บทความวิจัย

หนอนพยาธิในทางเดินอาหารของหนูชนิดต่างๆ จากจังหวัดเลย ประเทศไทย

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บทคัดย่อ

การศึกษาหนอนพยาธิในทางเดินอาหารของสัตว์ฟันแทะจำพวกหนูชนิดต่างๆ จำนวน 443 ตัว ซึ่งดักจับได้จากแหล่งที่อยู่อาศัยหลากหลายเช่น พื้นที่ป่าไม้ พื้นที่เกษตรกรรมบนที่สูง พื้นที่เกษตรกรรมในที่ลุ่มชุ่มน้ำ และพื้นที่ในเขตชุมชนเมือง ของอำเภอเมือง จังหวัดเลย ผลการศึกษาพบหนูจากการดักจับทั้งหมด 16 ชนิด และมีการติดหนอนพยาธิในทางเดินอาหารจำนวนทั้งสิ้น 19 ชนิด โดยแบ่งเป็น กลุ่มพยาธิใบไม้ 3 ชนิด กลุ่มพยาธิตัวตืด 3 ชนิด กลุ่มพยาธิตัวกลม 12 ชนิด และกลุ่มพยาธิหัวหนาม 1 ชนิด ความชุกของการติดหนอนพยาธิคิดเป็นร้อยละ 55.1% (ตรวจพบหนอนพยาธิในหนู 244 ตัว) หนอนพยาธิที่ถูกพบมากที่สุดคือ พยาธิตัวกลมในวงศ์ Trichostrongylidae (25.5%) ตามด้วยพยาธิตัวตืดหนู (*Hymenolepis diminuta;* 12.4%) และพยาธิเข็มหมุดของหนู (*Syphacia muris;* 9.2%) โดยหนูหริ่งนาหางยาว (*Mus caroli*) มีอัตราการติดพยาธิสูงที่สุด (81.5%) ตามด้วยหนูเขาสูง (*Leopoldamys edwardsi;* 75%) หนูพุกเล็ก (*Bandicota savilei;* 71.4%) และหนูหริ่งใหญ่ (*Mus cookii;* 70.2%) ตามลำดับ ในขณะที่หนูนาเล็ก (*Rattus losea*) มีจำนวนชนิดของหนอนพยาธิที่ติดสูงที่สุดคือ 12 ชนิด ตามด้วยหนูพุกเล็ก (*Bandicota savilei*) 9 ชนิด หนูหริ่งนาหางสั้น (*Mus cervicolor*) 8 ชนิด หนูขนเสี้ยนดอย (*Niviventer fulvescens*) 8 ชนิด และหนูบ้านเอเชีย (*Rattus tanezumi*) 8 ชนิด จากการวิเคราะห์ทางสถิติพบว่า

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จำนวนชนิดของหนอนพยาธิที่ติดในหนูแต่ละตัว มีความสัมพันธ์กับวัยของหนูอย่างมีนัยสำคัญ กล่าวคือ จำนวนชนิดของหนอนพยาธิที่ติด จะพบสูงในหนูวัยโตเต็มที่มากกว่าหนูวัยอ่อน ในทางตรงกันข้ามพบว่าหนูเพศผู้ และเพศเมียไม่มีความแตกต่างต่อจำนวนชนิดของหนอนพยาธิที่ติด พยาธิที่มีความสำคัญทางการแพทย์ และสาธารณสุข โดยมีความเสี่ยงเป็นโรคหนอนพยาธิที่ติดต่อจากสัตว์สู่คน ซึ่งมีหนูเป็นพาหะหรือตัวอมโรคได้แก่ พยาธิตัวตืด *Raillietina* sp. พยาธิตัวตืดแคระ *Rodentolepis nana* (syn. *Hymenolepis nana*) พยาธิตัวตืดหนู *Hymenolepis diminuta* และพยาธิหัวหนาม *Moniliformis moniliformis* นอกจากนี้ผลการศึกษายังพบว่า หนูพุกเล็ก (*Bandicota savilei*) หนูจี๊ด (*Rattus exulans*) หนูนาเล็ก (*Rattus losea*) และหนูบ้านเอเชีย (*Rattus tanezumi*) ประกอบกับแหล่งที่อยู่อาศัยที่เป็นพื้นที่เกษตรกรรมบนที่สูงและที่ลุ่มชุ่มน้ำ มีความเสี่ยงต่อมนุษย์ในการสัมผัสกับโรคหนอนพยาธิที่มีหนูเป็นพาหะหรือตัวอมโรคในพื้นที่จังหวัดเลยที่ทำการศึกษาในครั้งนี้

คำสำคัญ: หนอนพยาธิ หนู จำนวนชนิดของหนอนพยาธิ แหล่งที่อยู่อาศัย จังหวัดเลย ประเทศไทย

Gastrointestinal Helminth Fauna in Rodents from Loei Province, Thailand

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ABSTRACT

The presence of gastrointestinal helminth (GI helminth) was investigated in 443 murid rodents, trapped in various habitats as forests, upland, lowland agricultural areas and domestic areas from Loei province, Thailand. The study revealed 16 species of rodents infected with 19 species or taxonomic groups of parasites (3 trematodes, 3 cestodes, 12 nematodes and 1 acanthocephalan). The prevalence of infection was 55.1% (244 infected out of 443 rodents). Among GI helminths, the dominant parasite was Trichostrongylidae (25.5%), followed by *Hymenolepis diminuta* (12.4%) and *Syphacia muris* (9.2%). The highest prevalence was found in *Mus caroli* (81.5%), followed by *Leopoldamys edwardsi* (75%), *Bandicota savilei* (71.4%) and *Mus cookii* (70.2%). *Rattus losea* revealed the highest total parasite species richness (total PSR) (12 parasite species), followed by *Bandicota savilei* (9), *Mus cervicolor* (8), *Niviventer fulvescens* (8), and *Rattus tanezumi* (8). Statistical analysis of individual parasite species richness (individual PSR) with sex and maturity showed that high individual PSR was possibly related to maturity (adult rodents). In contrast, individual PSR was not associated with host sex. The following parasites, *Raillietina* sp., *Rodentolepis nana* (syn. *Hymenolepis nana*), *Hymenolepis diminuta and Moniliformis moniliformis* are considered as cause of parasitic zoonoses of medical important linked with murid rodents. *Bandicota savilei, Rattus exulans, Rattus losea and Rattus tanezumi* together with habitat fragmentation as upland and lowland agricultural areas appear to be the possible risks for human exposure to helminthiasis in this location.

Keywords: Helminth, Rodents, Parasite species richness, Habitat, Loei province, Thailand

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Introduction

Murid rodents are highly successful to various environments. They have a large foraging range and high potential in reproduction. Typically, they have short gestation periods with high litter size. All of that information is much enough to conclude that rodents are important animal, can affect human as agricultural pest, spoil and contaminate stored food and carry diseases to human and livestock or companion pets [1]. Rodents act as the host for ectoparasites such as lice, mite and tick that can transmit viral, bacterial and protozoan parasites to human and animal. In addition, they can harbor many different helminthic endoparasites [2-4]. Gastrointestinal helminth (GI helminth) studies of rodents are important that are known to cause diseases to domestic animal, wildlife and human. The public health and zoonotic importance of helminth infection are effect on both nutritional and immune status of host, particularly those living in tropical and subtropical areas [5].

There have been some reports on the occurrence of helminth infection in rodents of Thailand [6-8], however the study on helminth diversity and distribution are still required. In this study, Loei province was selected following the ANR CERoPath Project (Community Ecology of Rodents and their Pathogens in South-East Asia, France) which created the field mission for rodent activities.

The objectives of this study were to survey the biodiversity of helminth in rodents captured from Loei province, and evaluate the risk of helminthic disease transmission to human and animal in this locality.

Materials and Methods

Murid rodents were collected for 2 weeks in February 2008 from Muang district, Loei province, Thailand. The sampling locations were selected from both urban and rural areas, highly represented from forest areas with low human density to poor forest areas with high human density follow the index of anthropization. The index of anthropization was a transformation of the habitat variable into a semi-quantitative variable following Jittapalapong *et al.* (2008) [9] with the index varying from forests (1); upland agricultural areas (2); lowland agricultural areas (3) to domestic habitats (4). Live-traps were used to collect rodents alive. The trapping was organized into 2 tasks: the set of 10 trapping lines (10 traps in each line) and the assistance of local hunter. The trapped rodents were collected each morning and brought to the laboratory. Cotton wool soaked in chloroform was used for induction of anesthesia followed by death of rodents in side a plastic box. Rodent species identification was done by morphological character followed to Marshall (1988) [10] and Aplin *et al.* (2003) [1]. Rodent maturity was categorized to juvenile and adult. Likewise, the sex was determined by visual inspection of external sexual

organs. GI tract were collected from esophageal sphincter of stomach to rectum before anus. Stomach, small intestine and large intestine were examined for helminth under stereomicroscope. The helminths were isolated and preserved in 70% alcohol. Trematodes and cestodes were stained in Semichon's carmine and mounted in Permount as permanent slide while nematodes were cleared in lactophenol and mounted as temporary slide. The helminth species were identified according to various helminth identification keys [11-15].

Statistical analysis was performed by using computer software (Statistica). The analysis was investigated by univariate statistical analysis to evaluate the relations between individual PSR and host sex and maturity by using student's t-test (p=0.05).

Results

Totally 443 murid rodents comprising 16 species as *Bandicota indica, Bandicota savilei, Berylmys berdmorei, Berylmys bowersi, Chiropodomys gliroides, Leopoldamys edwardsi, Leopoldamys neilli, Maxomys surifer, Mus caroli, Mus cervicolor, Mus cookii, Mus fragilicauda, Niviventer fulvescens, Rattus exulans, Rattus losea and Rattus tanezumi* were captured and examined. Each murid rodent profiles and habitats showed in Table 1. The prevalence of

Table 1 The murid rodent profiles of habitats and feeding behaviors

Murid rodents	Normal habitats	Feeding behaviors
Bandicota indica	Agricultural area (lowland or upland)	Omnivorous
Bandicota savilei	Agricultural area (upland or lowland)	Omnivorous
Berylmys berdmorei	Agricultural area (upland) or forest edge	Omnivorous
Berylmys bowersi	Agricultural area (upland) or forest	Omnivorous
Chiropodomys gliroides	Forest	Herbivorous
Leopoldamys edwardsi	Forest	Herbivorous
Leopoldamys neilli	Forest (karst and cave)	Herbivorous
Maxomys surifer	Forest and agricultural area (upland)	Herbivorous
Mus caroli	Agricultural area (lowland)	Omnivorous
Mus cervicolor	Agricultural area (lowland)	Omnivorous
Mus cookii	Forest and agricultural area (upland)	Omnivorous
Mus fragilicauda	Agricultural area (lowland or upland)	Herbivorous
Niviventer fulvescens	Forest and agricultural area (upland)	Herbivorous
Rattus exulans	Domestic area	Omnivorous
Rattus losea	Agricultural area (lowland)	Omnivorous
Rattus tanezumi	Ubiquitous from domestic area to forest edge	Omnivorous

helminth infection was 55.1% from 244 infected rodents. Each habitats showed the prevalence of infection among rodent species that highest in upland agricultural area (22.3%) followed by lowland agricultural area (20.8%), forest (8.1%) and domestic (3.8%). In addition, the highest total PSR were found in lowland agricultural areas followed by upland agricultural areas, forests and domestic areas as 16, 15, 13 and 8 species, respectively (Figure 1). The prevalence and total PSR in each rodent species among habitats also showed in Table 2.

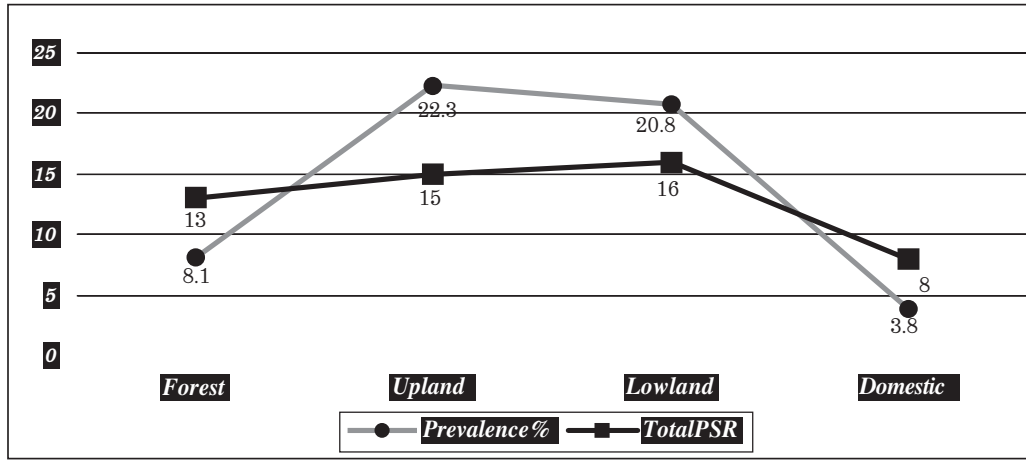

Figure 1 Prevalence and total PSR of GI helminth infection in murid rodents among habitats in Loei province, Thailand

Table 2 Murid rodents infection with GI helminths among habitats in Loei province, Thailand

Murid rodents (Examined number)	No. of infected (%)	Total PSR	Habitats							
			Forest		Upland		Lowland		Domestic	
			+	(%)	+	(%)	+	(%)	+	(%)
Bandicota indica (16)	3 (18.7)	4	-	-	-	3	(18.8)	-	-	
Bandicota savilei (21)	15 (71.4)	9	4	(19.1)	1	(4.8)	10	(47.6)	-	-
Berylmys berdmorei (9)	3 (33.3)	2	1	(11.1)	2	(22.2)	-	-	-	-
Berylmys bowersi (22)	7 (31.8)	3	1	(4.5)	6	(27.3)	-	-	-	-
Chiropodomys gliroides (2)	1 (50)	1	-	-	1	(50)	-	-	-	-
Leopoldamys edwardsi (12)	9 (75)	3	4	(33.3)	5	(41.7)	-	-	-	-
Leopoldamys neilli (1)	-	-	-	-	-	-	-	-	-	-
Maxomys surifer (21)	5 (23.8)	5	3	(14.3)	1	(4.8)	1	(4.8)	-	-
Mus caroli (27)	22 (81.5)	5	-	-	6	(22.2)	16	(59.3)	-	-
Mus cervicolor (28)	19 (67.9)	8	-	-	10	(35.7)	9	(32.1)	-	-
Mus cookii (47)	33 (70.2)	6	3	(6.4)	23	(48.9)	6	(12.8)	1	(2.1)
Mus fragilicauda (1)	-	-	-	-	-	-	-	-	-	-
Niviventer fulvescens (66)	42 (63.6)	8	8	(12.1)	29	(43.9)	5	(7.6)	-	-
Rattus exulans (47)	12 (25.5)	4	-	-	-	-	-	-	12	(25.5)
Rattus losea (88)	54 (61.4)	12	9	(10.2)	9	(10.2)	36	(40.9)	-	-
Rattus tanezumi (35)	19 (54.3)	8	3	(8.6)	6	(17.1)	6	(17.1)	4	(11.4)
Total (443)	**244 (55.1)**	**19**	**36**	**(8.1)**	**99**	**(22.3)**	**92**	**(20.8)**	**17**	**(3.8)**

A total of 19 different helminths were identified as 3 trematodes, 3 cestodes, 12 nematodes and 1 acanthocephala species or taxonomic groups (Table 3 and 4). The dominant rodent species that highly found the helminth infection was *Mus caroli* (81.5%), followed by the other rodents frequently found were *Leopoldamys edwardsi* (75%), *Bandicota savilei* (71.4%) and *Mus cookii* (70.2%). The highest total PSR was shown in *Rattus losea* followed by *Bandicota savilei* as 12 and 9 helminth species respectively. The most prevalent helminth was the nematode in the family Trichostrongylidae (25.5%) followed by cestode, *Hymenolepis diminuta* (12.4%); nematode, *Syphacia muris* (9.2%) and cestode, *Raillietina* sp. (8.1%). In the same way, *Hymenolepis diminuta* and Trichostrongylidae were the most wide host range, 10 rodent species found to infect with those parasites.

Table 3 Prevalence of trematodes, cestodes and acanthocephalan in murid rodents from Loei province, Thailand

Murid rodents (Examined number)	Trematodes				Cestodes			Acanthocephalan
	Notocotylus sp.	Lecithodendriidae	*Echinostoma* sp.		*Raillietina* sp.	*Hymenolepis diminuta*	*Rodentolepis nana*	*Moniliformis moniliformis*
Bandicota indica (16)	-	-	-		12.5	-	-	-
Bandicota savilei (21)	-	-	4.8		19.0	4.8	-	-
Berylmys berdmorei (9)	-	-	-		-	33.3	-	-
Berylmys bowersi (22)	-	-	-		-	13.6	-	-
Chiropodomys gliroides (2)	-	-	-		-	-	50.0	-
Leopoldamys edwardsi (12)	-	-	-		25.0	41.7	-	-
Leopoldamys neilli (1)	-	-	-		-	-	-	-
Maxomys surifer (21)	-	-	-		9.5	4.7	-	-
Mus caroli (27)	-	-	-		-	-	14.8	-
Mus cervicolor (28)	-	-	-		7.1	-	14.3	-
Mus cookii (47)	-	2.1	-		-	4.3	25.5	-
Mus fragilicauda (1)	-	-	-		-	-	-	-
Niviventer fulvescens (66)	-	-	-		12.1	33.3	1.5	-
Rattus exulans (47)	-	-	-		-	23.4	-	2.1
Rattus losea (88)	9.1	19.3	1.1		11.4	1.1	2.2	-
Rattus tanezumi (35)	-	-	-		14.3	17.1	-	-
Total (443)	**1.8**	**4.1**	**0.5**		**8.1**	**12.4**	**5.4**	**0.2**

Table 4 Prevalence of nematodes in murid rodents from Loei province, Thailand

Murid rodents (Examined number)	Nematodes											
	Tichuris muris	*Eucoleus* sp.	*Aonchotheca* sp.	*Ganguleterakis spumosa*	*Syphacia obvelata*	*Syphacia muris*	*Physaloptera* sp.	*Protospiura* sp.	*Pterygodermatites* sp.	*Gongylonema neoplasticum*	Trichostrongylidae	Filariidae
Bandicota indica (16)	6.3	-	-	12.5	-	-	-	6.3	-	-	-	-
Bandicota savilei (21)	4.8	-	-	9.5	-	42.9	9.5	-	-	4.8	14.3	-
Berylmys berdmorei (9)	-	-	-	11.1	-	-	-	-	-	-	-	-
Berylmys bowersi (22)	-	-	-	18.2	-	13.6	-	-	-	-	-	-
Chiropodomys gliroides (2)	-	-	-	-	-	-	-	-	-	-	-	-
Leopoldamys edwardsi (12)	-	-	-	-	-	8.3	-	-	-	-	25.0	-
Leopoldamys neilli (1)	-	-	-	-	-	-	-	-	-	-	-	-
Maxomys surifer (21)	-	-	-	-	-	4.8	-	-	-	4.8	9.5	-
Mus caroli (27)	-	-	-	14.8	-	3.7	14.8	-	-	74.1	-	
Mus cervicolor (28)	-	3.6	3.6	-	14.3	-	3.6	17.9	-	-	35.7	-
Mus cookii (47)	-	-	-	23.4	-	-	14.9	-	-	38.3	-	
Mus fragilicauda (1)	-	-	-	-	-	-	-	-	-	-	-	-
Niviventer fulvescens (66)	-	-	-	-	-	1.5	-	-	4.5	1.5	27.3	1.5
Rattus exulans (47)	-	-	-	-	-	-	-	-	-	2.1	2.1	-
Rattus losea (88)	1.1	-	-	-	-	22.7	11.4	2.3	-	1.1	32.9	-
Rattus tanezumi (35)	2.9	-	-	-	-	17.1	-	2.9	5.7	-	25.7	5.7
Total (443)	**0.9**	**0.2**	**0.2**	**2.0**	**4.3**	**9.2**	**3.2**	**4.5**	**1.1**	**1.1**	**25.5**	**0.7**

The relation between individual PSR and host maturity was statistically significant ($t = 2.14$, p-value = 0.03) as showed in Figure 2. In contrast, individual PSR was not different among host sex ($t = 1.23$, p-value = 0.22).

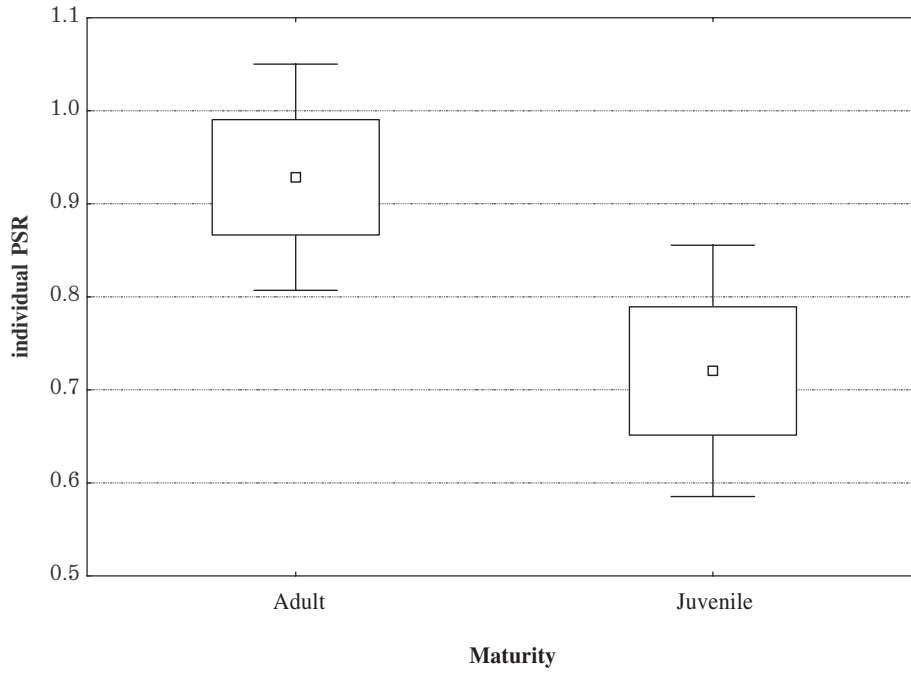

Figure 2 Significant difference of individual PSR between adult and juvenile rodents (t = 2.14, p-value = 0.03)

Discussion

Rodents have been the representative animal of several studies on the survey of GI helminth parasites in Europe, America, Australia and many countries in Africa or Asia including Southeast Asia (SEA) [4, 16-20] but surprisingly not so much work has been done in Thailand. In this study, murid rodents from Loei province were examined, according to the protocol of ANR CERoPath project. Then, the GI helminths diversity of rodents was informed. Some statistical analysis was used to test the relative importance of intrinsic factors (sex and maturity) in order to determine the individual PSR. The prevalence of infection is 55.1% with 19 species or taxonomic groups of GI helminths indicated that murid rodents in this locality were infected with high helminth diversity.

The nematode in family Trichostrongylidae appeared to be the dominant parasite with 25.5% prevalence infection. The specimens from this study difficult to determined to genus or species. They seem to comprise with 4 or 5 species, so the further identification on molecular technique are still required. However, nematode in family Trichostronngylidae that have been reported in SEA possibly be the *Trichostrongylus* sp., *Nippostrongylus brasiliensis, Brevistriata*

skrjabini and *Orientostrongylus tenorai* [2, 4, 8, 21-24]. Two genuses of capillarid nematode, *Eucoleus* sp. and *Aonchotheca* sp. were found only in stomach from *Mus cervicolor*. One possible species of *Eucoleus* that has been reported in Indonesia was *Eucoleus bacillatus* [25]. This study also showed the first report of *Aonchotheca* sp. infection in murid rodents in Thailand. The nematode in family Rictulariidae: *Pterygodermatites* sp. (syn. *Rictularia* sp.) was infected only in duodenum of *Niviventer fulvescens* and *Rattus tanezumi.* The possible species of Rictulariidae has been reported in SEA was *Rictularia tani,* found in Indonesia and Malaysia [21, 22, 26]. The Filariidae in this study was found in the GI tract of two species of murid rodent as *Niviventer fulvescens* and *Rattus tanezumi.* The review study of nematode parasites in Malaysian rodents, Singh and Chee-Hock (1971) [21] was reported one species of Filariidae: *Breinlia* sp. from abdominal cavity and lung. However, our filarid specimens still required the molecular identification in further study.

Three cestodes species were found comprising of *Raillietina* sp., *Hymenolepis diminuta* and *Rodentolepis nana.* All of these cestodes were found only in small intestine. The *Raillietina* sp. is commonly found in birds [27] while rodents in SEA were reported to be infected by *Raillietina celebensis* and *Raillietina siriraji* from Thailand and Vietnam [2, 7, 28]. The other two cestodes in family Hymenolepididae, *Hymenolepis diminuta* and *Rodentolepis nana* (syn. *Hemenolepis nana*) were found in small intestine of many murid rodent species. Interestingly, all of these three cestodes have been reported in human as the zoonotic disease [7, 22, 29]. Therefore, the murid rodents from this region were realized as the possible reservoirs for cestode transmitted to human.

The result of trematode infection showed that 1 family and 2 genera as Lecithodendriidae, *Notocotylus* sp. and *Echinostoma* sp. were found. All of these flukes were found only in 3 species of rice field and upland rodents as *Bandicota savilei, Rattus losea* and *Mus cookii.* The result of these trematodes finding was similar to the previous study reported by Artchawakom (1981) [6] that found the trematode of family Notocotylidae: *Quinqueserialis quinqueserialis* and *Echinostoma* sp. from rice field rats, *Rattus argentiventer* and *Bandicota indica* in Nakhon Prathom, Thailand.

The acanthocephalan, *Moniliformis moniliformis* was also found in this study. Only the Polynesian Rat, *Rattus exulans* from domestic habitat was infected with the parasite. This parasite was often found in township or near human living place because their life cycle must be completed by cockroach as intermediate host [30]. For this reason, the *Moniliformis moniliformis* was also realized as the zoonotic parasite that might be affected to the human public health.

According to the statistical analysis, some patterns seem to emerge in relationship between individual PSR and host factors. Student's t-test analysis for independent sample between individual PSR and host maturity (adult and juvenile) was significantly differed while host sex (male and female) was showed non-significant difference. Summary that increasing of individual PSR was possibly found more in adult rodents as expected from the longer lifespan, increasing opportunity to contact with the transmission stage of parasites. In contrast, individual PSR was not difference between males and females. Some previous studies in Europe about the infection with GI helminths were in agreement with significantly correlated by age maturity [31, 32].

Four of the parasites in present study have been reported as transmissible to humans and constitute a problem for public health especially cestodes such as *Raillietina* sp. [29, 33], *Rodentolepis (Hymenolepis) nana* [34, 35], *Hymenolepis diminuta* [7, 22]. Moreover, the acanthocephalan: *Moniliformis moniliformis* can also found to infect in humans [22, 36, 37].

Upland and lowland agricultural areas were found as the dominant habitats of helminth infection and zoonotic helminth species, this suggest that two of these habitat types were places of potential risks for humans. Habitat fragmentation and new land uses in uplands and lowlands may favor the spread and emergence of helminthiasis. The results of this study suggest that *Bandicota savilei, Rattus exulans, Rattus losea* and *Rattus tanezumi* are possible sources of human exposure to helminths, especially, *R. tanezumi*, the species which widely found from domestic places to forest edges.

This study provides some information on GI-helminth of murid rodents in Loei province. However, the helminths infection was reported only from gastrointestinal tract, while parasites of other organs should also be studied, such as ectoparasites or endoparasites in blood circulation, lung, liver, peritoneum cavity and reproductive organ. Further study should be done on the other parts of Thailand and also determine the rodent-parasite relationships such as host sex, maturity, body mass, habitat and so on. The analysis might be useful to find out the possible routes of its zoonotic potential to human and domestic animal health in Thailand or even in SEA.

Conclusion

A total of 443 murid rodents were examined in Loei province, Thailand. The prevalence of infection was 55.1% (244 rodents) from 16 species of murid rodents were infected with helminths including acanthocephalan. Twenty-two parasites species or taxonomic groups were identified from all infected rodents. Four parasites species of medical importance as zoonotic parasite were *Raillietina* sp., *Hymenolepis diminuta, Rodentolepis nana* and *Moniliformis moniliformis.* According to statistical analysis showed the relationship between individual PSR

and host intrinsic factors. Increasing of individual PSR was significantly found more in adult rodents while the host sex was not significantly associated with individual PSR. The diversity of parasites and the influences of habitats on the parasite fauna which appear to present risks for human exposure were also discussed in the study.

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