

**NEW RECORD AND REDESCRIPTION OF *Microcotyle helotes* Sandars, 1944
(Monogenea: Microcotylidae) IN VIETNAM**

Nguyen Thi Hoang Ha¹, Nguyen Van Ha^{1,2}, Nguyen Manh Hung^{1,2,*}

¹Graduate University of Science and Technology, Vietnam Academy of Science and
Technology, 18 Hoang Quoc Viet, Ha Noi, Vietnam

²Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology,
18 Hoang Quoc Viet, Ha Noi, Vietnam

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ABSTRACT

Twenty-seven specimens of the fish species *Terapon jarbua* and 4 specimens of the fish species *Terapon theraps* were collected from the Cat Ba Archipelago marine area, and examined for parasite infection. Among these, 4 specimens of *T. jarbua* and 1 specimen of *T. theraps* were infected with a total of 42 monogeneans. The intensity of infection ranged from 1 to 16 worms per fish. Four monogenean species were identified, three of which belong to the Protogyrodactylidae: *Protogyrodactylus gussevi* (14 specimens) and *Protogyrodactylus perforatus* (12 specimens) were found on *T. jarbua*, while *Protogyrodactylus solidus* (1 specimen) was identified on *T. theraps*. The species *Microcotyle helotes* (17 specimens) was recorded for the first time in Vietnam, found in two individuals of the new host *T. jarbua*. Additionally, a redescription of *M. helotes* was provided.

Keywords: Marine fish, parasites, *Terapon jarbua*, Terapontidae.

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*Corresponding author email: hung_iebr@yahoo.com

INTRODUCTION

Genus *Microcotyle* Van Beneden & Hessr, 1863 is one of the oldest genera of the class Monogenea, comprising 73 valid species (World Register of Marine Species, 2023). Due to the diversity and numerous species within the genus, *Microcotyle* is notorious for causing difficulties in taxonomy (Song et al., 2021). Consequently, Tripathi (1954) divided this genus into four subgenera, namely *Microcotyle*, *Bispina*, *Vaginaespina*, and *Aspina*, without designating type species for each subgenus. However, this classification was later suppressed by Mamaev (1986). In Vietnam, two species of *Microcotyle* have been reported in the Gulf of Tonkin: *Microcotyle arrips* Sandars, 1945 found on monocle breams *Scolopsis vosmeri*, *Scolopsis taeniopterus* (Nemipteridae), and yellowtail amberjack *Seriola lalandi* (Carangidae), and *Microcotyle fistulariae* Mamaev, 1989 discovered on Red cornetfish *Fistularia petimba* (Fistulariidae) (Hung et al., 2020).

The species *Microcotyle helotes* Sandars, 1944, was originally described based on 11 specimens from the gills of Easter striped grunter *Helotes sexlineatus* (Terapontidae) off Safety Bay, Western Australia (Sandars, 1944). Dillon et al. (1985) redescribed and illustrated this monogenean due to incomplete original figures and descriptions of the adult morphology. Williams (1991) recovered *M. helotes* from the type-host *Helotes sexlineatus*, and a second Terapontidae, *Pelsartia humeralis*, from the type locality; however, he only redescribed *M. helotes* from *Pelsartia humeralis*. Zhang et al. (2001) found *M. helotes* on the large scaled terapon *Terapon theraps* (Terapontidae) from the South China Sea.

During a study of monogenean fauna of fishes from the Cat Ba Archipelago, we discovered *M. helotes* on the spiky trumpeter *Terapon jarbua*. The finding represents the first report of the species *M. helotes* within the monogenean fauna in Vietnam. The paper presents new data and illustrations of the species obtained from this new host.

MATERIALS AND METHODS

In March 2019 and March 2023, we collected 31 terapontid specimens from the Cat Ba Archipelago, comprising 27 specimens of the spiky trumpeter *T. jarbua* and 4 specimens of the largescale terapon *T. theraps*. These fish specimens were promptly placed in an ice box and carried fresh to the laboratory. Following the method outlined by Nguyen et al. (2016; 2020a, b; 2024), we conducted identification, examination, and sample preparation procedures. To elaborate, the gills of fish were excised and placed in Petri dishes containing seawater. Subsequently, we examined these gills for the presence of monogeneans using a stereomicroscope (Olympus SZ61).

Monogeneans were removed from debris, and then fixed in warm AFA (a mixture of 70% ethanol-formalin-acetic acid in the ratio 90:7:3), and then preserved in 70% ethanol. Following one month of preservation, staining was carried out using Gomori's trichrome. Subsequently, the specimens underwent dehydrated in an ethanol series (ranging from 80 to 100%), clearing in xylene, and finally, mounting in Canada balsam.

The study of monogeneans involved the use of a light microscope (Olympus CH40), and drawings were created with the aid of a drawing tube. Measurements are denoted in micrometers, with the mean value provided, followed by the range in parentheses and the number of measurements [n] in square brackets.

RESULTS

Out of a total of 31 terapontid specimens examined, only four specimens of *T. jarbua* and one specimen of *T. theraps* were found to be infected, collectively harboring 42 monogeneans. The intensity of infection varied from 1 to 16 worms per fish. Further morphological examination of these 42 monogenean specimens revealed the presence of four species.

Among these monogenean species, three belong to the Protogyrodactylidae: *Protogyrodactylus gussevi* Bychowsky &

Nagibina, 1974 [n = 14] and *Protogyrodactylus perforatus* Bychowsky & Nagibina, 1974 [n = 12] were found on *T. jarbua*, while *Protogyrodactylus solidus* Bychowsky & Nagibina, 1974 [n = 1] was identified on *T. theraps*. Additionally, the species *M. helotes* [n = 17] was solely found in two individuals of *T. jarbua*.

***Microcotyle helotes* Sandars, 1944 (Fig. 1)**

Hosts: Centrarchiformes: Terapontidae: Easter striped grunter *Helotes sexlineatus* (Type-host) (Sandars, 1944; Dillon et al., 1985; Williams, 1991), sea trumpeter *Pelsartia*

humeralis (Williams, 1991), largescaled terapon *Terapon theraps* (Zhang et al., 2001), and spiky trumpeter *T. jarbua* (the present study).

Locality:

In Western Australia: Swan River, Nedlands, Rockingham, and Safety Bay, Perth (Sandars, 1944); Cape Peron, and Shark Bay, Carnarvon (Dillon et al., 1985); Swan River Estuary and Cockburn Sound, Perth (Williams, 1991).

In South China Sea: China: Beihai, Qisha, Guangxi (Zhang et al., 2001); Vietnam: Cat Ba Archipelago, Hai Phong (the present study).

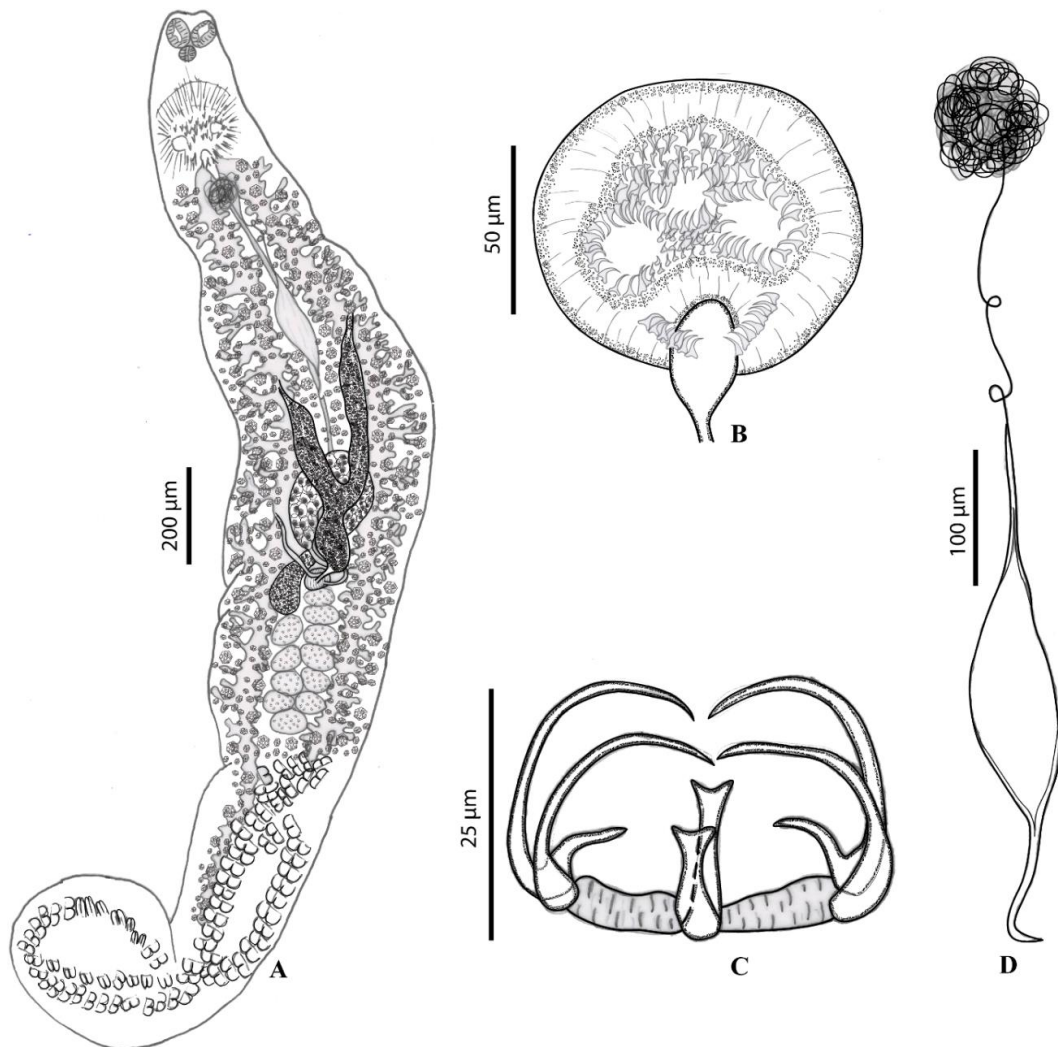


Figure 1. *Microcotyle helotes* Sandars, 1944. A. Whole body, ventral view; B. Genital atrium; C. Clamp; D. Egg

Table 1. Comparative morphometric data for *Microcotyle helotes* in different hosts and regions

Feature/Author(s)	Sandars (1944)	Dillon et al. (1984)	Wiliam (1991)	Wiliam (1991)	Zhang et al. (2001)	The present study
Host of <i>Microcotyle helotes</i>	<i>Pelates sexlineatus</i>	<i>Pelates sexlineatus</i>	<i>Pelates sexlineatus</i>	<i>Pelates humeralis</i>	<i>Terapon theraps</i>	<i>Terapon jarbua</i>
Localities	Swan River Estuary and Cockburn South, Western Australia	Carnarvon, Western Australia	Swan River Estuary and Cockburn South, Western Australia	Carnarvon, Western Australia	Beihai, Qisha, Guangxi, China	Cat Ba Archipelago, Vietnam
Total length	2,870	1,670 (1,610–1,730)	2,774 (2,576–3,088)	2,145 (1,773–2,259)	2,970–4,342	2,737 (1,957–3,074) [n = 15]
Width at ovary	380	282 (235–329)	435 (272–592)	404 (302–510)	270–486	311 (205–396) [n = 17]
Length of haptor	1,020	610	932 (800–1,104)	960 (684–1,160)	1,512–2,268	1,033 (850–1,196) [n = 15]
No. testes	14	12–13	10 (9–11)	17 (12–19)	11–13	11–12 [n = 14]
Testis diameter	-	-	-	-	32–97	53 (40–66) [n = 60]
Genital atrium dimensions	87 × 70	88 × -	91 (80–102) × 84 (77–90)	93 (74–116) × 82 (72–92)	-	108 (84–137) × 106 (65–159) [n = 15]
Distance from anterior margin of genital atrium to anterior end	240	184	213 (179–246)	193 (175–212)	216–324	175 (148–197) [n = 15]
Pharynx diameter	38	38 (35–50)	43 (40–46)	35 (33–37)	32–43	32 (28–41) [n = 17]
Buccal organs (length × width)	71 × 59	60 × 44	65 (59–72) × 39 (35–42)	51 (46–58) × 39 (35–45)	57–60 × 65–70	54 (39–69) × 40 (32–46) [n = 30]
No. clamps	64	54–60	54 (37–61)	87 (71–103)	108–117	98 (90–126) [n = 15]
Clamps (width × height)	58 × 33	53 (51–55) × 37 (34–39)	59 (54–67) × 39 (35–42)	50 (42–45) × 35 (33–38)	26–41 × 44–54	46 (40–51) × 26 (22–29) [n = 45]
Egg (length × width)	225 × 62	-	237 (234–240) × 77 (74–80)	- × 56	-	217 (124–341) × 34 (16–64) [n = 5]

Voucher material: NMH-Microcotylid-Microcotyle-1-17; the remaining material from Department of Parasitology, Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology.

Site on host: Gill filaments.

Infection parameters: *T. jarbua* [n = 26]: prevalence, 7.41% (2 out of 27); mean intensity: 9.

Description: (based on 17 specimens stained in Gomori's trichrome; measurements are provided in Table 1, Fig. 1).

Body is elongate, relatively slender, and tapering anteriorly. Haptor is not sharply delineated, tapering posteriorly, and symmetrical with two nearly equal rows. The clamp of microcotylid-type, dissimilar in size, decreases from the middle region towards the posterior part of the haptor, with the posterior and newly formed anterior clamps being the smallest.

A pair of prohaptor suckers is present, elongate-oval, muscular, septate, and displaying a row of tiny papillae visible on ventral rims. Pharynx is sub-spherical, lacking a prepharynx. The oesophagus is slender, relatively long and narrow, devoid of diverticula, bifurcating immediately behind the genital atrium. There are two intestinal caeca, each with numerous lateral and medial diverticula that are not confluent posteriorly. The right caeca is shorter, terminating at the posterior end of body, while the left caeca extends into haptor for about one third of its length.

There are 11–12 testes, intercaecal and postovarian, similar in size and shape. The vas deferens dilates with sperm at its base, extending anteriorly and coiling in the mid-line dorsal to the uterus. The cirrus is unarmed, with muscular bulb surrounded by small hooks, situated in the posterior part of the genital atrium.

The ovary is pretesticular, taking on a question mark-shape, and is intercaecal. The oviduct loops posteriorly and dorsally, joining the vitelline reservoir in the mid-line. The vitellaria are coextensive with the intestinal caeca. The vitelline reservoir is large and Y-shape, ventral to ovary with two transverse ducts. The genito-intestinal canal runs dextrally and ventrally to the proximal end of the ovary, joining the right caecum. The oötype is located near the posterior end of ovary, oval in shape and surrounded by Mehlis' glands. The uterus arises from the dextral margin of oötype, extending forward in mid-line and traceable to the posterior margin of genital atrium.

The genital atrium is prebifurcal, large, and muscular, with an outer muscular rim of radiating muscle fibers and an inner portion armed with numerous small spines. The eggs are ovoid, featuring filaments at both ends, with one filament being extremely long and coiling in a knot.

DISCUSSION

The redescription of *M. helotes* is provided due to the discovery of the species in the Cat Ba Archipelago of Vietnam, marking a new locality for its distribution, and the identification of *T. jarbua* as the new host. The morphometric data from previous studies and those obtained in the present study for *M. helotes* are presented in Table 1. The measurement of *M. helotes* samples from Vietnam exhibits greater similarity to those from China, particularly in terms of the number of testes and clamps. Furthermore, both *M. helotes* samples from Vietnam and China were collected from *Terapon* fish, whereas fish hosts from Australia belong to the genus *Pelsartia*.

An intriguing aspect of this study is the description of *M. helotes* eggs, which was not previously illustrated in earlier studies. Williams (1991) provided egg size measurements but noted that they were based on only one damaged egg. Sandars (1944) also documented egg measurements but also did not provide illustrations.

Although minor differences were observed among samples from various hosts and localities, all specimens exhibit specific characteristics, particularly identical structures in the genital atrium and clamps.

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