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Parasitic Diversity of Siluriform Fishes in Mekong River, Chiang Rai Province

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ABSTRACT

A total of 672 Siluriform fishes were collected from Mekong River, Chiang Rai province for parasitic investigation. Twelve species from five fish families were identified; Bagridae (*Hemibagrus nemurus*, *Mystus wyckii*), Pangasiidae (*Pangasianodon gigas*, *Pangasius bocourti, Pangasius conchophilus*, *Pangasius micronemus, Pangasius sanitwongsei*), Schilbeidae (*Clupisoma sinensis*), Siluridae (*Belodontichtys dinema*, *Kryptopterus cryptopterus, Wallago attu*) and Sisoridae (*Bagarius bagarius*). The parasite assembly consisted of 14 species of monogeneans (*Cornudiscoides* (1 species), *Thaparocleidus* (13 species), 18 species of digeneans, *Clinostomum* (1 species), *Dollfustrema* (1 species), *Haplorchis* (1 species), *Haplorchoides* (1 species), *Metadena* (2 species), *Opisthorchis* (2 species), *Paracryptogonimus* (1 species), *Phyllodistomum* (1 species), *Prosorhynchoides* (6 species), *Rhipidocotyle* (1 species), Unidentified digene (1 species)), 3 species of cestodes (*Gephyrolina* (2 species), *Lytocestus* sp. (1 species)), 4 species of acanthocephalans (*Arhythmorhynchus* (1 species), *Pallisentis* (1 species), *Polyacanthorhynchus* (1 species), *Polymorphus* (1 species), 7 species of nematodes (*Cucullanus* (1 species), *Monhysterides* (1 species), *Procamallanus* (3 species), *Proleptus* (1 species), *Spinitectus* (1 species)) and 4 species of arthropods (*Alitropus* (1 species), *Ergasilus* (2 species), *Lamproglena* (1 species)). The highest diversity of parasites was found in *Bagarius bagarius*, *Hemibagrus nemurus* and *Clupisoma sinensis* with 16, 10 and 9 species of parasites, respectively.

Key words: parasite, Siluriformes fish, Mekong river, Chiang Rai province

INTRODUCTION

The Mekong River, the largest river in the South-East Asia, is blessed with rich water, forest and aquatic resources. The Mekong River starts in the southeastern Himalayan mountains and flows 4,200 kms. to its mouth at the South China Sea, making it the world's twelfth longest river (Kazama *et al*., 2007). There were about 1,200 fish species have been recorded from the Mekong river including catfishes (Rainboth, 1996). However, many species of parasites were reported in wild fishes (Hymen, 1951; Yamaguti, 1958; Bykhovskaya-Pavlovskaya *et al.,* 1964; Kabata, 1985; Lerssutthichawal, 1999). Parasitic organisms also play an important role directly or indirectly in causing mortality in fish (Lerssutthichawal, 1999). The monogeneans can cause severe gill damage, results in loss of gill surface area for respiration. Some of the arthropods that affect wild fish that are commercial significance as they affect host survival or cause

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unsightly changes in the flesh (Lester and Hayward, 2006). The parasites also feed on host tissue and blood leading to secondary infection.

The rich diversity of the Mekong River is striking, not only for fishes but also for other groups of aquatic organisms such as mollusks (Rainboth, 1996). Digeneans undergo part or all of their larval development in mollusks (Paperna and Dzikowski, 2006). Metacercarial infection in fish is the main source of disease causing subsequent economic loss. Some metacercaria in fisheries and aquaculture products are source of infections in humans and domestic animals (Ito, 1964; Deardorff and Overstreet, 1991; Paperna and Dzikowski, 2006).

In our study, parasitic diversity were compared among five groups of catfishes; bagrids, pangasiids, schilbeids, silurids and sisorid which were collected from the Mekong River. The result from this study can be used for public health information involved the infestation of metacercaria encysting in muscle, internal organs and peritoneum of freshwater fishes. Furthermore, parasites have been used widely as biological tags to provide information for fishery managers on the movements and population structure of their hosts such as monogeneans, digeneans, acanthocephalans and nematodes (Brickle and MacKenzie, 2007; Timi, 2007). Monogene is regarded as the greatest host specificity (Whittington *et al.*, 2000; Buchmann and Bresciani, 2006).

MATERIALS AND METHODS

Catfish samples were collected from the Mekong River at Chiang Rai Province between 2003-2005. Fishes were identified according to Nelson (2006) and Rainboth (1996). Examination for ectoparasites (eyes, mouth, nostril and fins) were made using the magnifier. The mucus was also examined under the microscope. Parts of fins, gills and skin of the fishes were removed and examined under stereomicroscope. The visceral organs including liver, intestine and stomach and also in the muscle of the fishes were examined under compound microscope. Collection of the parasites were done separately for further identification. Digeneans, cestodes, acanthocephalans, nematodes and crustaceans were kept in the 70% alcohol while monogeneans were fixed and preserved in ammonium-picrate glycerine.

Identification of the parasitic species was performed according to Hymen (1940); Yamaguti (1958); Bykhovskaya-Pavlovskaya *et al.* (1964); Kabata (1985); Lim and Lerssutthichawal (1996); Lerssutthichawal (1999); Purivirojkul and Sirikanchana (2006). Prevalence and mean intensity of each parasitic species were calculated according to Margolis *et al.* (1982).

RESULTS AND DISCUSSION

Twelve species from five families of fishes namely *Hemibagrus nemurus, Mystus wyckii* (Bagridae), *Pangasianodon gigas, Pangasius bocourti, Pangasius conchophilus, Pangasius micronemus, Pangasius sanitwongsei* (Pangasiidae), *Clupisoma sinensis* (Schilbeidae), *Belodontichtys dinema, Kryptopterus cryptopterus*, *Wallago attu* (Siluridae) and *Bagarius bagarius* (Sisoridae) were examined for parasites. Number of fish samples per species were not consistent because many species of fishes such as *Pangasianodon gigas*, *Pangasius sanitwongsei* and *Mystus wyckii* could be collected only in particular season.

Eighteen species of the external parasites were found. There were 14 monogenean species, viz., *Cornudiscoides malayensis*, *Thaparocleidus kao*, *Thaparocleidus siamensis* and *Thaparocleidus* spp. and four species of arthropods, *Alitropus typus, Ergasilus* spp. and *Lamproglena* sp. Monogeneans, copepods *Lamproglena* and *Ergasilus* sp. occurred on the gills while isopod, *Alitropus typus* occurred on the

gill cavity and skin. Although they were ectoparasites but they are specific to their host.

Thirty two species of the internal parasites consisted of 18 digenean species, viz., *Clinostomum* sp., *Dollfustrema* sp., *Haplorchis* sp., *Haplorchoides* sp., *Metadena bagarii*, *Metadena* sp., *Opisthorchis* spp., *Paracryptogonimus* sp., *Phyllodistomum* sp., *Prosorhynchoides* spp., *P. chiangkhongensis*, *P. phillipinorum*, *P. siamensis, Rhipidocotyle* sp. and Unidentified digene, three species of cestodes, namely, *Gephyrolin*a spp. and *Lytocestus* sp., four species of acanthocephalans, namely, *Arhythmorhynchus* sp., *Pallisentis* sp., *Polyacanthorhynchus* sp. and *Polymorphus* sp. and seven species of nematodes, namely, *Cucullanus* sp., *Monhysterides* sp., *Procamallanus* sp., *Proleptus* sp. and *Spinitectus* sp. (Table 1).

The results showed that the highest diversity of parasites occurred in *Bagarius bagarius* (16 species), *Hemibagrus nemurus* (10 species) and *Clupisoma sinensis* (9 species) (Figure 1). *Paracryptogonimus* sp. was recorded only in marine fishes. Founding this parasite in freshwater might be parasite adaptation as found in *Alitropus typus*.

In most cases of the host specificity, the results also showed that parasites could be found in particular host species (in generic and specific levels). The monogeneans, particularly were limited to one host species similar to reported by Lim and Lerssutthichawal (1996), Lerssutthichawal (1999), Lerssutthichawal and Supamattaya (2005), for example, *Thaparocleidus kao* was found only on *Wallago attu* in this study and previous work (Lim and Lerssutthichawal, 1996), *Cornudiscoides malayensis* occurred only on *Hemibagrus nemurus* (Lerssutthichawal and Supamattaya, 2005). Many species of *Thaparocleidus* spp. found in this study were similar to the study of Lerssutthichawal (1999) found in same species of fish. However, Lerssutthichawal (1999) did not name these new species parasites.

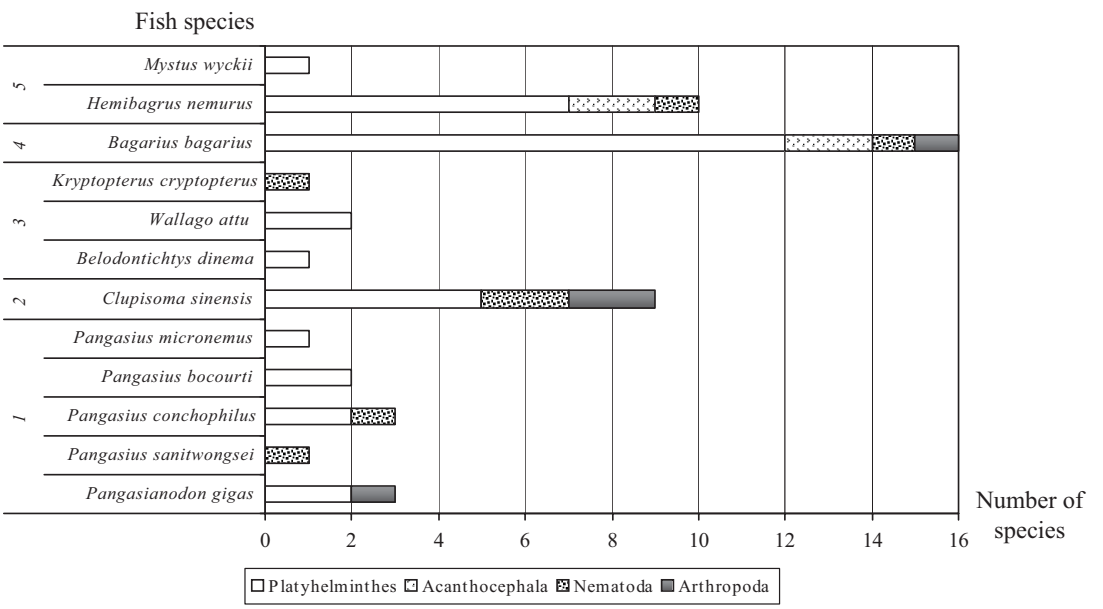

Figure 1 Number of parasitic groups observed from each fish host.
(1 = Bagridae, 2 = Pangasiidae, 3 = Schilbeidae, 4 = Siluridae, 5 = Sisoridae)

Table 1 Prevalence and mean intensity of parasites from each Siluriform fishes species in Mekong river, Chiang Rai province; Ac: acanthocephalan, Ar: arthropod, C: cestode, D: digenean, M: monogenean, N: nematode.

Fish families	Fish species (no. of fish specimens)	Parasites (%)	Prevalence intensity	Mean
Bagridae	*Hemibagrus nemurus* (200)	*Cornudiscoides malayensis* (M)	66.00	41.27
		Haplorchis sp. (D)	73.50	32.12
		Haplorchoides sp. (D)	91.00	40.63
		Lytocestus sp. (C)	1.00	1.00
		Pallisentis sp. (Ac)	1.00	2.50
		Polymorphus sp. (Ac)	14.50	6.96
		Spinitectus sp. (N)	59.00	1.84
		Thaparocleidus sp.1 (M)	47.00	39.42
		Thaparocleidus sp.2 (M)	34.00	6.61
		Thaparocleidus sp.3 (M)	81.50	52.24
	Mystus wyckii (12)	*Paracryptogonimus* sp. (D)	41.67	1000
Pangasiidae	*Pangasius bocourti* (12)	*Thaparocleidus* sp.4 (M)	83.33	32.40
		Thaparocleidus sp.5 (M)	83.33	56.40
	Pangasius conchophilus (21)	*Monhysterides* sp. (N)	100.00	100.00
		Thaparocleidus sp.6 (M)	100.00	91.00
		Thaparocleidus sp.7 (M)	100.00	38.00
	Pangasianodon gigas (6)	*Alitropus typus* (Ar)	100.00	20.00
		Prosorhynchoides chiangkhongensis (D)	33.33	8.00
		Prosorhynchoides siamensis (D)	100.00	70.00
	Pangasius micronemus (20)	*Thaparocleidus siamensis* (M)	100.00	13.09
	Pangasius sanitwongsei (1)	*Cucullanus* sp. (N)	100.00	12.00
Schilbeidae	*Clupisoma sinensis* (200)	*Ergasilus* sp. (Ar)	29.00	1.19
		Gephyrolina sp. (C)	6.00	1.42
		Lamproglena sp. (Ar)	25.50	1.24
		Metadena sp. (D)	21.50	1.11
		Procamallanus sp. (N)	36.50	1.10
		Proleptus sp. (N)	22.50	1.50
		Prosorhynchoides sp.1 (D)	47.50	3.86
		Prosorhynchoides sp.2 (D)	45.00	2.89
		Thaparocleidus sp.8 (M)	45.50	4.63
Siluridae	*Belodontichtys dinema* (22)	*Thaparocleidus* sp.9 (M)	72.73	7.88
	Kryptopterus cryptopterus (24)	*Procamallanus* sp. (N)	33.33	2.00
	Wallago attu (24)	*Thaparocleidus kao* (M)	91.67	21.18
		Unidentified digene (D)	8.33	1.00
Sisoridae	*Bagarius bagarius* (130)	*Arhythmorhynchus* sp. (Ac)	2.31	2.00
		Clinostomum sp. (D)	3.85	1.40
		Dollfustrema sp. (D)	16.15	6.50
		Ergasilus sp. (Ar)	3.08	1.00
		*Gephyrolin*a sp. (C)	30.00	4.05
		Metadena bagarii (D)	4.62	6.83
		Opisthorchis sp.1 (D)	0.77	2.00
		Opisthorchis sp.2 (D)	15.38	2.33
		Phyllodistomum sp. (D)	6.92	8.89
		Polyacanthorhynchus sp. (Ac)	16.92	2.40
		Procamallanus sp. (N)	20.00	2.12
		Prosorhynchoides phillipinorum (D)	26.92	30.86
		Prosorhynchoides sp. (D)	13.08	26.35
		Rhipidocotyle sp. (D)	10.00	1.75
		Thaparocleidus sp.10 (M)	79.23	51.00
		Thaparocleidus sp.11 (M)	3.85	2.60

The results obtained from this study suggested that the parasites of each fish species might be possibly specific to their host. However, under some environmental conditions mollusk or other animals were their intermediate hosts.

The selection of certain host species by monogenean must be involved mainly with factors in the host surface. Thus, chemical stimuli emitted from the host, mechanical and behavioral mechanisms have been suggested to explain this host specificity (Whittington *et al*., 2000; Buchmann and Lindenstrøm, 2002).

CONCLUSION

All monogenean species found in this study specific to their hosts as reported in many scientific papers. Other groups, such as digenean and cestode were also trend to have the host specificity. However, this might be under environmental factors (mollusk or other animals) because in their life cycle need at least one intermediate host. In this study, none of parasites is capable to infect human.

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LITERATURE CITED

Brickle, P. and K. MacKenzie. 2007. Parasites as biological tags for *Eleginops maclovinus* (Teleostei: Eleginopidae) around the Falkland Islands. **J. Helminthol.** 81: 147-153.

Buchmann, K. and J. Bresciani. 2006. Monogenea (Phylum Platyhelminthes), pp. 297-344. *In* P.T.K. Woo (ed.). **Fish Diseases and Disorders Vol. 1: Protozoan and Metazoan Infections.** 2nd ed. CAB international, London.

Buchmann, K. and T. Lindenstrom. 2002. Interaction between monogenean parasites and their fish host. **Int. J. Parasitol.** 32:309-319.

Bykhovskaya – Pavlovskaya, I. E., A.V. Guser, M.N. Dubinina, N.A. Izyumora, I.S. Smirnova, I.L. Sokolorskaya, G.A. Shtein, S.S. Shul' man and V.M. Epsthtein. 1964. **Key to Parasites of Fresh Water Fish of USSR.** Translated from Russian. Israel Program for Scientific Translations, Jerusalem. 919 p.

Deardorff, T.L. and R.M. Overstreet. 1991. Seafood transmitted zoonoses in the United States: the fishes, and the worms, pp. 211-265. *In* D.R. War and C. Hackney (eds.). **Microbiology of Marine Food Products.** AVI, Van Nostrand Reinhold, New York.

Hymen, L.H. 1951. **The Invertebrates: Platyhelminthes and Rhynchocoela the Acoelomate Bilateria.** Vol II. McGraw-Hill Book Company, Inc., New York. 550 p.

Ito, J. 1964. Metagonimus and other human heterophyid trematodes, pp. 317-393. *In* K. Morishita, Y. Komiya and H. Matsubayashi (eds.). **Progress of Medical Parasitology in Japan**, Meguro Parasitological Museum, Tokyo.

Kabata, Z. 1985. **Parasites and Disease of Fish Cultured in the Tropics.** Taylor & Francis (Printens) Ltd., London. 318 p.

Kazama, S., T. Hagiwara, P. Ranjan and M. Sawamoto. 2007. Evaluation of groundwater resources in wide inundation areas of the Mekong River basin. **J. Hydrol.** 340: 233-243.

Lambert, A. and S.E. Gharbi. 1995. Monogenean host specificity as biological and taxonomic indicator for fish. **Biol. Conserv.** 72: 227-235.

Lerssutthichawal, T. 1999. **Monogeneans of the Freshwater Siluriform Fishes of Thailand.** Ph.D. thesis. University of Malaya.

_____and K. Supamattaya. 2005. Diversity and distribution of parasites from potentially cultured freshwater fish in Nakhon Si Thammarat. **Songklanakarin J. Sci. Technol.** 27(Suppl. 1): 333-345.

Lester, R.J.G. and C.J. Hayward. 2006. Phylum Arthropoda, pp 466-565. *In* P.T.K. Woo (ed.). **Fish Diseases and Disorders Vol 1: Protozoan and Metazoan Infections.** 2nd ed. CAB international, London.

Lim, L.H.S. and T. Lerssutthichawal. 1996. Monogeneans from *Wallago attu* (Bloch&Schneider, 1802) of Thailand. **Raff. Bull. Zool.** 44(1): 287-300.

Margolis L., G. Esch, J.C. Holmes, A.M. Kuris and G.A. Schad. 1982. The use of ecological terms in parasitology. **J. Parasitol.** 68(1): 131-133.

Nelson, J.S. 2006. **Fishes of the World.** 4th ed. John Wiley & Sons, Inc, New Jersey. 601 p.

Paperna, I. and R. Dzikowski. 2006. Digenea (Phylum Platyhelminthes), pp. 345-390. *In* P.T.K. Woo (ed.). **Fish Diseases and Disorders Vol 1: Protozoan and Metazoan Infections.** 2nd ed. CAB international, London.

Purivirojkul, W. and P. Sirikanchana. 2006. Two species of *Prosorhynchoides* Dollfus, 1929 (Bucephalidae: Bucephalinae) from Mekong giant catfish (*Pangasianodon gigas* Chevey) from Mekong River, Chiangrai Province. **Songklanakarin J. Sci. Technol.** 28(4): 745-751.

Rainboth, W.J. 1996. **Fishes of the Cambodian Mekong. FAO Species Identification Field Guide for Fishery Proposes.** FAO, Rome. 265 p.

Timi, J.T. 2007. Parasites as biological tags for stock discrimination in marine fish from South American Atlantic waters. **J. Helminthol.** 81: 107-111.

Whittington, I.D., B.W. Cribb, T.E. Hamwood and J.A. Halliday. 2000. Host-specificity of monogenean (platyhelminth) parasites: a role for anterior adhesive areas?. **Int. J.Parasitol.** 30: 305-320.

Yamaguti, S. 1958. **Systema Helminthum Vol I.** The Digenetic Trematodes of Vertebrates. Part I,II. Interscience Publishers, Inc., New York. 1575 p.