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Diversity of Helminths in Freshwater Snails from Thaksin University, Phatthalung Province

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ABSTRACT

Some species of freshwater snail act as intermediate hosts for flukes, They have intermediate for development from larva stage to infective stage, in definitive host, such as people and other animals. The objective of this study was to survey and identify helminths in freshwater snails from Thaksin University Phatthalung Campus during January to April 2019. Freshwater-snails samples were collected and then determinated their infectivity with helminths by stereo-microscope. The helminths were identified based on their morphology. A total of 361 freshwater snails were collected and identified as 7 family, 10 genus and 12 species. The overall prevalence was 15.51% (56/361). *Redix auricularia rubiginosa* has the highest prevalence rate of 62.22% (28/45). The results showed that 2 groups of larva stage were observed including 1 type of nematode group (*Strongyloides* sp. Filariform larva) and 7 types of digenea groups (3 types of Redia, 2 types of Cercaria and 2 types of Metacercaria). The findings of this research can be used to estimate helminths infection situation of the study area.

INTRODUCTION

Thaksin University Phatthalung Campus is near to rice fields, palm plantations, or agricultural areas. There is an abundance of water sources have a diversity of organisms, one of the organisms is snails, includes freshwater and land snails. So, the survey of diversity may be useful in terms of indicating the conditions of the local ecosystems.

Snails are invertebrates, classified in the Phylum Mollusca. It is important to the ecosystem is terms of prey on predators, is food [1,2]. In nature, some terrestrial gastropods are also a pest problem, Destroy agricultural plants [3,4]. Many freshwater snails are important in the intermediate host of helminths larva in human and other animals, such as *Angiostrongylus cantonensis*, Liver fluke, Blood fluke.

Freshwater snails is a very important intermediate host for the life cycle of flukes. It intermediary for the development and increase the number of larva stages to contact definitive host which are human and other animals. It is the most typical feature of trematodes, that snails play a key role in the life cycle of trematodes, nearly all trematode families use snails as first intermediate hosts, they are the keystone organisms in the trematode life cycles.

This study aim to survey and identify helminths in freshwater snails from Thaksin University Phatthalung Campus. This work will provide new information on the distribution and intermediate host of trematode in this area.

METHODOLOGY

In this study, the authors argue that all steps contributing to this work comply with the ethical standards of relevant national and institutional handbooks on the care and use of laboratory animals. The confirmation number is U1-01336-2558.

Sampling site and collection

Sampling sites were selected from natural water resources within Thaksin University, Phatthalung Campus, which are suitable for habitats of freshwater snails and land snails, during January to April 2019. In this study, the water resource was determined into 7 stations include, station 1 is near to rice fields (7°48'39.6''N 99°56'24.36''E), standing water are station 2 (7°48'32.4''N 99°56'45.96''E), station 3 (7°48'33.48''N 99°56'45.96''E), station 4 (7°48'29.88''N 99°56'25.44''E), station 5 (7°48'33.84''N 99°56'13.2''E) and station 7 (7°48'26.28''N 99°56'22.2''E) and running water is station 6 (7°48'36.36''N 99°56'16.8''E) during January to April 2019. Freshwater snails sample were collected using net and land snails sample were collected using hands picking. Snail samples were then collected in plastic bags at separate collection stations by dividing each snail for parasite detection and identify the type of snail according to the textbook.

Examination of helminths infection

Helminths infection in snail were examined by crushing method. Put the snail on a petri dishand determination of their helminths infected were observed under stereo microscope. The helminths were identified base on their morphological. Specimen were fixed in 5% formalin, staining with acetocamine and De - hydration in alcohol series, specimen was mounted in permount. After that, the stained sample was examined with a compound microscope to study morphological. The identification of helminths was according to the textbook. The number and type of infection study results were used to determine the prevalence and severity of parasitic infection.

RESULTS AND DISCUSSION

Total of 897 freshwater snails and land snails were collected and identified as 11 Family 16 Genus 19 Species. 1 species in Family Unionidae of freshwater bivalves were found as *Pilsbryoconcha exilis compressa*. Freshwater snails were found as follows: 15 species in 8 family (Family Planorbidae, Lymnaeidae, Bithyniidae, Buccinidae, Pachychilidae, Thiaridae, Ampullariidae and Viviparidae) as *Gyraulus convexiusculus*, *Radix auricularia rubiginosa*, *Bithynia* (*Siamensis*) *siamensis*, *Clea* (*Anentome*) *helena*, *Sulcospira housei*, *Brotia* (*Brotia*) *costula costula*, *Melanoides tuberculata*, *Tarebia granifera*, *Pomacea canaliculata*, *Pila ampullacea*, *P. gracilis*, *Trochotaia trochoides*, *Filopaludina* (*Filopaludina*) *sumatrensis speciosa*, *F.* (*Filopaludina*) *sumatrensis polygramma* and *F.* (*Siampaludina*) *matensi matensi*. And land snails were found 3 species in 2 families (Family Achatinidae and Ariophantidae) as *Achatina fulica*, *Cryptozona siamensis* and *Sarika resplendens*. Stations with the most distribution snail species as station 4, 6 and 7 were found 8 types, followed by station 3, there are 7 types of snails that are distributed. Station 1 and 2 there are 6 types and station 5 had the least number of snail species were found 4 types.

A total of 361 freshwater snails were examined, 56 Individuals 8 Species were found to be infected of helminths: *Radix auricularia rubiginosa*, *Brotia* (*Brotia*) *costulacostula*, *Melanoides tuberculate*, *Pila gracilis*, *Trochotaia trochoides, Filopaludina* (*Filopaludina*) *sumatrensis speciose*, *F.* (*Filopaludina*) *sumatrensis polygramma* and *F.* (*Siampaludina*) *matensimatensi*. All helminths were found in 2 phylum showed that 2 groups of larva stage were observed including 1 type of nematode group is a *Strongyloides* sp. Filariform larva and 7 type of digenea groups: 3 type of Redia; Redia type 1 is a redia of *Transversotrema* sp., Redia type 2 is a redia of Xiphidiocercaria and unknown redia. 2 type of Cercaria; Cercaria type 1 is a cercaria of *Transversotrema* sp. and Cercaria type 2 is a cercaria of Xiphidiocercaria and 2 type of Metacercaria; Metacercaria type 1 is a Distome metacercaria and Metacercaria type 2 is a Echinostome metacercaria (Figure 1). The overall prevalence of infection was 15.51% (56/361). When comparing the infection prevalence rates of each host. It was found that the snails with the highest infection were *R. auricularia rubiginosa*, *M. tuberculate*, *P. gracilis*, *F.* (*F.*) *sumatrensis speciose*, *F.* (*F.*) *sumatrensis polygramma*, *F.* (*Siampaludina*) *matensi matensi*, *T. trochoides* and *B.* (*Brotia*) *costula costula*, the infection prevalence was 62.22, 53.33, 13.33, 10, 6.67, 3.85, 3.70 and 3.13% respectively (Table 1). For the intensity by counting the total number of helminth under the steriomicroscopy, it was found that helminths with the highest intensity was the cercaria of *Transversotrema* sp., Echinostome metacercaria, Cercaria of Xiphidiocercaria, Unknown redia, Redia of *Transversotrema* sp., Redia of Xiphidiocercaria, Distome metacercaria and *Strongyloides* sp. Filariform larva infection prevalence was 82.5, 29.38, 13.25, 11, 6.67, 2, 1 and 1 respectively. In addition, in stations 1 and 5 not found distribution of helminths. The most invasive helminths are *Strongyloides* filariform, which has four stations: Stations 2, 3, 4 and 7 (Table 2).

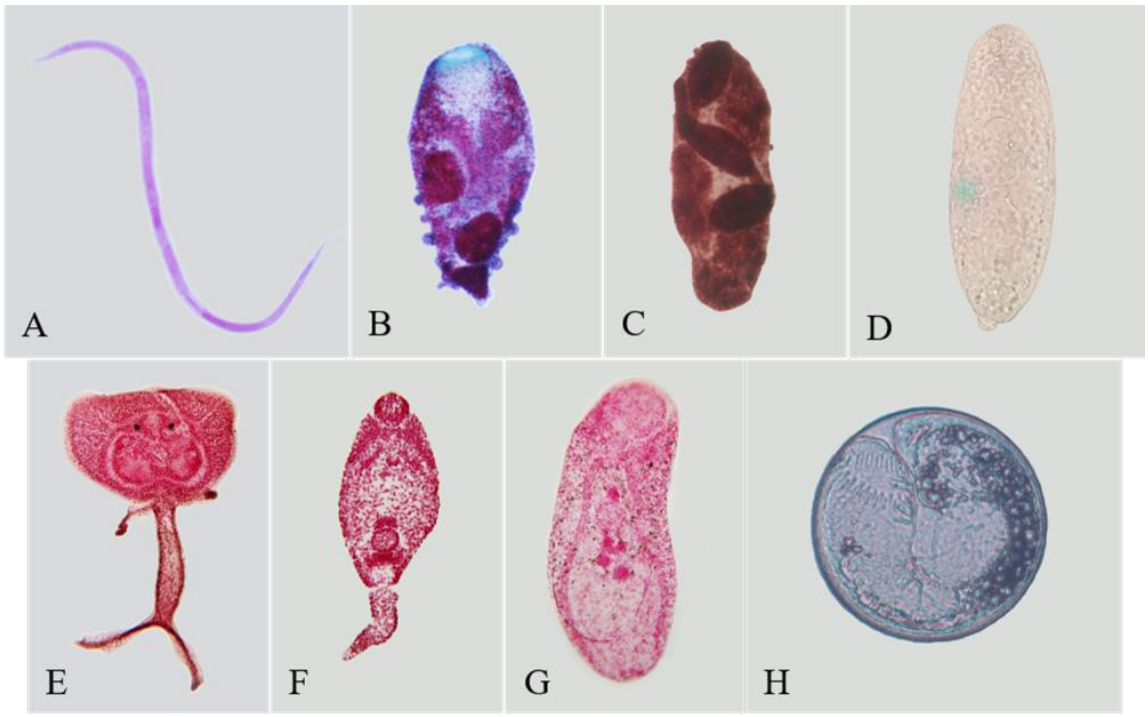

Figure 1. The illustrations of helminths infected in snails. A: Nematode; B: Redia type 1 is a redia of *Transversotrema* sp.; C: Redia type 2 is a redia of Xiphidiocercaria; D: Unknown redia; E: Cercaria type 1 is a cercaria of *Transversotrema* sp.; F: Cercaria type 2 is a cercaria of Xiphidiocercaria; G: Metacercaria type 1 is a Distome metacercaria; H: Metacercaria type 2 is a Echinostome metacercaria.

Table 1. Prevalence infection of each species of freshwater snails.

Species of freshwater snails	Nematoda	Digenia							Prevalence of infected (%)
		Redia			Cercaria		Metacercaria		
	Filariform larva	*Transversotrema* sp.	Xiphidio redia	Unknown redia	*Transversotrema* sp.	Xiphidiocercaria	Distome metacercaria	Echinostome metacercaria	
Gyraulus convexiusculus	-	-	-	-	-	-	-	-	0
Radix auricularia rubiginosa	2/2	-	-	-	-	-	-	876/26	62.22
Clea (Anentome) helena	-	-	-	-	-	-	-	-	0
Sulcospira housei	-	-	-	-	-	-	-	-	0
Bithynia (Siamensis) siamensis	-	-	-	11/1	-	-	-	-	3.13
Melanoides tuberculata	-	20/3	2/1	-	660/8	53/4	-	-	53.33
Tarebia granifera	-	-	-	-	-	-	-	-	0
Pila gracilis	1/1	-	-	-	-	-	-	43/3	13.33
Trochotaia trochoides	1/1	-	-	-	-	-	-	-	3.70
Filopaludina (Filopaludina) sumatrensis speciosa	1/1	-	-	-	-	-	-	20/2	10
Filopaludina (*Filopaludina*) *sumatrensis polygramma*	-	-	-	-	-	-	2/2	-	6.67
Filopaludina (*Siampaludina*) *matensi matensi*	-	-	-	-	-	-	-	1/1	3.85
Total	5/5	20/3	2/1	11/1	660/8	53/4	2/2	940/32	15.51

Table 2. Distribution of helminthes in each sample stations.

Station	Nematoda	Digenia						
		Redia			Cercaria		Metacercaria	
	Filariform larva	*Transversotrema* sp.	Xiphidio redia	Unknown redia	*Transversotrema* sp.	Xiphidiocercaria	Distome metacercaria	Echinostome metacercaria
Station 1	-	-	-	-	-	-	-	-
Station 2	√	-	-	-	-	-	-	-
Station 3	√	√	√	-	√	√	√	-
Station 4	√	-	-	-	-	-	-	-
Station 5	-	-	-	-	-	-	-	-
Station 6	-	-	-	√	-	-	-	-
Station 7	√	-	-	-	-	-	-	√

Identification species of snail

The diversity of snail, we found that 8 of 19 Species (*Pilsbryoconcha exilis compressa*, *Gyraulus convexiusculus*, *Bithynia*(*Siamensis*) *siammensis*, *Cryptozona siamensis*, *B*.(*B*.) *costula costula*, *Tarebia granifera* and *P*. *ampullaceal* that found in only station, indicate that their snails have a low abundant.

In this study, 2 Genus 4 Species of freshwater snail in Family Viviparidae, which were indentified to Genus *Trochotaia* 1 Species and Genus *Filopaludina* 3 Species. Previous report, To-orn [5], gastropods in Family Viviparidae is a dominant distribution in the Pasak River because their hats species – rich. In addition*, P. gracilis and R. auricularia rubiginosa* are species that dominant distribution in study area because can be found almost sample station. The different of freshwater snail species in sample station may be depend on nutrients in the water, which is factors for the growth, amount and species of aquatic animals [6].

Identification and prevalence of helminths

The identification and prevalence rate of helminths that infectivity in freshwater snail can be analyzed to act as intermediate hosts of fluke, which some freshwater snail can be infected by helminths that transmit diseases to humans and animals [7].

Eight species of snail were infectivity by helminths including *R. auricularia rubiginosa*, *B*. (*B*.) *costula costula*, *M*. *tuberculata*, *P*. *gracilis*, *T*. *trochoides*, *F*. (*F*.) *sumatrensis speciose*, *F*. (*F*.) *sumatrensis polygramma* and *F*. (*Siampaludina*) *matensi matensi*. Echinostome metacercaria (Trematode larva) were found highest a number and prevalence rate: 940 helminths in 32 individual snail and found in *R. auricularia rubiginosa*, *P*. *gracilis*, *F*. (*F*.) *sumatrensis speciose* and *F*. (*Siamopaludina*) *martensi martensi*. Wivitchuta [6] reported a snail in Genus *Radix*, a 1st intermediate host and 2nd intermediate host of *E. revolutum* (Intestinal fluke), which can be transmit to human. Moreover, their also intermediate host of Blood fluke larva, which their larva can be penetrate into the skin of human but can't develop to an adult. Thus cause cercarial dermatitis. Furthermore, a previous reported by Anucherngchai, Panich, Chontananarth [8] that investigate found *Filopaludina* snail infect by *E. revolutum*. In situations where this group of helminthiasis infection may pose a risk of Echinostomiasis in collegian and personnel within Thaksin University. In this study, *Transversotrema* cercaria was found in *Melanoides tubercularta*. Rattanathai [9] reported that *Transversotrema laruei* cercaria was also found in *Melanoides tubercularta*.

CONCLUSION

This is the first study to provide information on the distribution of various snails and their trematode infections from Thaksin University Phatthalung Campus. In this study, were found larva stage of importance helminth, such as Echinostome metacercaria, may pose a risk of Echinostomiasis in collegian and personnel within Thaksin University. The result of this study indicate to diversity of freshwater snail which is host of helminths, can be used to estimate helminths infection situation of the study area and useful in epidemiology. Knowledge of the infection rates and distributions of the host snail populations is essential and must be taken into consideration when developing future control strategies.

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