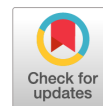


# TYPE OF CERCARIA IN FRESHWATER SNAILS AT TUNGGU PAMPANG RESERVOIR, MAKASSAR CITY, INDONESIA



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**Abstract.** The Tunggu Pampang Reservoir is one of the reservoirs located in the city of Makassar. The functions of the reservoir area was tourist attractions and fish farming locations so that the local community uses them for swimming, fishing, selling, and gardening. The existence of various types of freshwater snails in the reservoir has the potential to act as intermediate hosts for trematodes in animals and humans. This study aimed to analyze the type of cercariae in freshwater snails. This research is a descriptive survey to determine the distribution of trematode larvae. The stages of this research began with the snails were collected from Tunggu Pampang Reservoir, Makassar City. Freshwater snails were collected at several points in the reservoir. Freshwater snail collection using hand collecting method. The snails were put into a plastic bag with different types of snails and site of collection. The collected samples and cercariae were examined in the Tropical Disease Laboratory of the Study Program of DIII Medical Laboratory Technology, Megarezky University, South Sulawesi, Indonesia. Freshwater snails are placed on a petri dish and their shells were gently crushed with a stamper. Dropped with aquadest on the crushed snail shell. The next step was observed using a microscope to determine the presence of cercariae. Cercariae found then identified according to morphological classification as previously study. A total number of 500 freshwater snail were collected in Tunggu Pampang Reservoir. The results showed that overall snails infected with cercariae was 33,4%. The highest prevalence of cercariae in *Indoplanorbis exustus* was 94.3%. Total of *Echinostoma* cercariae found (n = 224) compared to furcocercous cercariae (n = 5). Cercariae of *Echinostoma* sp., *Fasciola gigantica*, *Fasciolopsis buski* living in Tunggu Pampang Reservoir can cause diseases in humans and animals. Larval trematodes can be controlled in snails using reducing parasite contamination, monitoring surveillance, information dissemination, and preventive education.

**Key words:** cercariae, freshwater, snail, reservoir, Makassar, Indonesia.

## ТИП ЦЕРКАРИЙ В ПРЭСНОВОДНЫХ УЛИТКАХ ВОДОХРАНИЛИЩА ТУНГУ ПАМПАНГ, ГОРОД МАКАССАР, ИНДОНЕЗИЯ

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**Резюме.** Водоохранилище Тунггу Пампанг — одно из водоохранилищ, расположенных в городе Макассар, являющегося туристической достопримечательностью и местом разведения рыбы, используемым местным

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населением для купания, рыбалки, продажи и садоводства. Существующие в водоеме различные виды пресноводных улиток может выступать в качестве промежуточных хозяев для трематод у животных и людей. Настоящее исследование было направлено на анализ типа церкарий у пресноводных улиток. Это исследование представляет собой описательный обзор для определения распределения личинок трематод. Исследование заключалось в сборе улиток в нескольких точках водохранилища Тунгу Пампанг, город Макаassar. Сбор улиток пресной воды осуществлялся ручным методом. Улиток помещали в полиэтиленовый пакет с разными видами улиток из определенного места сбора. Собранные образцы и церкарии были исследованы в Лаборатории тропических болезней Программы исследований ДПП Медицинской лаборатории технологий, Университет Мегарежки, Южный Сулавеси, Индонезия. Пресноводных улиток помещали в чашку Петри и осторожно измельчали их раковины с помощью ступки, капали вакуумный испаритель на раздавленную раковину улитки. Далее под микроскопом определяли наличие церкарий, которые были идентифицированы в соответствии с морфологической классификацией, как в предыдущем исследовании. Всего в водохранилище Тунгу Пампанг было собрано 500 пресноводных улиток. Результаты показали, что общее количество улиток, инфицированных церкариями, составило 33,4%. Самая высокая распространенность церкарий у улиток *Indoplanorbis exustus* составила 94,3%. Всего обнаружено 224 эхиностомных церкарий по сравнению с 5 фуркоцеркозными церкариями. Церкарии *Echinostoma* sp., *Fasciola gigantica*, *Fasciolopsis buski*, обитающих в водохранилище Тунгу Пампанг, способны вызывать заболевания человека и животных. С трематодами личинок у улиток можно бороться с помощью снижения заражения паразитами, мониторинга, распространения информации и профилактического просвещения.

**Ключевые слова:** *Cercariae*, пресная вода, улитка, водохранилище, Макаassar, Индонезия.

## Introduction

The Tunggu Pampang Reservoir is one of the reservoirs located in the city of Makassar. The reservoir is used as a water catchment area. The reservoir is located in Manggala Sub-district, Makassar City. Other functions of the reservoir area was tourist attractions and fish farming locations so that the local community uses them for swimming, fishing, selling, and gardening. According to Selmi et al. (2019) anthropogenic loads such as ammonia (0.4127), nitrite (0.0397), lead (0.002), cadmium (0.003). Measurement of water temperature of 25–27°C, pH 8.3, Dissolved Oxygen (Do) of 5.9 mg/L [20]. All parameters are classified as normal in the Tunggu Pampang Reservoir. Apart from fish, there are several species of snails found in the reservoir. Several species of snails as intermediate hosts of helminth in animals and humans [14].

This infection occurs through a water medium. Snail species that can be intermediate hosts, such as *Brotia* sp., *Gyraulus* sp., *Bellamya* sp., *Melanoides* sp., *Indoplanorbis* sp., *Lymnaea rubiginosa* and *Biomphalaria* sp. [1, 7]. Helminth that can infect snails are one of the trematodes. This infection occurs through the intermediary of water. According to Malatji et al. (2019), lymnaeidae species snail is an intermediate host for trematodes in humans and livestock, especially *Fasciola* sp. [15].

Trematode larvae residing in the snails are sporocysts, reidia, and cercariae. Various types of cercariae that infect on snails. According to Ngern-Klun et al. (2006), type of cercariae is virgulate, lophocercous, monostome, and wer [18]. According to Chontanarath and Wongsawad (2013) type

is furcocercous cercaria, megalurous cercaria and gymnocephalous cercaria [7].

The water comes from several sub-districts in the Makassar and parts of the Gowa regency to the Tunggu pampang reservoir. The existence of various types of freshwater snails in the reservoir has the potential to act as intermediate hosts for trematodes. Therefore, a study was conducted on the presence of cercariae in freshwater snails. There is no data on the type of cercariae in snails in Tunggu Pampang Reservoir.

## Materials and methods

This research is a descriptive survey to determine the distribution of trematode larvae in the Tunggu Pampang Reservoir. The stages of this research began with sample collection in the field and laboratory examinations. This research was conducted from January to June 2018. This research was conducted at the Tropical Disease Laboratory of Departemen DIII Medical Laboratory Technology, Faculty of Health Technology, Megarezky University.

Freshwater snails were collected at several points in the reservoir. Snail collection using hand collecting method. The snails were put into a plastic bag with different types of snails and site of collection. Snails identified refer to Chontanarath and Wongsawad (2013) [7]. Freshwater snails are placed on a petri dish and gently crushed by the snail shells using a stamper. Dropped with aquadest on the crushed snail shell. The next step was observed using a microscope to determine the presence of cercariae. Cercariae found then identified according to morphological classification as previously study [6, 9, 23].

**Table 1. The number of cercariae infections in snails**

Snails species	Number examined	Infected snails (n)		Larva trematode (n)		
		–	+	Sporocysts	Redia	Cercariae
<i>Pila</i> sp.	100	97	3	2	5	0
<i>Bellamya</i> sp.	100	70	30	3	45	1
<i>Lymnaea rubiginosa</i>	100	66	34	19	35	7
<i>Indoplanorbis exustus</i>	100	40	60	6	298	216
<i>Melanoides</i> sp.	100	60	40	16	90	5
<b>Total</b>	<b>500</b>	<b>333</b>	<b>167</b>	<b>46</b>	<b>473</b>	<b>229</b>

### Results

A total number of 500 snail were collected at Tunggu Pampang reservoir in Manggala Sub-district, Makassar. Snails classified into 5 genera, including *Ampullariidae* (*Pila* sp.), *Viviparidea* (*Bellamya* sp.), *Lymnaeidae* (*Lymnaea rubiginosa*), *Planorbidae* (*Indoplanorbis exustus*), and *Thiaridae* (*Melanoides* sp.) (Fig. 1). All collected snail species found trematode larvae in Tunggu Pampang reservoir. The results showed that overall snails infected with cercariae was 33.4% (167/500).

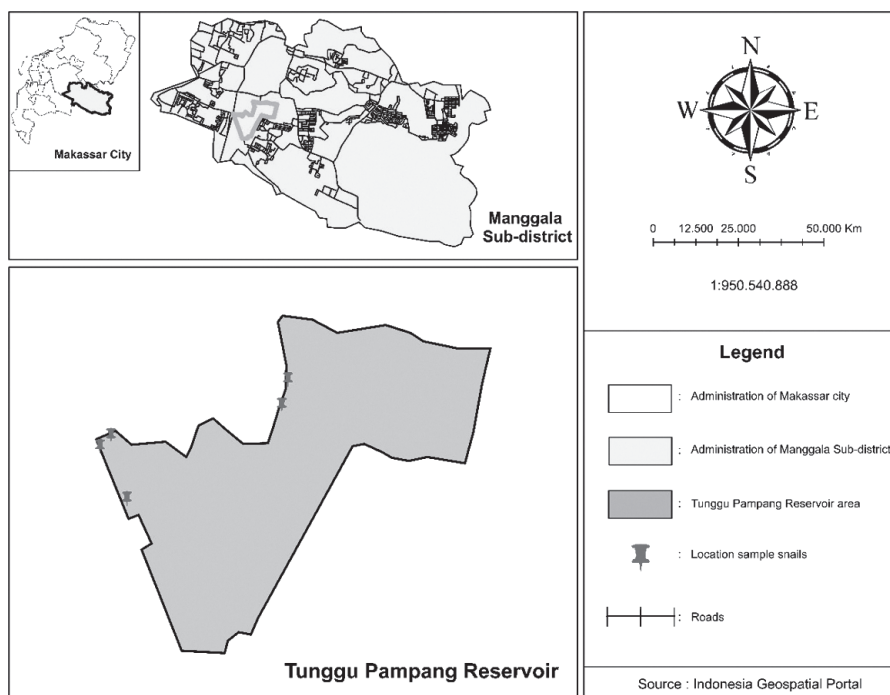
Species of snails, such as *Pila* sp., *Bellamya* sp., *Lymnaea rubiginosa*, *Indoplanorbis exustus*, and *Melanoides* sp., found sporocysts, redia, and cercariae in Tunggu Pampang Reservoir (Fig. 2, see color plate, p. II). The highest prevalence of cer-

cariae in *Indoplanorbis exustus* was 94.3% (216/229) compared to cercariae in other species of snails (Table 1).

Type of cercariae dominated echinostome than furcocercous. *Echinostome cercariae* found in *Bellamya* sp., *Lymnaea rubiginosa*, and *Indoplanorbis exustus*, while furcocercous cercariae found in one types of snail, such us, *Melanoides* sp. Total of *Echinostome cercariae* found (n = 224) compared to furcocercous cercariae (n = 5) in all snail (Table 2).

### Discussion

Almost all mollusks that have the role of intermediate host for trematode are freshwater snails. The overall of trematode life cycle begun fecal



**Figure 1. Map of the sampling sites**

**Table 2. Type of cercariae infections in snails**

Snails species	Type cercariae (n)	
	Echinostome	Furcocercous
<i>Pila</i> sp.	0	0
<i>Bellamya</i> sp.	1	0
<i>Lymnaea rubiginosa</i>	7	0
<i>Indoplanorbis exustus</i>	216	0
<i>Melanoides</i> sp.	0	5
<b>Total</b>	<b>224</b>	<b>5</b>

mammals or human containing trematode eggs in water develop into miracidium. Miracidium enters the body of the snail and transform into sporocyst, redia, and cercariae. Cercariae infected humans in water through skin pores or become metacercariae and adhere to aquatic plants.

This study was the first known report on cercariae infection in snails freshwater at Tunggu Pampang Reservoir, Makassar City. Species snail found at Tunggu Pampang Reservoir was *Pila* sp., *Bellamya* sp., *Lymnaea rubiginosa*, *Indoplanorbis exustus*, and *Melanoides* sp. According to Chontanarith et al. (2013); Chontanarith et al. (2017) and Dodangeh et al. (2019), infected snail species, such as *Pila* sp., *Pomacea* sp., *Indoplanorbis exustus*, *Lymnaea auricularia*, *Melanoides tuberculata* and *Bellamya bengalensis* [6, 7, 8].

This study showed that all species of snails found sporocysts, redia, and cercariae. Total prevalence of cercariae infection found in Tunggu Pampang Reservoir (45.8%) as similar to that of the previous report by Anucherngchai et al. (2016) in Chao-Phraya Basin, Central Thailand, which the prevalence of cercariae infection at 5.90% [1]. According to Anucherngchai et al. (2017) overall prevalence cercariae was 7.92 in the snail intermediate hosts from Ratchaburi Province, Thailand [2]. Percentage of prevalence cercariae was 2.57 in Laguna, Philippines [19]. The findings of cercariae in various types of snails in Tunggu Pampang Reservoir because many aquatic plants such as water hyacinth in several sites in the reservoir. The community around cultivated certain parts of the Tunggu Pampang Reservoir. Aquatic plants near the reservoir are feed for freshwater snails.

The highest quantity of cercariae found in *Indoplanorbis exustus* was 94.3% (216/229). According to Chontanarith et al. (2017), the prevalence of cercariae in the snails *Indoplanorbis exustus* was 0.64% [6]. Cercariae infected *Indoplanorbis exustus* snails was 4.9% [1]. According to Chontanarith and Wongsawad (2013), cercariae infected *Indoplanorbis exustus* was 0.2% [7]. The location of *Indoplanorbis*

*exustus*, snail collection is close to an aquatic plant was water hyacinth on the side of Tunggu Pampang reservoir. The existence of *Indoplanorbis exustus* in the Tunggu Pampang Reservoir probably originated from the water of Pampang canal, Gowa canal, and Perumnas canal that accommodated in the reservoir. The function of the Tunggu Pampang Reservoir prevent flooding in parts of Makassar City and Gowa Regency.

There are two type of cercariae were found in snails. The difference of cercariae based on morphologically, place and number of sucker. The types of cercariae found are echinostome and furcocercous. *Echinostome cercariae* (n = 224) predominated compared to furcocercous cercariae (n = 5) found in snails. *Echinostome cercariae* found the body snails, such as *Bellamya* sp., *Lymnaea rubiginosa*, and *Indoplanorbis exustus*. *Echinostome cercariae* body is long shape. The oral sucker is round in shape and position on the sub-terminal part of the body and has collar spines. The position of the ventral sucker is two-thirds down the end of the body. The tail is thin and almost the same length as the body cercariae [6]. According to Martin et al. (2018) the adult trematode species of *Echinostome cercariae* was *Echinostoma* sp. found in Barangay Cawongan, Philippines [16]. According to Mareta et al. (2019) *Echinostome cercariae* causes echinostomiasis in humans and livestock [17]. According to Hairani et al. (2016) and Hairani et al. (2018), *Echinostome cercariae* confirmed as *Fasciola gigantica*, *Fasciolopsis buski* in Hulu Sungai Utara Regency, South Kalimantan [12, 13]. Humans infected *Echinostoma* sp., *Fasciola gigantica*, and *Fasciolopsis buski* because of consumption of undercook aquatic plants, fish, snail. Humans are infected with trematode because cercariae enters to skin pores through fishing, swimming, and farming in Tunggu Pampang Reservoir.

In this study, furcocercous cercariae was only found in *Melanoides* sp. This snail is medically important because they serve as the intermediate host for intestinal trematodes [4]. *Melanoides* sp. is an intermediate host of paragonimiasis and digestive trematodes. The body of furcocercous cercariae is long, flat, and oval shaped. The oral sucker is located in the front of the body. Position of ventral sucker at two-thirds of its body-length. The tail of this cercariae is longer than the body and divisible into two furca [1]. According to Anucherngchai et al. (2017), furcocercous cercariae found in Ratchaburi Province, Thailand, and Yousif et al. (2010) furcocercous cercariae were also found in Egypt, respectively in *Melanoides tuberculata* [2, 24]. Furcocercous cercariae can develop into the trematode of family cyathocotylidae [6]. Adult Trematode stages of furcocercous cercariae are strigeidae, diplostomidae, schistosomatidae and sanguinicolidae [10].

*M. tuberculata* snails and their potential of zoonosis diseases such as heterophyiasis, schistosoma dermatitis, echinostomiasis, and philophthalmiasis in humans and animals [11].

The presence of cercariae can infect human skin that works in the water of the Tunggu Pampang Reservoir. Diseases caused by cercariae infections such as fasciolopsiasis and echinostomiasis. Symptoms of fasciolopsiasis include minor infections such as anemia, eosinophilia, dizziness, and gastrointestinal disorders. Moderate and severe infections occur when parasites on the colon and stomach. A patient has epigastric pain, diarrhea, nausea, acute ileus, anasarca, leucocytosis with

eosinophilia [3, 21]. Pain caused by echinostomiasis is epigastric, fatigue, diarrhea, and weight loss. Patients infected with echinostomiasis experience acid reflux, anorexia, headaches, nausea and vomiting, and urinary incontinence [5, 22].

In summary, the highest quantity of *Echinostome cercariae* found in *Indoplanorbis exustus* at Tunggu Pampang Reservoir. This cercariae potential for establishment of zoonosis diseases, such as *Echinostoma* sp., *Fasciola gigantica*, *Fasciolopsis buski* in human and animal. Larval trematodes can be controlled in snails using reducing parasite contamination, monitoring surveillance, information dissemination, and preventive education.

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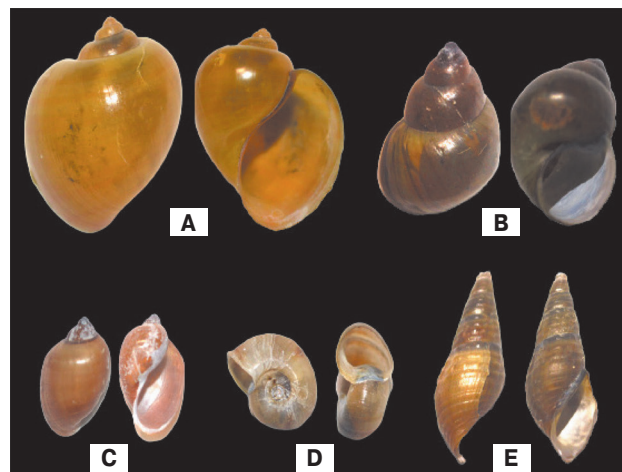
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**Иллюстрация к статье «Тип церкарий в пресноводных улитках водохранилища Тунгу Пампанг, город Макаassar, Индонезия» (авторы: А.Р. Джабал, Д. Мутиасари, Х. Акбар, М. Арфах, Мархани, Рини, Н.А. Собак, А.Д. Пису, А.И. Тоэмон, А. Ратнасари) (с. 765–770)**

Illustration for the article “Type of cercaria in freshwater snails at Tunggu Pampang reservoir, Makassar City, Indonesia” (authors: Jabal A.R., Mutiasari D., Akbar H., Arfah M., Marhani, Rini, Sobak N.A., Pisu A.J., Toemon A.I., Ratnasari A.) (pp. 765–770)



**Figure 2. Snails collected from Tunggu pampang reservoir. A) *Pila* sp., B) *Bellamya* sp., C) *Lymnaea rubiginosa*, D) *Indoplanorbis exustus*, E) *Melanoides* sp.**