Gut Content Analysis of Pangasiid Catfish, *Helicophagus waandersii* Bleeker, 1858 from the Mekong River: a Preliminary Report

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ABSTRACT

The study on gut content of *Helicophagus waandersii* from the Mekong River was carried out in Muang Nong Khai, Nong Khai province during March to May 2006. The sampling site is located at N=17°59'47.5" and E=102°56'01.4". There were many food items found in the gut of *H. waandersii*. The frequency of occurrence and relative abundance of bivalves were 100 and 37.0%, respectively. Forty percent of the sampled fish were infected with nematode. The highest number of nematode in the gut of *H. waandersii* was 889 individuals/fish. *H. waandersii* is a bottom feeder and an omnivorous fish.

Key words: Pangasiid catfish, *Helicophagus waandersii*, gut content, Mekong River

INTRODUCTION

The tropical Asian catfish family Pangasiidae is characterized by a laterally compressed body, a short dorsal fin with one or two spines, a well developed adipose fin, a long anal fin, strong pectoral spines, and two pairs of barbells, i.e. maxillary and mandibulary (Teugels, 1996). Pangasiidae exhibits great morphological and ecological diversity (Pouyaud *et al*., 2000). Most Pangasiidae are freshwater fishes, except *Pangasius pangasius* (Hamilton, 1822) and *P. krempfi* (Fang and Chaux, 1949) which have also been reported to grow in brackish water (Roberts and Vidthayanon, 1991).

Helicophagus is a genus of catfishes (order Siluriformes) belonging to the family Pangasiidae which consists of three species, *H. leptorhynchus*, *H. typus* and *H. waandersii* (Ferraris, 2007). These species migrate upstream and downstream with changes in the water level and feed primarily on bivalves (Ng and Kottelat, 2000). In general, however, the snail-eating catfish is often referred to as *Pangasius conchophilus* (Hogan *et al*., 2004).

This preliminary study of gut content of *H. waandersii* is part of a study on aquaculture development of this species. This report presents only some basic information of feeding behavior which will be used as reference for further research.

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MATERIALS AND METHODS

The study on gut content of *Helicophagus waandersii* from the Mekong River was carried out in Muang Nong Khai district, Nong Khai province, during March to May 2006. The sampling sites were located at N=17°59'47.5" E=102°56'01.4". Fish samples were obtained from small-scale capture fisheries in the area. The sampled fishes were fixed immediately with 10% formalin solution, which was also injected directly into the fish coelom and gut to avoid post-capture digestion. Quantitative analysis of gut content was done based on two parameters: frequency of occurrence (O_{fi}) and relative abundance of prey in terms of weight (A_{wi}). This was calculated using following formulas (Jobling *et al*., 2001; Bowen, 1996), respectively:

$$O_{fi} = 100^{*}N_i/N_f$$

Where N_i = number of fish with prey *i* in stomach and N_f = number of fish which contained food in the stomach;

$$A_{wi} = 100^{*}(\Sigma S_i/\Sigma S_t)$$

Where S_i (g) = weight of prey *i* in stomach and S_t (g) = total weight of stomach content.

RESULTS AND DISCUSSION

There were many food items found in the gut of *H. waandersii* (Table 1). The frequency of occurrence of bivalves was 100%. In terms of prey biomass, bivalves (*Corbicula tenuis*) were also the most abundant food item (Figures 1 and 2) with a relative abundance of 37.0%. *H. leptorhynchus*, *H. typus* and *H. waandersii* feed primarily on bivalves (Ng and Kottelat, 2000). Interestingly,

Table 1. Quantitative analyses of gut content of *Helicophagus waandersii* sampled from Mekong River at Muang Nong Khai (17°59'47.5"N 102°56'01.4"E) during March to May 2006

Food items	Frequency of occurrence (*Ofi*)			Relative abundance in terms of weight (*Awi*)		
	Nf (no.)	*Ni* (no.)	*Ofi* (%)	*St* (g)	*Si* (g)	*Awi* (%)
Bivalve	30	30	100.0	119.37	44.16	37.0
Freshwater sponge	30	19	63.3	119.37	26.90	22.5
Freshwater prawn	30	12	40	119.37	18.13	15.2
Plant debris	30	8	26.7	119.37	11.34	9.5
Phytoplankton	30	5	16.7	119.37	6.56	5.5
Earthworms	30	4	13.3	119.37	6.63	5.6
Insect larva	30	3	10.0	119.37	4.81	4.0
Water worm	30	1	3.3	119.37	0.84	0.7

Figure 1. Gut of *H. waandersi*

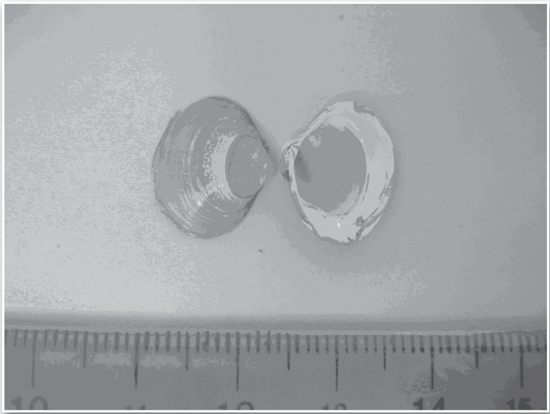

Figure 2. *Corbicula tenuis* found in gut of *H. waandersi*

gastropods were not found in the stomach of *H. waandersii*, although the Mekong River contains more than 110 species of endemic gastropods (Dudgeon, 2000). This may be due either to selective feeding behavior of the fish itself or the distribution of the gastropods which also merits further study. For example, some pomatiopsid snails (e.g. *Neotricula*) in the Mekong River mate during the high water level period but oviposition does not occur until water level has dropped. Other Mekong genera (e.g. Paraprososthenia) mate before the floods, but egg development is delayed so that recruitment takes place when low-flow conditions prevail (Attwood, 1995). However, most of the food items in the gut of *H. waandersii* in the present study were benthic fauna. This indicates that *H. waandersii* could be considered as a bottom feeder fish.

Invertebrate biodiversity in Asian rivers has not been studied thoroughly (Dudgeon, 2000). The general composition of benthos in large Asian rivers appear similar to that of similar habitats the world over, and includes Tubificidae, Chironomidae, Gastropoda, Bivalvia (Hynes, 1970), Protozoa, Crustacea, and other groups (Palmer *et al*., 1997). Small invertebrates are functionally important in many terrestrial and aquatic ecosystems (Freckman *et al*., 1997; Postel and Carpenter, 1997). For example, benthic species perform a variety of functions in the freshwater food web (Covich *et al*., 1999).

In freshwater sediments, benthic invertebrates are diverse and abundant, but they are often patchily distributed making them relatively difficult to sample, especially when they live in deep subsurface sediments. Thus, the species richness and functional importance of freshwater benthic invertebrates generally go unnoticed until unexpected changes occur in ecosystems (Covich *et al*., 1999).

Unanticipated changes in freshwater ecosystems are often due to alterations among sediment-dwelling species and associated food web (Stickney *et al*., 1998). However, essential information on the unique contributions made by individual benthic species is lacking (Covich *et al*., 1999). There is insufficient information about how individual zoobenthic species interact with one another under a dynamic range of natural conditions in freshwater sediments (Covich *et al*., 1999). Such is the case with spatial and temporal distributions which suggest that benthic species have different preferences for particular ranges of temperature, pH, current velocity and types of substrata (Covich *et al*., 1999).

The various food items found in the gut of *H. waandersii* in this present study indicate that this species is omnivorous. Further study about the relationship between food items in the gut of sampled fish and those in their environment is important, because some bottom feeder fish species may be used as indicators for the diversification and distribution of benthos.

The present study also found significant number of nematodes in the gut of *H. waandersii* (Figure 3). The highest number of nematodes in the gut of sampled fishes is 889 individuals per fish (Table 2). In relation to the present study, several literatures report on the infestation of harmful nematodes in freshwater fishes, especially *Gnathostoma* sp. (Daengsvang, 1981; Setasuban *et al*., 1991; Nuamtanong *et al*., 1998; Rojekittikhun *et al*., 2004). However, there are also reports on the use of nematodes as fish food. Although it was also mentioned that almost no identifiable nematodes were found in the fish guts when the digestion period was 3 h or more (Hofsten *et al*., 1983). Some experiments on the use of nematodes as fish feed had the following results: the combination of *Panagrellus* and dry diet created little improvement in the growth and survival of catfish larvae (Santiago *et al*., 2003); bighead carp larvae should be fed 100 free-living nematodes per ml at each feeding time (Santiago *et al*., 2004); and, common carp larvae fed nematodes doubled their body mass and had a mean survival rate higher than 80% (Schlechtriem *et al*., 2004). A more recent conclusion revealed that *Panagrellus redivirus* is a potential source of live food for first feeding fish (Schlechtriem *et al*., 2005). The nematode *P. redivirus* (Linné) has been suggested as a source of live food in the rearing of larval fish and shrimp species (Sautter *et al*., 2007).

Moreover, only a small percentage of freshwater nematodes have been described (Covich *et al*., 1999). From the present study, the classification of nematodes found in the guts of bottom feeder fish should be done and their roles analyzed.

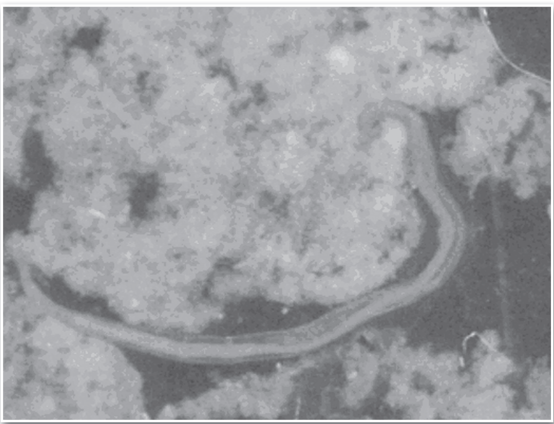

Figure 3. Nematode found in gut of *H. waandersii*

Table 2. Nematodes found in *Helicophagus waandersii* sampled from Mekong River at Muang Nong Khai (17°59'47.5" N 102°56'01.4"E) during March to May 2006

Fish no.	**Total length of fish sampled (cm)**	**Total weight of fish sampled (g)**	**No. of bivalves**	**No. of *Gnathostoma* larvae**
1	32	150	4	0
2	32	220	88	0
3	36	268	94	0
4	37	282	+	60
5	35	236	63	50
6	34	235	+	0
7	35	235	+	0
8	37	287	+	1
9	26	103	150	0
10	33.8	175	19	1
11	37	355	46	0
12	32.7	286	+	0
13	32	264	+	4
14	35	241	22	39
15	33	250	+	108
16	33	239	24	21
17	32	181	23	0
18	34	255	15	599
19	34	250	24	12
20	36	268	37	0
21	32.5	234	9	0
22	37	408	8	25
23	32.5	234	61	0
24	23	253	2	77
25	25	120	+	0
26	32	197	12	0
27	31	201	+	0
28	23	88	17	1
29	32	221	10	889
30	29	122	6	0

+ partly digested bivalves

CONCLUSIONS

The various food items found in the gut of *H. waandersii* in the present study indicate that this species is omnivorous. Further study on the relationship between food items in gut of sampled fish and those found in their environment is important, because some bottom feeder fish may be used as indicators for the diversification and distribution of benthos. From the present study, nematodes found in the gut of *H. waandersii* should be identified and the role of those nematodes should be clarified. The nematodes found in *H. waandersii*, a river catfish may be harmful to humans thus it is important to cook this and other freshwater fish from the river well and properly. Omnivorous fish, especially *H. waandersii* used in this study, is often considered as a potential species for aquaculture.

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