

# **Diversity and Distribution of External Parasites from Potentially Cultured Freshwater Fishes in Nakhonsithammarat, Southern Thailand**

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## **ABSTRACT**

Twenty-one species from 16 genera of potentially cultured freshwater fishes were examined for external parasites. Ten individuals of each fish species (mainly local species) were examined from various places in Nakhonsithammarat, southern Thailand. Five parasitic groups containing a total of 51 species were identified. They were a single ciliated protozoan, myxozoans (2 spp.), monogeneans (44 spp.), digeneans (2 spp.) and crustaceans (2 spp.). Monogenea was regarded as a major parasitic group of the fish. *Dactylogyrus* (Monogenea) had the highest number of species (12 spp.), whereas *Trichodina* sp. (Ciliophora) was the most widely distributed species, being observed on seven fish species from seven families. Most of the parasites (43 taxa or 86 %) found in this study were specific to their host species. All except red pacu (*Piaractus brachypomus*) and swamp eel (*Monopterus albus*) were infected with parasites (91 %).

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## INTRODUCTION

In Thailand, many species of freshwater fish, both native and introduced species have been successfully cultured. In the past two decades some exotic species have been introduced into the Southeast Asian region including Thailand for food fish aquaculture, for example, common carp (*Cyprinus carpio*), Nile tilapia (*Oreochromis niloticus*), African shaft-toothed catfish (*Clarias gariepinus*) and red pacu (*Piaractus brachypomus*). Hence, fish culture are now extending into all parts of Thailand.

Nakhonsithammarat, a representative province of the southern region of Thailand is situated at about 7°55' - 9° 20'N and 99° 15' - 100° 20' E, facing both the Pacific and Indian Oceans. The province is remarkable in having three main watersheds, the Pakpanang, the Tapi and the Trang including many tributaries that support both agricultural and fishery activities. A recent survey of fish diversity showed that there are 121 fish species of inland waters in Nakhonsithammarat (Lerssutthichawal *et al.*, 2005). Although only a few species of fish are cultured, there are more species that has aquaculture potential, both feral and introduced species.

To address the increasing demand for food protein, fish culture has become a major sector of fish production. Some indigenous as well as introduced species have been induced to the culture program. Nevertheless during the culture period, it could experience many serious problems, particularly those caused by parasites. The aim of this project is to document the diversity and host distribution of the external parasites of potentially cultured fishes, which were regarded as a major cause of low production in aquaculture system.

## MATERIALS AND METHODS

### Fish samples

Various species of freshwater fishes were obtained from natural waters (rivers, canals, swamps) and cultured areas (ponds, net cages and ditches) including the local fish markets of Nakhonsithammarat, southern Thailand to examine their external parasites. Fish species examined were chosen based on their potential value as aquaculture (both indigenous and introduced species). Fish were identified using the keys given by Kottelat *et al.* (1993, Lerssutthichawal *et al.* 2005, Rainboth, 1996, Roberts, 1989, Smith, 1945, Vidthayanon, 2001) and Vidthayanon *et al.* (1997). A list of fish species examined and the external parasites identified is given in Table 1.

### Examination for parasites

Fish were measured and killed. Skin and fin mucous were scraped and examined using compound and phase-contrast microscopy. Gills were removed and scraped into a Petri dish filled with clean water to dislodge the parasites and examined under a stereo microscope. The parasites found were transferred onto a glass slide and covered with coverslip. Parasites were fixed and preserved using the appropriate methods for each group as outlined by Tonguthai *et al.* (1999).

## Identification and determination of prevalence and intensity

External parasites were identified using the following relevant works (e.g. Arthur and Lumanlan-Mayo, 1997; Bondad-Reantaso and Arthur, 1989; Chinabut and Lim, 1993; Dykova and Lom, 1988; Ergens, 1981; Gussev, 1976; Hanek and Furtado, 1973; Kabata, 1985; Kaewviyudth and Chinabut, 1999; Lerssutthichawal, 1999; Lerssutthichawal and Lim, 1997; Lom and Dykova, 1992; Lim, 1986, 1987, 1991, 1995, 1998; Lim and Furtado, 1983, 1985, 1986; Paperna, 1996; Sirikanchana, 2003). New parasitic species are indicated as sp. n. Prevalence and mean intensity for selected parasites were determined according to Margolis *et al.* (1982).

## RESULTS AND DISCUSSION

### Species and occurrence of fish parasites

Five parasitic groups with a total of 51 species were collected from 19 fish host species belonging to 16 genera and 14 families). They were a single species of ciliate protozoan and two species of myxozoans, 44 monogenean species, two digenean species and two crustacean species (Table 1). All hosts except *Piaractus brachypomus* (red pacu) and *Monopterus albus* (swamp eel) were infected with external parasites (91 %).

Table 1 also shows that cyprinid and bagrid fishes accommodated the highest number of parasite species, exemplified by *Barbodes gonionotus* and *Hemibagrus nemurus*, each having seven species of parasites. Except for red pacu and swamp eel, which were uninfected, the majority of fish host species (12 of 19) harbored two to three parasite species.

### Diversity and specificity of freshwater fish parasites

Monogenea was the most common parasitic group encountered, with 44 species found on 18 fish species (86 %) from 13 genera and 11 families. *Dactylogyrus* had the highest number of species (12 spp.), followed by *Bychowskeylla*, *Cichlidogyrus*, *Thaparocleidus* and *Trianchoratus* with four species each (Table 2).

Table 2 indicated that there are specific interaction between the parasites, especially monogeneans and their host. *Bifurcohaptor* and *Cornudiscoides* were found only on the Bagridae (*Hemibagrus*), *Bychowskeylla* and *Quadriacanthus* from the Clariidae (*Clarias*) and *Cichlidogyrus* from the Cichlidae (*Oreochromis*). However, some monogenean genera present on different fish families, indicating a low degree of host specificity, exemplified by *Trianchoratus* from Anabantidae (*Anabas*), Channidae (*Channa*) and Belontiidae (*Trichogaster*) or *Thaparocleidus* from Bagridae (*Hemibagrus*) and Notopteridae (*Notopterus*). *Sundanonchus*, however, was found on Channidae (only *Channa micropeltes*) and Pristolepididae (*Pristolepis fasciatus*). The previous works reported some monogenean genera found in this study were found on another fish group. For example *Bychowskeylla* could be found on Bagridae, Schilbeidae, Siluridae and Sisoridae (see Lerssutthichawal, 1999; Lim, 1998).

The absence of clinical signs of disease on feral fish and the high diversity of parasite species encountered, suggest that there are factors controlling any drastic increase in any of the co-existing species within the community thereby keeping populations of the different species within the carrying capacity of their environment. These factors help to maintain species diversity, resulting in the stability of the ecosystem concerned.

**Table 1.** Prevalence and mean intensity of freshwater fish parasites in Nakhornsithammarat.

Fish families	Fish species	Parasite species	Parasite group	Prevalence (%)	Mean intensity
Anabantidae	<i>Anabas testudineus</i>	<i>Trianchoratus gussevi</i>	Mo	40	13
		<i>T. parvulus</i>	Mo	10	1
		<i>Trichodina</i> sp.	Ci	40	NC
Bagridae	<i>Hemibagrus filamentus</i>	<i>Bifucohapter baungi</i>	Mo	20	2
		<i>Cornudiscooides malayensis</i>	Mo	20	3
		<i>C. sundanensis</i>	Mo	20	2
Belontiidae	<i>Trichogaster trichopterus</i>	<i>Trianchoratus trichogasterium</i>	Mo	20	1
		<i>Gyrodactylus</i> sp. A	Mo	10	1
	<i>T. pectoralis</i>	<i>Transversotrema partialense</i>	D	10	2
		<i>Trichodina</i> sp.	Ci	60	NC
Channidae	<i>Channa micropeltes</i>	<i>Sundanonchus micropeltis</i>	Mo	50	150
		<i>Trichodina</i> sp.	Ci	10	7
	<i>C. striata</i>	<i>Lamproglena chinensis</i>	Cr	10	7
		<i>Trianchoratus ophiocephali</i>	Mo	40	13
Characidae	<i>Piaractus brachypomus</i>	-	-	-	
Cichlidae	<i>Oreochromis niloticus</i> (black tilapia)	<i>Trichodina</i> sp.	Ci	10	NC
		<i>Cichlidogyrus longicornis</i>	Mo	50	4
		<i>C. sclerosus</i>	Mo	60	9
		<i>C. tilapiae</i>	Mo	40	3
		<i>C. tubicirus</i>	Mo	20	10
	<i>O. niloticus</i> (red tilapia)	<i>C. sclerosus</i>	Mo	70	4
		<i>C. thurstonae</i>	Mo	80	4
		<i>C. tilapiae</i>	Mo	40	12
		<i>Trichodina</i> sp.	Ci	20	NC
Pristolepidae	<i>Pristolepis fasciatus</i>	<i>Sundanonchus triradicatus</i>	Mo	100	17
Synbranchidae	<i>Monopterus albus</i>	-	-	-	

Ci:Ciliophora; Cr:Crustacea; Di:Digenea; Mo :Monogenea ; My :Myxozoa ; NC :Not calculated

**Table 1.** continued

Clariidae	<i>Clarias batrachus</i>	<i>Bychowskylla tchangi</i>	Mo	60	10
		<i>Quandricanthus kobiensis</i>	Mo	60	14
	<i>Clarias hybrid (C. macrocephalus x C. gariepinus)</i>	<i>Q. bagrae</i>	Mo	30	1
		<i>Gyrodactylus fernandoi</i>	Mo	10	2
	<i>Clarias macrocephalus</i>	<i>Bychowskyella tchangi</i>	Mo	7	5
		<i>G. fernandoie</i>	Mo	7	5
		<i>Quadricanthus</i> sp.n. A	Mo	26	46
		<i>Trichodina</i> sp.	Ci	7	NC
	<i>Clarias nieuhofi</i>	<i>Bychowskyella</i> sp.n. A	Mo	10	1
		<i>Bychowskyella</i> sp.n. B	Mo	10	4
<i>Bychowskyella</i> sp.n. C		Mo	10	4	
Cyprinidae	<i>Barbodes gonionotus</i>	<i>Dactylogyrus kanchananuriensis</i>	Mo	70	4
		<i>D. pseudosphyrna</i>	Mo	60	14
		<i>D. puntii</i>	Mo	60	16
		<i>D. siamensis</i>	Mo	70	11
		<i>D. tonguthai</i>	Mo	70	41
		<i>Gyrodactylus</i> sp. B	Mo	10	NC
		<i>Thelohanellus jiroveci</i>	My	10	NC
	<i>Cyprinus carpio</i>	<i>Dactylogyrus minutes</i>	Mo	80	10
		<i>Dactylogyrus</i> sp.n. A	Mo	10	4
		<i>Gyrodactylus</i> sp. B	Mo	40	5
	<i>Leptobarbus hoeveni</i>	<i>Dactylogyrus leptobarbi</i>	Mo	100	25
		<i>Dactylogyrus</i> sp.n. B	Mo	100	19
		<i>Dactylogyrus</i> sp.n. C	Mo	90	4
		<i>Dactylogyrus</i> sp.n. D	Mo	70	5
		<i>Dactylogyrus</i> sp.n. E	Mo	100	18
Eleotridae	<i>Oxyleotris marmorata</i>	<i>Pseudodactylogyroides marmoratae</i>	Mo	20	1
		<i>Pseudodactylogyroides</i> sp.n. A	Mo	10	2
Helostomatidae	<i>Helostoma temincki</i>	<i>Transversotrema patialense</i>	Di	10	5
		<i>Trihodina</i> sp.	Ci	50	NC
Notopteridae	<i>Notopterus notopterus</i>	<i>Lamproglena inermis</i>	Cr	10	1
		<i>Malayanodiscoides bihamuli</i>	Mo	80	1
		<i>Thaparocleidus platamauxilli</i>	Mo	20	1
Osphronemida	<i>Osphronemus goramy</i>	<i>Henneguya shaharini</i>	My	40	NC
		<i>Percianyrocephalus</i> sp. A	Mo	20	3

Table 2. Distribution of parasites in freshwater fish species.

Parasite species	Fish hosts		Parasite species	Fish hosts	
	Fish species	Fish families		Fish species	Fish families
<b>Protozoa</b>			Monogenea		
<i>Henneguya shaharini</i> <i>Thelohanellus jiroveci</i>	<i>Osphronemus goramy</i>	Osphronomidae			
	<i>Barbodes gonionotus</i>	Cyprinidae	<i>Dactylogyrus n. sp. B</i>	<i>Leptobarbus hoeveni</i>	Cyprinidae
	<i>Anabas testudineus</i>	Anabantidae	<i>Dactylogyrus n. sp. C</i>	<i>L. hoeveni</i>	Cyprinidae
	<i>Channa striata</i>	Channidae	<i>Dactylogyrus n. sp. D</i>	<i>L. hoeveni</i>	Cyprinidae
	<i>Clarias macrocephalus</i>	Clariidae	<i>Dactylogyrus n. sp. E</i>	<i>L. hoeveni</i>	Cyprinidae
<i>Helostoma temincki</i>	Helostomatidae	<i>Gyrodactylus fernandoi</i>	<i>Clarias hybrid (C. macrocephalus x C. gariepinus)</i>	Clariidae	
<i>Oreochromis niloticus (common type)</i>	Cichlidae		<i>C. macrocephalus</i>	Clariidae	
<i>Osphronemus goramy</i>	Osphronemidae	<i>Gyrodactylus n. sp. A</i>	<i>Trichogaster pectoralis</i>	Belontiidae	
<i>Trichogaster pectoralis</i>	Belontiidae	<i>Gyrodactylus n. sp. B</i>	<i>Barbodes gonionotus</i>	Cyprinidae	
<i>Monogenea</i>			<i>Cyprinus carpio</i>	Cyprinidae	
<i>Bifurcator baungi</i>	Bagridae	<i>Malayanodiscoides bihamuli</i>	<i>Notopterus notopterus</i>	Notopteridae	
<i>Bychowskyella tchangi</i>	Clariidae	<i>Perciancyrocephalus n. sp. A</i>	<i>Osphronemus goramy</i>	Osphronomidae	
	Clariidae	<i>Pseudodactylogyroides marmoratae</i>	<i>Oxyeleotris marmorata</i>	Eleotridae	
<i>Bychowskyella sp.n. A</i>	Clariidae	<i>Pseudodactylogyroides n.sp. A</i>	<i>O. marmorata</i>	Eleotridae	
<i>Bychowskyella sp.n. B</i>	Clariidae	<i>Quadricanthus bagrae</i>	<i>Clarias hybrid (C. macrocephalus x C. gariepinus)</i>	Clariidae	
<i>Bychowskyella sp.n. C</i>	Clariidae	<i>Q. kobiensis</i>	<i>C. batrachus</i>	Clariidae	
<i>Cichlidogyrus longicornis</i>	Cichlidae	<i>Quadricanthus n.sp. A</i>	<i>C. macrocephalus</i>	Clariidae	
<i>C. sclerosus</i>	Cichlidae	<i>Sundamonchus triradicatus</i>	<i>Pristolepis fasciatus</i>	Pristolepidae	

Table 2. continued

	<i>O. niloticus</i> (tub-tim)	Cichlidae	<i>S. micropeltis</i>	<i>Channa micropeltis</i>	Channidae
<i>C. thurstonae</i>	<i>O. niloticus</i> (common type)	Cichlidae	<i>Thaparocleidus platamauxilli</i>	<i>Notopterus notopterus</i>	Notopteridae
	<i>O. niloticus</i> (tub-tim)	Cichlidae	<i>Thaparocleidus</i> n.sp. A	<i>Hemibagrus filamentus</i>	Bagridae
<i>C. tilapiae</i>	<i>O. niloticus</i> (common type)	Cichlidae	<i>Thaparocleidus</i> n.sp. B	<i>H. filamentus</i>	Bagridae
	<i>O. niloticus</i> (tub-tim)	Cichlidae	<i>Thaparocleidus</i> n.sp. C	<i>H. filamentus</i>	Bagridae
<i>C. tubicirrus</i>	<i>O. niloticus</i> (common type)	Cichlidae	<i>Trianchoratus ophiocephali</i>	<i>Channa striata</i>	Channidae
<i>Cornudiscoides malayensis</i>	<i>Hemibagrus filamentus</i>	Bagridae	<i>Trianchoratus trichogasterium</i>	<i>Trichogaster trichopterus</i>	Belontiidae
<i>C. sundanensis</i>	<i>H. filamentus</i>	Bagridae	<i>Trianchoratus gussevi</i>	<i>Anabas testudineus</i>	Anabantidae
<i>Dactylogyrus kanchanaburiensis</i>	<i>Barbodes gonionotus</i>	Cyprinidae	<i>T. parvulus</i>	<i>A. testudineus</i>	Anabantidae
<i>D. leptobarbi</i>	<i>Leptobarbus hoeveni</i>	Cyprinidae	<i>Digenea</i>		
<i>D. minutus</i>	<i>Cyprinus carpio</i>	Cyprinidae	<i>Transversotrema patialense</i>	<i>Trichogaster pectoralis</i>	Belontiidae
<i>D. pseudosphyrna</i>	<i>B. gonionotus</i>	Cyprinidae		<i>Helostoma temincki</i>	Helostomatidae
<i>Monogenea</i>			<i>Digenea</i> gen sp. <i>metacercaria</i>	<i>Hemibagrus filamentus</i>	Bagridae
<i>D. puntii</i>	<i>D. puntii</i>	D. puntii	<i>Crustacea</i>		
<i>D. siamensis</i>	<i>D. siamensis</i>	D. siamensis	<i>Lamprologena chinensis</i>	<i>Channa striata</i>	Channidae
<i>D. tonguthai</i>	<i>B. gonionotus</i>	Cyprinidae	<i>Lamprolegna inermis</i>	<i>Notopterus notopterus</i>	Notopteridae
<i>Dactylogyrus</i> n. sp. A	<i>Cyprinus carpio</i>	Cyprinidae			

## CONCLUSIONS

Despite of the presence of number of parasites (both cases of single species and co-existing species), the fish hosts show no clinical signs of disease. This strongly suggests that the presence of parasites on their fish hosts is a common phenomenon, and it is not necessary to remedy. Pond and water quality as well as feeding could be more concerned to keep the fish healthy.

The important issue here is to determine which of the co-existing species would become potential pathogen(s) under intensive culture. It is difficult presently to ascertain whether a specific species or a species with wide host range could become a potential pathogen.

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