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SPECIES AND CHARACTERIZATION OF THE PARASITES IN THE THREE SPOT GOURAMI (*TRICHOGASTER TRICHOPTERUS*)

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ABSTRACT: In light of the significance of the three spot gourami (*Trichogaster trichopterus* Pallas, 1770) as a widely consumed main protein source, this research identifies and characterizes the parasites, especially those with the harmful health effects, residing in this fish species of the Thung Lam reservoir in Thailand's northeastern province of Buriram. In the study, a total of 120 three spot gourami fish samples were examined and the findings revealed the presence of three parasitic species. Two external parasitic species were found in the gill filaments: *Trianchoratus aecleithrium* and *Gyrodactylus* sp., and another one in the intestines: *Pallisentis nagpurensis*. The discovery of the three host-specific parasitic species shows no clinical signs of disease in the fish, despite the presence of parasites on their fish hosts. It is also the case that fish-borne helminthic infections are commonplace in Thailand. Furthermore, these parasites could conveniently be eliminated by adequate cooking. Thus, to minimize the parasites-induced health risks, it is recommended that the fish must be thoroughly cooked prior to consumption.

Keywords: Parasites, Three spot gourami, Trichogaster trichopterus, Thailand

1. INTRODUCTION

The three spot gourami or Pla Kra Dee Mor (*Trichogaster trichopterus*) is a species of gourami native to Southeast Asia. Another name of the fish is the blue gourami because of the color of its scales [1]. As the name implies, the three spot gourami has two spots on either side and the third spot is the eye (Fig. 1). The fish inhabits the standing or slow-moving freshwater and are ubiquitous in Yunnan, China and Southeast Asia, i.e. Cambodia, Laos, Malaysia, Myanmar, Singapore, Thailand and Vietnam [2]. In Thailand, due to its ubiquity, the three spot gourami is caught and widely consumed as a staple food in several regions of the country, especially in the rural areas of the Northeast. The Thung Lam reservoir plays a vital role in the economy of Buriram and neighboring provinces. Specifically, the reservoir serves as the natural water source for irrigation, agriculture, fisheries, tourism and the habitat of a variety species of freshwater fish, including the three spot gourami. In fact, many rural villagers rely on fish in the reservoir as their primary source of protein.

Given its widespread local consumption and significance as the main protein source for this community, the present research sought to identify and characterize the parasitic species residing in the three spot gourami, especially those with possible harmful health effects. The findings would then be used to develop simple guidelines which can help to minimize the identified parasites-induced health risks in the consumers of the three spot gourami. This information will be particularly beneficial to those in rural areas with limited formal education.

Fig.1 Morphology of the three spot gourami

2. RESEARCH METHODOLOGY

A total of 120 three spot gourami caught in the Thung Lam reservoir during November 2014 to January 2015 were used in this research. Prior to the data collection, fish dimensions were measured and those with 7.5-8.0 cm in length selected. The skin and fin mucus were then scraped and examined using phase contrast microscopy. The gills were removed and scraped onto a Petri dish filled with clean water to dislodge the parasites and then examined under a stereo microscope. The observable external parasites were transferred onto

a glass slide and covered with coverslip. The fish were then disemboweled and the contents examined under the microscope. In addition, the parasites were immobilized and preserved using the methods appropriate for each group as outlined in Tonguthai *et al*. (1999) [3].

Parasite identification was carried out based on the morphological features in Gelnar (1989) [4], Price and Berry (1996) [5], Paperna (1996) [6] and Sirikanchana (2003) [7]. The prevalence and mean intensity of each parasitic species were determined as per Margolis *et al*. (1982) [8].

3. RESULTS AND DISCUSSION

A breakdown of the three parasitic species found in the three spot gourami samples from the Thung Lam reservoir, together with the number of fish infected with the parasites and the total number of the parasites is presented in Table 1. The findings revealed that all of the fish samples (120) were infected with *Trianchoratus aecleithrium* and only two (2) with *Gyrodactylu*s sp. (the class Monogenea). Both parasitic species were found in the gill filaments. Meanwhile, almost one-third of the fish samples (33) were infected with the intestinal *Pallisentis nagpurensis* (the spiny headed-worm species).

Table 1: Parasites in the three spot gourami samples from the Thung Lam reservoir

Parasitic species	Number of fish with parasites	Total number of parasites
(1) Monogenean		
- *Trianchoratus aecleithrium*	120	219
- *Gyrodactylu*s sp.	2	20
(2) Acanthocephala		
- *Pallisentis nagpurensis*	33	99

Table 2 displays the prevalence and mean intensity of the parasites found in the three spot gourami samples from the *Thung Lam* reservoir. In the table, *T. aecleithrium* exhibited a 100% prevalence, consistent with the finding that all the fish samples were infected with this parasitic species, followed by 1.66% and 27.5% for *Gyrodactylu*s sp. and *Pallisentis nagpurensis*, respectively. The corresponding mean intensity were 64.79, 5.91 and 29.28.

Table 2 Prevalence and mean intensity of the parasites in the three spot gourami samples

Parasitic species	Prevalence (%)	Mean intensity
Trianchoratus aecleithrium	100	64.79
*Gyrodactylu*s sp.	1.66	5.91
Pallisentis nagpurensis	27.5	29.28

3.1 *Trianchoratus aecleithrium*

T. aecleithrium is a flatworm or monogenetic trematode mainly found on the gills of fish, generally elongated and compressed dorsoventrally. The research findings revealed that the parasite's body is 0.28-0.37 mm in length and 0.07-0.09 mm in width and is covered with smooth and thin cuticle, with two pairs of eye spots on the anterior part. The pharynx is of oval shape, 0.02-0.03 mm in diameter. The opishaptor is bilobed, 0.03-0.04 mm long and 0.08 mm wide, and is distinctly separated from the body.

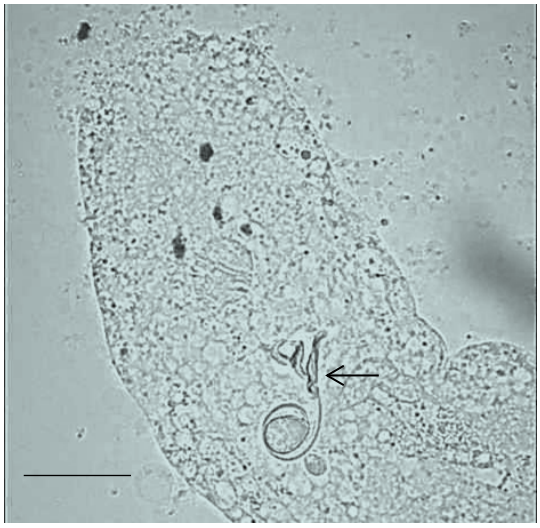

Fig.2 Copulatory organ of *T. aecleithrium* (arrow) (scale = 0.02 mm)

Additionally, the parasite has three anchors: one dorsal anchor 0.04 mm in outer length, 0.03 mm in inner length and 0.01 mm base width, 0.016 mm point length, 0.017 mm and 0.008 mm inner and outer root lengths; and two ventral anchors with 0.028 mm outer length, 0.026 mm inner length and 0.015 mm base width, 0.018 mm point length, 0.014 mm inner root length, and 0.004 mm outer root length. However, the opishaptor has no support bars. In addition, there are 14 marginal hooks,

measuring 0.013 in total length. The copulatory organ, measuring 0.04 mm in total length, consists of non-articulated cirrus and accessory piece. The vagina opens laterally and is reinforced by the weakly sclerotized vaginal tube (Figs.2 and 3).

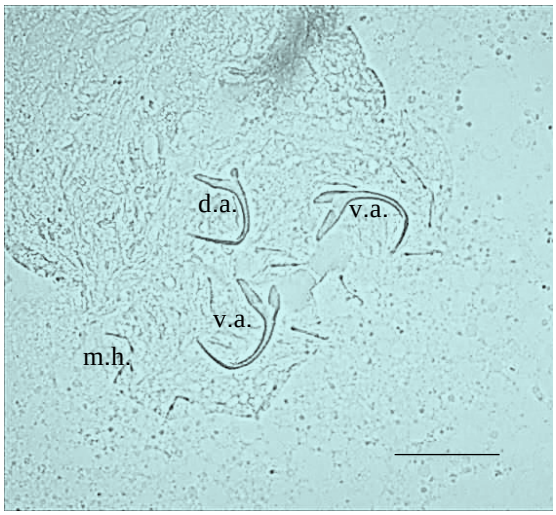

Fig.3: Opishaptor of *T. aecleithrium* (scale = 0.02 mm), where d. a. = dorsal anchor; v. a. = ventral anchor; m.h. = marginal hooks

Interestingly, the genus *Trianchoratus* with the three well-developed anchors was first found in the gills of the kissing gourami (*Helostoma rudolfi*), belonging to the family Helostomatidae from Southeast Asia [5]. In addition, *T. aecleithrium* was detected in the gills of *Trichogaster trichopterus* (three spot gourami) from Czechoslovakia, belonging to another related family Belontiidae, indicating the host specificity of the parasite [4].

3.2 *Gyrodactylus* sp.

Gyrodactylus sp. is a small monogenetic trematode (0.2 mm) mainly found on the fin or the external fish skin, generally elongated and compressed dorsoventrally. There are two lobes at the anterior end of the head without eye spots. In addition, the parasite is viviparous and the embryos with well-developed hooks are visible inside the body of adult parasites. The opishaptor is armed with a pair of large hooks and sixteen marginal hooks, as shown in Figs.4 to 5.

The genus *Gyrodactylus* has many species and is among the main causes of parasitic infestations in both marine and freshwater fish [9]. Severe infestations could lead to the destruction of the fin or skin epithelium due to mechanical damage.

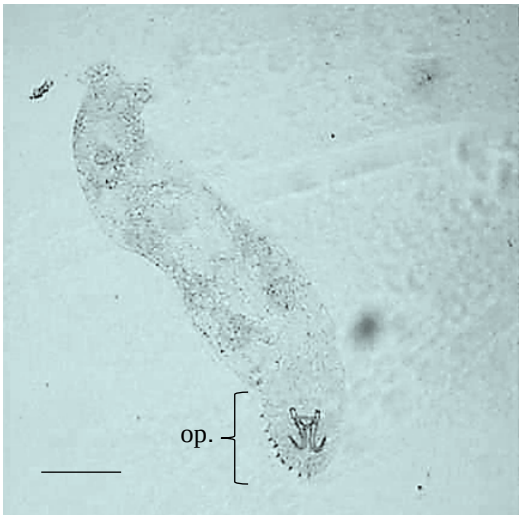

Fig.4: *Gyrodactylus* sp. (scale = 0.02 mm), where op. = opishaptor

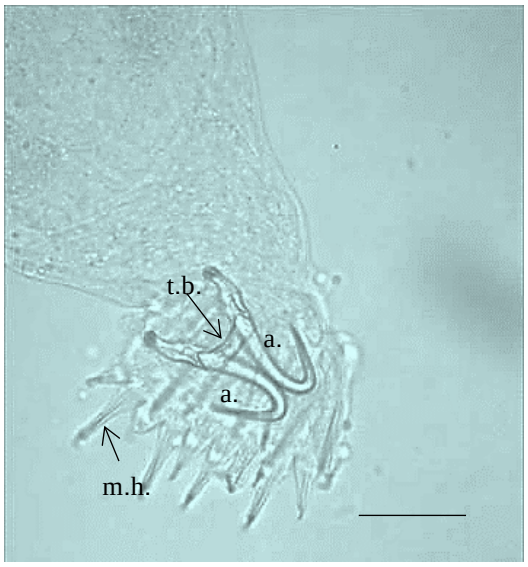

Fig.5 Opishaptor of *Gyrodactylus* sp. (scale = 0.02 mm), where a. = anchor; t.b. = transverse bar; m.h. = marginal hooks

3.3 *Pallisentis nagpurensis*

P. nagpurensis is of cylindrical shape with 4.1 mm in length and 0.3 mm in width. The research findings showed that the parasite's proboscis is large and globular, 0.17 mm long, 0.2 mm wide, and is armed with four circles of 10 fine, recurved hooks that are similar in shape but different in size. The hooks of the first circle are stout and larger than those of the basal row. Each hook consists of a recurved blade, a horizontally directed root, and a handle sunk in proboscis wall, as shown in Fig. 6.

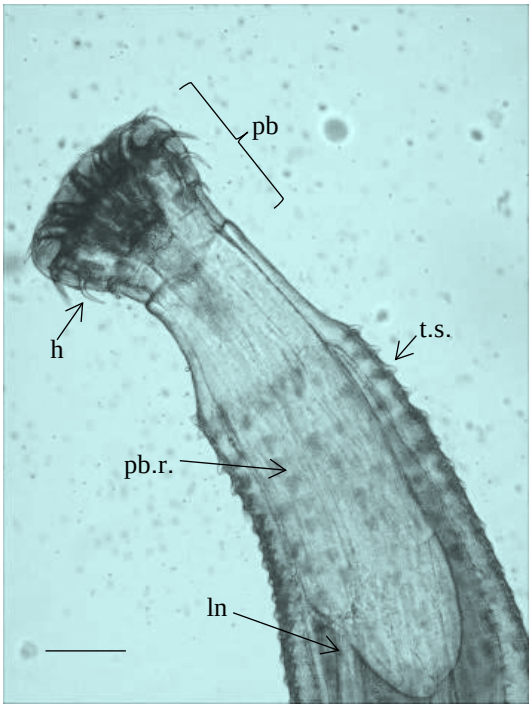

Fig.6 The head part of *P. nagpurensis* (scale = 0.1 mm), where pb = proboscis; h = hook; pb.r. = proboscis receptacle; ln. = lemnisci; t.s. = trunk spine

In addition, the neck is long and the proboscis receptacle is sac-like and single-layered. The lemniscal tubulars are longer than the proboscis receptacle. The body consists of the collar and trunk spines. The collar spines are arranged in 14-16 transverse circles, each with 16 spines, and the trunk spines start after a short non-spiny area with 20 circles, each with 14-16 spines. The anterior and posterior testes are 0.3 mm long and 0.1 wide. The seminal vesicle is 0.3 mm long and 0.06 wide. The cement gland is single, syncytial, cylindrical, 0.3 mm long and 0.1 wide, and to the rear of the testes. The cement reservoir is 0.2 mm long and 0.1 wide. From each testis a vas deferens runs down in close association with the cement gland, the cement reservoir and the joint bursa (Figs. 6 to 8).

In fact, the genus *Pallisentis* was identified in the specimens of three fish species from Beijing, China [10]. Specifically, *Pallisentis* is grouped under class Eoacanthocephala [11], order Gyracanthocephala [12], family Quadrigyridae [13] and subfamily Pallisentinae [14]. The acanthocephalan *Pallisentis nagpurensis* is the intestinal parasite of fishes, amphibians, birds, reptiles and mammals. It can penetrate its thorny proboscis into the intestinal wall of the host and absorb the nutrients. Their large numbers could cause the occlusion of the stomach and intestinal lumina, and even death of the fish host [15]. In Thailand, *P. nagpurensis* was found in *Ophiocephalus striatus* from the central province of Sing Buri [16] and the capital Bangkok [17]; and in *Channa striatus* and *C. lucius* from the Bueng Boraphet freshwater lake in Nakhon Sawan province [18].

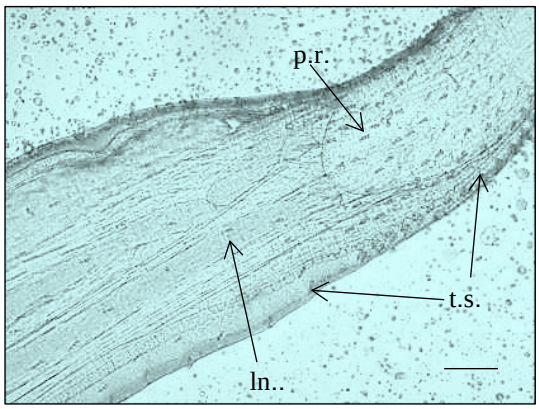

Fig.7 The trunk part of *P. nagpurensis* (scale = 0.1 mm), where pb.r. = proboscis; receptacle; ln. = lemnisci; t.s. = trunk spine

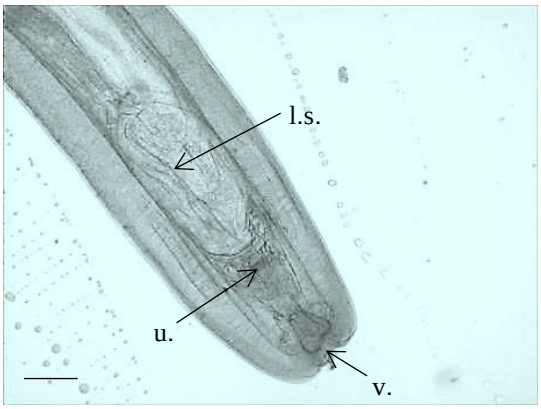

Fig.8 The tail (end) part of *P. nagpurensis* (female) (scale = 0.1 mm, where l.s. = ligament sag; sp. = sphincter; u = uterus; v = vulva

Given that the presence of parasites on their fish hosts and the fish-borne helminthic infections are commonplace in Thailand, the discovery of the three host-specificity parasitic species in the three spot gouramis from the Thung Lam reservoir shows no clinical signs of disease in the fish. In addition, a number of freshwater fish species have been reported as the intermediate host of parasites [19]. However, humans could acquire the parasites from consuming raw or undercooked fish containing the infective-stage parasites [20]. Fortunately, these

parasites could conveniently be eradicated by adequate cooking. It is thus imperative that the three spot gourami be thoroughly cooked prior to consumption to minimize the health risks induced by the parasites. In addition, the rural residents along the natural waterways who catch and feed on the three spot gourami must be made aware of this safe practice.

4. CONCLUSIONS

This research has identified and characterized the parasites residing in the three spot gourami (*Trichogaster trichopterus* Pallas, 1770) of the Thung Lam reservoir in Thailand's northeastern province of Buriram. This is valuable information given the widespread local consumption of the fish and its significance as the main source of protein. In the study, a total of 120 three spot gourami fish samples were examined and the findings revealed the existence of three parasitic species. Two external parasitic species were found in the gill filaments: *Trianchoratus aecleithrium* and *Gyrodactylus* sp., and another in the fish intestines: *Pallisentis nagpurensis*. Specifically, *T. aecleithrium* was the parasitic species with the highest mean intensity (64.79), followed by *Pallisentis nagpurensis* (29.28) and *Gyrodactylus* sp. (5.91). Interestingly, the existence of the three host-specific parasitic species shows no clinical signs of disease in the fish, although the presence of parasites on their fish hosts and the fish-borne helminthic infections are commonplace in Thailand. In fact, these parasites could easily be killed by adequate cooking. To successfully minimize the parasites-induced health risks, the fish thus must be thoroughly cooked prior to consumption. More importantly, the rural residents whose livelihoods depend on the three spot gourami fish species must be made aware of the safe practice.

5. ACKNOWLEDGEMENTS

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6. REFERENCES

[1] Frankel JS, " Inheritance of trunk coloration in the three spot gourami, *Trichogaster trichopterus* Pallas", J. of Fish Biology, Vol. 41, 1992, pp. 663-665.

[2] Vidthayanon C, "Freshwater Fishes of Thailand" Nanmee Books Co. Ltd., Bangkok: 2001. pp. 54-55.

[3] Tonguthai, K., S., Chinabut, C., Limsuwan, T., Somsiri, P., Chanratchakool, & Kanchanakarn, S. "Diagnostic Proceedures for Finfi.sh Diseases" Aquatic Animal Health Research Institute, Department of Fisheries, Bangkok: 1999. pp. 1-152.

[4] Gelnar M, "The morphology of *Trianchoratus aecleithrium* Price et Berry, 1966 (Dactylogyridae, Monogenea) from a new host *Trichogaster trichopterus trichopterus* (Pallas, 1777)", Folia Parasitologica, Vol. 35, 1989, pp. 7-11.

[5] Price, C.E. & Berry, W.S. "*Trianchoratus*, a new genus of Monogenea", P Helm Soc Wash, Vol. 33, 1966, pp. 201-203.

[6] Paperna I, "Parasites, infections and diseases of fishes in Africa" An Update, CiFa Technical Paper No. 31. Food and Agriculture Organization, Rome, 1966. pp. 1-120.

[7] Sirikanchana P, "Parasites of Aquatic Animal" 6th ed. Bangkok: Sky Word Advertising Partnership, 2003. pp. 1-270.

[8] Margolis, L., Esch, G.E., Holmes, J.C., Kuris, A.M. & Schad, G.A. "The use of ecological terms inparasitology (repoet of an Ad Hoc committee of the American Society of Parasitologists)", J. Parasitol, Vol. 68, 1, 1982, pp. 131-133.

[9] Appleby C & Mo TA, "Population dynamics of *Gyrodactylus salaris* (Monogenea) infecting Atlantic salmon, *Salmo salar*, parr in the river Batnfjordselva, Norway" Parasitology, Vol. 83, 1, 1997, pp. 23-30.

[10] Van Cleave HJ, "Acanthocephala from China I. New species and new genera from Chinese fishes", Parasitology, Vol. 20, 1982, pp. 1-9.

[11] Van Cleave HJ "Expanding horizons in of a phylum", J parasitol, Vol. 34, 1, 1948, pp. 1-20.

[12] Van Cleave HJ, "The recognition of a new order in the Acanthocephala", J parasitol, Vol. 22, 2, 1936, pp. 202-206.

[13] Van Cleave HJ, "Notes on life cycle of two species of Acanthocephala from freshwater fishes", J parasitol, Vol. 6, 4, 1920, pp. 167-172.

[14] Amin OM, "Biology of Acanthocephala: Classification", Cambridge University Press Cambridge, UK, 1985. pp. 27-55.

[15] Fatima H, "Seasonal variation and histophatology of nematodes and Acanthocephalan of some edible fishes of Karacho coast", PhD Thesis, Department of Zoology, University of Karachi, Pakistan, 1988, pp. 1-516.

[16] Sirikanchana P, "Seasonal variations of parasites in alimentary canal of snake-head fish (*Ophiocephalus striatus* Bloch) from natural Waters", Bangkok: Department of Fisheries, Kasetsart University, 1983. pp. 1-22.

[17] Sirikanchana P, "Some parasites infected fishes from Bung Makkasan, Bangkok", Bangkok: Department of Fisheries, Kasetsart University, 1988. pp. 1-12.

[18] Monrudee C, Chalobol W & Pheravut W. "Diversity of Helminths Found in Channid Fish from Bung Boraphet", Southeast Asian J Trop Med Public Health, Vol. 38, suppl 1, 2007, pp. 191-193.

[19] Wongsawad C, Rojanapaibul A & Wongsawad P, " Helminths of vertebrates in Mae Sa stream, Chiang Mai, Thailand", Southeast Asian J Trop Med Public Health, Vol 35, suppl 2, 2004, pp. 140-146.

[20] Wongsawad C, Chariyahponpun P & Namue C, "Experimental host of *Stellanchasmus falcatus*", Southeast Asian J Trop Med Public Health, Vol 29, 1998, pp. 406-409.