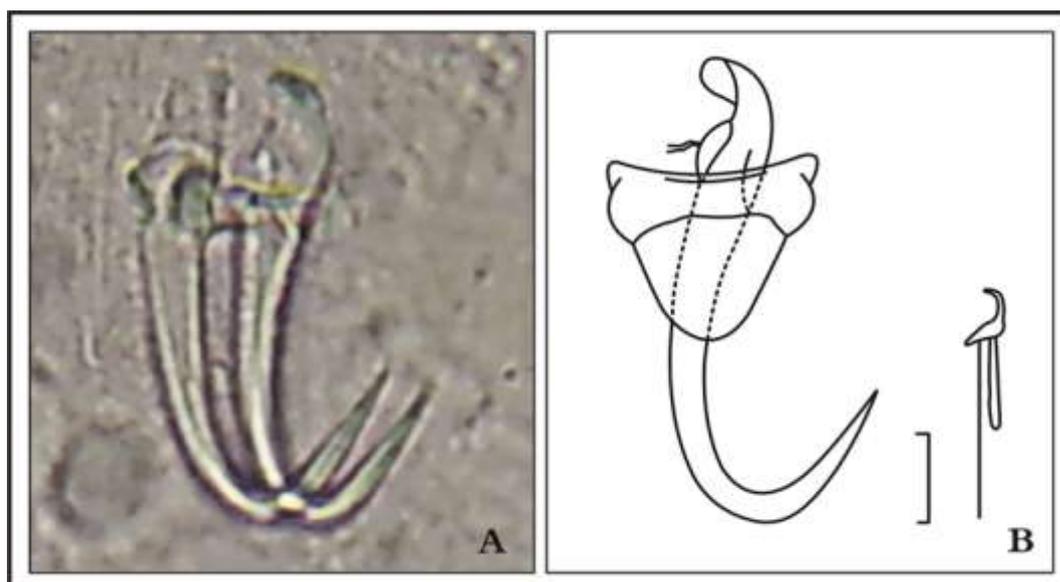


Fig. (2): *Gyrodactylus comephori*.
A- Photomicrograph of the haptor (400x).

B- Camera Lucida drawing of the haptor, (Scale bar 0.01mm).

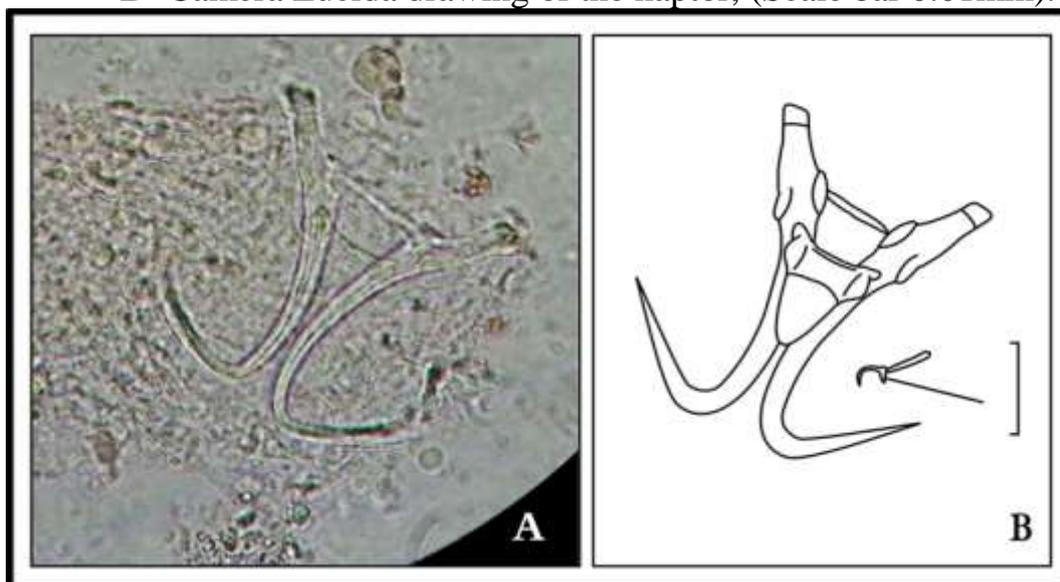


Fig. (3): *Gyrodactylus ibragimovi*.

A- Photomicrograph of the haptor (400x).

B- Camera Lucida drawing of the haptor, (Scale bar 0.02mm).

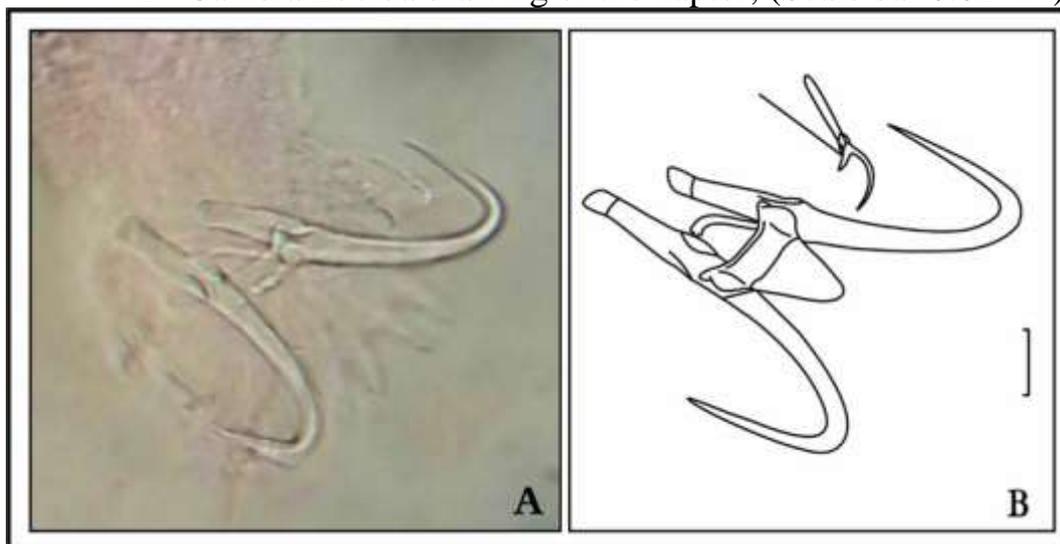


Fig. (4): *Gyrodactylus macronychus*.

A- Photomicrograph of the haptor (400x).

B- Camera Lucida drawing of the haptor, (Scale bar 0.02mm).

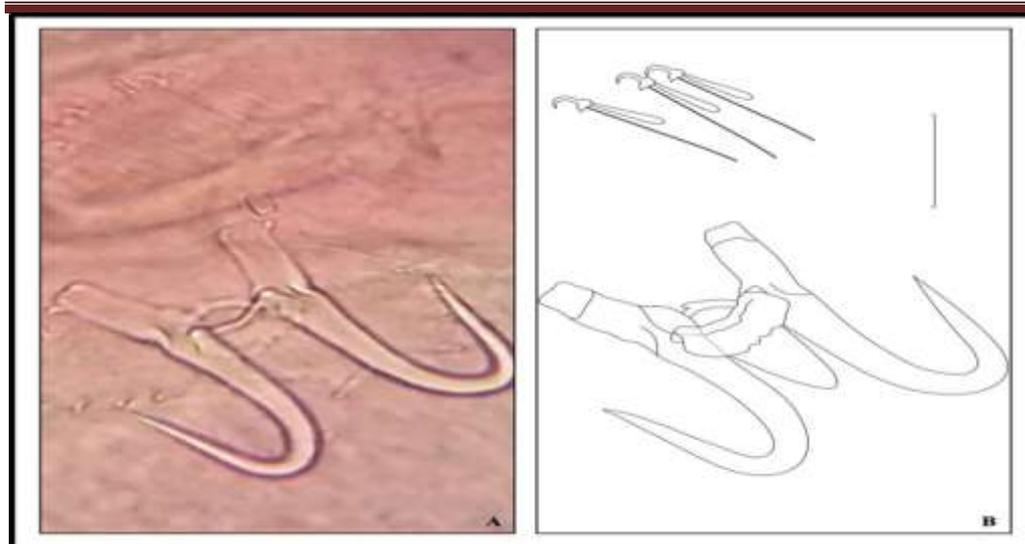


Fig. (5): *Gyrodactylus masu*.

A- Photomicrograph of the haptor (400x).

B- Camera Lucida drawing of the haptor, (Scale bar 0.02mm).

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