

PREVALENCE AND INTENSITY OF THIRD STAGE *GNATHOSTOMA SPINIGERUM* LARVAE IN SWAMP EELS SOLD IN THREE LARGE MARKETS IN BANGKOK, THAILAND

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Abstract. *Gnathostoma spinigerum* is a common human tissue parasite in Thailand. The swamp eel is the major intermediate or paratenic host for this parasite. The high prevalence of the infective third stage larvae (L3) of this parasite in the rainy season has been noted in previous studies. During June 1999 (rainy season), we performed a cross-sectional survey of the prevalence and the intensity of *G. spinigerum* L3s in the livers of swamp eels that were obtained from three large Bangkok markets (Klong Toey, Pran Nok, and Tevej). Of a total of 785 livers, *G. spinigerum* L3s were found in 97; an infection rate of 12%. The prevalence rates in Klong Toey, Pran Nok, and Tevej markets were 13%, 10% and 14% respectively. There was no significant difference in the proportion of infected eels between the markets ($p > 0.05$). The intensity of L3 burden in the livers ranged from 1-17 larvae, with an average of 2.60 ± 0.24 larvae (mean \pm SE). In this study a high prevalence of *G. spinigerum* L3s was found; there was no significant difference in the intensity of larvae in swamp eels between markets. These findings emphasize the importance of public health education: people need to be aware of the dangers of consuming raw or undercooked food.

INTRODUCTION

Gnathostoma spinigerum is known to be the major causative agent of human gnathostomiasis, a disease which is common in Thailand (Daengsvang, 1980; 1986; Kamiya *et al.* 1987; Radomyos and Daengsvang, 1987). The disease has also been reported in Japan, China, Malaysia, Indonesia, Philippines, Israel and other areas where raw and pickled fish are part of the diet (Ando *et al.* 1988; Akahane *et al.* 1994; Rojkeitikhun *et al.* 1989 a, b; Markell *et al.* 1999). The most common outcome of human gnathostomiasis is intermittent cutaneous migratory swellings (Daengsvang, 1986). However, the migration of *G. spinigerum* through important organs such as the brain and the eyes, can result in intracranial hemorrhage, paralysis and blindness (Miyazaki, 1960; Daengsvang, 1986). A fatal case of eosinophilic encephalomyelitis caused by this nematode has been reported (Chitanondh and Rosen, 1967).

Dogs and cats are the definitive hosts of *G. spinigerum*. Copepods or cyclops serve as the first intermediate host. The second intermediate hosts are

mainly freshwater fish. In Thailand, data about the prevalence and concentration of parasites in the second intermediate hosts (mainly freshwater fish) have been reported; a high prevalence of *G. spinigerum* L3 was found during the rainy season (Rojkeitikhun *et al.* 1998b). A study of the distribution of *Gnathostoma* infective larvae in second intermediate hosts during the rainy season was clearly necessary; the information gained through such a study would help in planning control programs and monitoring the disease.

According to previous surveys, of fifty-nine species of freshwater fish available in the markets of Bangkok, nine were infected with *Gnathostoma* larvae. The highest prevalence of *G. spinigerum* L3s was in *Fluviat alba* (swamp eels) (Rojkeitikhun *et al.* 1989; 1998 a, b). These larvae can be found in every part of the eel's body, including the liver. To assess the burden of *Gnathostoma* parasites in the commonest second intermediate host, we examined the livers of swamp eels that were obtained from three of Bangkok's large markets.

MATERIALS AND METHODS

Collection of swamp eels

A total of 785 swamp eel livers were obtained from three of Bangkok's large markets: Klong Toey, Tevaraj (Tevej), and Pran Nok; the samples were collected during June 1999. Each of the three selected markets serves a different area of Bangkok; each has more than 1,000 customers per day.

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Collection of gnathostome larvae

The livers were separated from the viscera and washed with tap water. Each liver was then digested with 25ml artificial gastric juice (0.05 % HCl in 1.5 % pepsin) in a 27ml screw-cap tube. Digestion was performed in a water bath at 37°C for 4 hours with frequent agitation. The digested liver was washed several times in normal saline by a simple sedimentation technique. Gnathostome L3s from each sediment were identified and counted by a stereomicroscopy.

Statistical analysis

All data were analyzed by descriptive statistics. Differences of prevalence and concentration of gnathostoma larvae between the samples from the three markets were regarded as statistically significant if $p \leq 0.05$.

RESULTS

Prevalence of *G. spinigerum*

Of the 785 swamp eel livers, 97 were positive for gnathostome larvae (Table 1). All the detected larvae were identified as *G. spinigerum* larvae. The infection rate of *G. spinigerum* L3s was 12%. The highest prevalence rate of *G. spinigerum* L3s from swamp eel livers was in Pran Nok (14%), while those of Klong Toey and Tevej markets were 13% and 10%, respectively. There was no significant difference in the proportion of infected eels between these three markets. ($p > 0.05$; Table 1).

Intensity of *G. spinigerum*

A total of 244 gnathostome larvae were recovered from 97 positive livers. All were morphologically confirmed to be *G. spinigerum*. The worm burden of *G. spinigerum* L3s was highest in the eels purchased from Pran Nok: 2.75 ± 0.56 larvae per infected liver. The intensity of *G. spinigerum* L3s from Klong Toey

market was 2.66 ± 0.67 , while those from Tevej and Pran Nok market were 2.47 ± 0.35 and 2.75 ± 0.56 respectively. However, there was no statistically significant difference of intensity between markets. ($p > 0.05$).

DISCUSSION

We collected our samples during the rainy season, during which a high prevalence of *G. spinigerum* L3 infection is expected (Rojekittikhun *et al.*, 1998b).

In a previous survey of swamp eels in eleven provinces of central Thailand, Nuamtanong *et al.* (1998) found that Nakhon Nayok had the highest prevalence of *G. spinigerum* L3s (68.7%). The infection rates in some provinces in central Thailand ranged from 10% to 33.3%. These different infection rates depend on the sources of the swamp eels studied. Many freshwater fish, including eels available in the markets, are captured in the natural freshwater, while others are from the freshwater fish farms of central Thailand. (Nuamtanong *et al.*, 1998; Rojekittikhun *et al.*, 1989; 1998a). The source of the swamp eels in the present study was, according to the vendors, from the provinces of central Thailand. In comparison with a neighboring country, the prevalence in June in Thailand (Rojekittikhun *et al.*, 1998b) and of our studies were higher than that in June of Vietnam (8.6%) (Xuan and Rojekittikhun, 2000).

The intensity of *G. spinigerum* L3s (per infected whole eel) from provinces in central Thailand varied from 2.3 ± 1.9 to 29.7 ± 137.0 (Nuamtanong *et al.*, 1998). These were different from those found in our study which varied from 2.47 ± 0.35 to 2.75 ± 0.56 with an average of 2.60 ± 0.24 . These differences are due to the recovery of the parasites from the whole body, whereas we examined the parasites that were in the liver only.

Table 1

The prevalence and the intensity of *G. spinigerum* L3s in swamp eel livers from three markets in Bangkok (June 1999).

Markets	No. eel livers		% Positive	No. L3s recovered		
	Positive	Investigated		Range	Total	Mean \pm SE / infected livers
Klong Toey	28	214	13	1-12	67	2.66 ± 0.67
Tevej	30	291	10	1-9	86	2.47 ± 0.35
Pran Nok	39	280	14	1-17	91	2.75 ± 0.56
Total	97	785	12	1-17	244	2.60 ± 0.24

In this study, a high prevalence of *G. spinigerum* L3s was found in three of Bangkok's markets. Asian people, including Thais, believe that the consumption of grilled eels benefits health. Unfortunately, the chance of undercooking (undergrilling) eels is high. Furthermore, the eating of partially cooked or uncooked freshwater fish is also a normal habit of the people of Thailand and Japan (Daengsvang, 1986). Food control organizations must act to protect consumers from these risks. Our data emphasizes the importance of public health education: awareness of the dangers of the consumption of raw or partially cooked food must be maximized. Japanese restaurants in Thailand that serve swamp eels must be made aware of *G. spinigerum* infection.

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