

INVESTIGATION OF *STELLANTCHASMUS FALCATUS* METACERCARIAE IN HALF-BEAKED FISH, *DERMOGENUS PUSILLUS* FROM FOUR DISTRICTS OF CHIANG MAI PROVINCE, THAILAND

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Abstract. Half-beaked fish, *Dermogenus pusillus*, collected from Mueang, Hang Dong, Doi Saket and Saraphi Districts, Chiang Mai Province, were examined for their infection status with *Stellantchasmus falcatus* (Digenea: Heterophyidae) metacercariae. The infection rate of the fish was 100%. Fish in three of four districts were found only to have metacercariae of *S. falcatus*, whereas those in Saraphi District had mixed infections with metacercariae of *Posthodiplostomum* sp. The intensity of *S. falcatus* infection per fish varied; 652-1,342 (mean 999.5), 562-2,422 (1,323.1), 185-2,492 (502.6), and 22-550 (210.4) in Mueang, Hang Dong, Saraphi, and Doi Saket Districts, respectively. The body portions of the fish with the heaviest metacercarial infection were the muscles, in all districts. The present study confirms that half-beaked fish in Chiang Mai Province are heavily infected with *S. falcatus* metacercariae.

INTRODUCTION

In Thailand, the opisthorchiid fluke (*Opisthorchis viverrini*) and heterophyid flukes are common trematodes infecting humans. Human infections with heterophyid flukes in Thailand are confined to the subfamily Haplorchiinae and Centrocestinae; five species of *Haplorchis pumilio*, *H. taichui*, *H. yokogawai*, *Stellantchasmus falcatus*, and *Centrocestus caninus* have been recorded (Waikagul, 1991; Waikagul *et al*, 1997). Consumption of uncooked or partially cooked fish harboring infective stage metacercariae is the major cause of infection. The infection rate and density of *O. viverrini* metacercariae in the fish decreased markedly during the last ten years due to the National Liver Fluke Control Program (Jongsuksuntigul and Imsomboon, 1997, 1998; Waikagul, 1998). On the other hand, the prevalence of heterophyid metacercariae in fishes has tended to increase, also with an increase in prevalence in humans (Radomyos *et al*, 1998). Recent fish surveys in several areas of

northern Thailand revealed that most trematode metacercariae were heterophyid flukes (Waikagul, 1998; Sukontason *et al*, 1999; Mard-arhin *et al*, 2001; Saenphet *et al*, 2001). *Stellantchasmus falcatus* is one of the heterophyid flukes reported in humans in northern Thailand (Kliks and Tantachamrun, 1974; Tantachamrun and Kliks, 1978; Radomyos *et al*, 1998), but its prevalence in fish hosts is poorly known. The present study was performed to determine the prevalence and intensity of *S. falcatus* infection in half-beaked fish, *Dermogenus pusillus*, in four districts of Chiang Mai Province.

MATERIALS AND METHODS

Half-beaked fish, *Dermogenus pusillus*, were collected from Mueang and Hang Dong, Saraphi and Doi Saket Districts, Chiang Mai Province, in July 2002. Three areas of each fish were examined to determine infection with metacercariae (the head, viscera and abdominal wall, and muscle). The head was dissected and placed on a Petri dish in tap water. It was then gently crushed with sharp dissecting needles and examined for metacercariae under a stereo-micro-

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scope. After opening the body cavity in tap water, the viscera and abdominal wall were carefully examined for metacercariae using a stereomicroscope. The muscle was digested using acid pepsin solution (conc. hydrochloric acid 1 ml: pepsin 1 g: 0.85% sodium chloride solution 99 ml) for 3 hours at 37°C. The digested material was then rinsed with 0.85% sodium chloride solution and examined for metacercariae with a stereo-microscope. The metacercariae were morphologically identified based on the criteria of Pearson and Ow Yang (1982) and Chai and Sohn (1988).

RESULTS

In Mueang District (Table 1), a total of 23,988 *S. falcatus* metacercariae were found from 24 fish examined, with a mean intensity of 996 per fish. The intensity of infection ranged from 652 to 1,342 metacercariae per fish. The muscles harbored the highest number of metacercariae

(52.8%, 12,653/23,988), followed by the viscera and abdominal wall, and the head (29.4%, 7,045/23,988 and 17.9%, 4,290/23,988, respectively) (Fig 1).

In Hang Dong District, all of 23 fishes harbored metacercariae of *S. falcatus*, with a total of 30,431 metacercariae. The average intensity of infection was 1,323 per fish, with variations of 562-2,422 metacercariae per fish. The metacercariae were found in the head (20.9%, 6,350/30,431), viscera and abdominal wall (25.5%, 7,760/30,431), and muscles (53.6%, 16,321/30,431), with increasing frequency.

In Saraphi District (Table 2), a total of 13,603 metacercariae, consisting of *S. falcatus* (11,559) and *Posthodiplostomum* sp (2,044), were found from all 23 fish examined. The intensity of *S. falcatus* infection varied between 185-2,492, and averaged 503 per fish. They were found in the head, viscera and abdominal wall, and muscles (21.4%, 2,468/11,559; 21.6%,

Table 1
Number of *S. falcatus* metacercariae from each separated organ of half-beaked fish collected from Muang and Hang Dong, Saraphi, and Doi Saket Districts, Chiang Mai Province.

District	No. of fish examined	Positive rate (%)	No. of metacercariae isolated			Total	Intensity
			Head	Viscera and abdominal wall	Muscles		
Muang	24	100	4,290	7,045	12,653	23,988	999.5
Hang Dong	23	100	6,350	7,760	16,321	30,431	1,323.1
Saraphi	23	100	2,468	2,491	6,600	11,559	502.6
Doi Saket	21	100	1,108	1,130	2,180	4,418	210.4

Table 2
Number of metacercariae from each separated organ of half-beaked fish collected from Saraphi District, Chiang Mai Province.

Species of metacercaria	No. of metacercariae isolated			Total (%)
	Head	Viscera and abdominal wall	Muscles	
<i>S. falcatus</i>	2,468	2,491	6,600	11,559 (85.0%)
<i>Posthodiplostomum</i> sp	-	2,044	-	2,044 (15.0%)
Total (%)	2,468 (18.2%)	4,535 (33.3%)	6,600 (48.5%)	13,603 (100%)

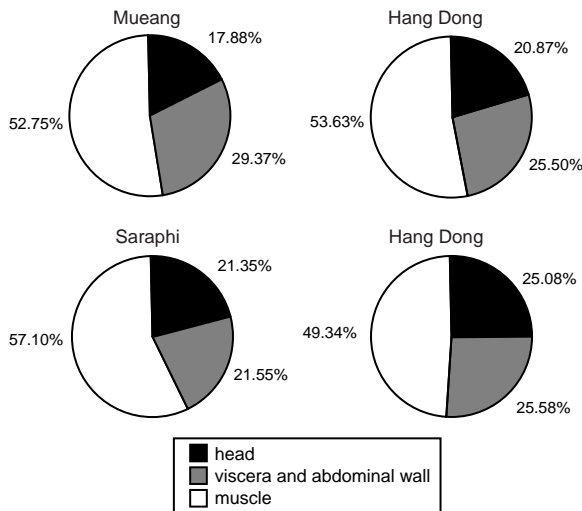


Fig 1—The percentage of *S. falcatus* metacercariae from each separated organ of half-beaked fish collected from Mueang and Hang Dong, Saraphi, and Doi Saket Districts, Chiang Mai Province.

2,491/11,559; and 57.1%, 6,600/11,559, respectively). *Posthodiplostomum* sp metacercariae were confined to the viscera and abdominal wall. The average intensity of infection with *Posthodiplostomum* sp was 89, with variations of 21-403 metacercariae per fish.

In Doi Saket District, all 21 fish harbored *S. falcatus* metacercariae with a total of 4,418. The average intensity of infection was 210 per fish, with variations of 22-520 metacercariae per fish. The metacercariae were localized in the head (25.1%, 1,108/4,418), viscera and abdominal wall (25.6%, 1,130/4,418), and muscles (49.3%, 2,180/4,418), with increasing frequencies.

DISCUSSION

In Japan, Korea, the Philippines, Hawaii and Thailand, brackish water fishes such as *Mugil cephalus*, *Mugil dussumieri*, *Liza menada*, and *Acanthogobius flavimanus* have been recorded as second intermediate hosts for *S. falcatus* (Alicata and Schattenburg, 1938; Vazquez-Colet and Africa, 1940; Martin, 1958; Noda, 1959; Komiya and Suzuki, 1966; Waikagul *et al*, 1985; Chai and Sohn, 1988). In Thailand, freshwater fishes such as *Dermogenus pusillus* and

Xenotodon cancila have been reported as second intermediate hosts (Kliks and Tantachamrun, 1974; Wongsawad *et al*, 1998; 2000). In Lao PDR, *S. falcatus* metacercariae were recorded in *X. canciloides* from Nam Ngum Water Reservoir (Dittrich *et al*, 1990).

In the present study area, metacercariae of *S. falcatus* were first reported from the fins of only one fish species, *D. pusillus* (Kliks and Tantachamrun, 1974). Wongsawad *et al* (1998) detected *S. falcatus* metacercariae from the body cavity of the same fish species, captured from Chiang Mai moat. Wongsawad *et al* (2000) then found the metacercariae of *S. falcatus* in the body cavities and muscles of 7 species of freshwater fishes, including *Xenotodon cancila*, with a very high prevalence of 100%, from Mae Sa Stream, Doi Suthep-Pui National Park. Recent research recovered *S. falcatus* metacercariae from the body cavity and scales of *D. pusillus* (Saenphet *et al*, 2001). In the present study, the metacercariae of *S. falcatus* were found in the head, viscera and abdominal wall, and muscles of *D. pusillus*.

As shown by the results, *S. falcatus* infection is commonly found in the half-beaked fish, *D. pusillus*, in the Chiang Mai area. All of the fish examined in this study were found infected with *S. falcatus*; however, those in Saraphi District always had mixed infections with metacercariae of *Posthodiplostomum* sp. The highest intensity of infection was found in Saraphi District (2,492 metacercariae per fish), but the highest mean intensity was found in Hang Dong District (1,323). Both the lowest intensity and lowest mean intensity of infection were found in Doi Saket District (22 and 210 metacercariae per fish, respectively). The highest metacercarial infection area of the fish body was the muscles, in all districts, while the lowest tended to be the head. Vichasri *et al* (1982) similarly reported that *O. viverrini* metacercariae were found mostly in the muscles of the fish body.

There have been many reports of human infections with *S. falcatus* in the northern and north-eastern parts of Thailand. Kliks and Tantachamrun (1974) initially reported a case of *S. falcatus* infection found at necropsy in Chiang Mai Province, and later added three more cases

from surgical sections of the ileum (Tantachamrun and Kliks, 1978). *S. falcatus* infection was also reported in two cases from Sakon Nakhon and Yasothon Provinces, northeastern Thailand, obtaining adult worms after praziquantel treatment (Radomyos *et al*, 1990). Radomyos *et al* (1994) added one male and one female from northeastern Thailand infected with *S. falcatus*. A recent survey found *S. falcatus* infection in a human residing in Phayao Province (Radomyos *et al*, 1998). *S. falcatus*, like other heterophyid flukes, such as *Haplorchis* spp, has been reported as causing intestinal irritation accompanied by colicky pain and mucous diarrhea, with the production of excess mucus and superficial necrosis of the mucous coat (Beaver *et al*, 1984). However, some of the heterophyid flukes perhaps wander in the deep layers of the intestinal wall, become imprisoned and die. The eggs that degenerate are taken up by the lymphatic or blood circulation and are carried to various organs of the body, including the brain, heart and spinal cord. Cardiac, brain and spinal cord lesions have also been recorded (Africa *et al*, 1935, 1936, 1937).

The present study confirms that half-beaked fish in Chiang Mai Province are heavily infected with *S. falcatus* metacercariae. The presence of human infections around the Chiang Mai area and pathogenicity to humans should be further investigated.

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