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Lymnaea Rubiginosa as a Host Found in the Babura River, Medan City

Masdiana Sinambela[1*], Andreas Simorangkir[2], Tonggo Sinaga[3]
[1,3]Biology Department, Mathematics and Natural Sciences Fakulty, Universitas Negeri Medan, Indonesia
[2]Kementrian Tenaga Kerja, Kepulauan Pangkajene, Sulawesi Selatan, Indonesia
Email: masdiana@unimed.ac.id

ABSTRACT

Lymnaea rubiginosa as a snail host found in the Babura River, Medan City, is a type of snail that is known to be an intermediate host in the life cycle of several trematode worms. Lymnaea rubiginosa was collected using net sources at four research stations and there were 10 sub stations at each research station. Research in 2023 found Lymneae rubiginosa in juvenile form and only at station two was it found, and even then only in one collection and only one individual. Snails can be infected by Fasciola gigantica and by other trematodes such as Echinostoma sp. and Trichobilharzia sp. as well as oligochaete worms, namely Chaetogaster sp. Chaetogaster sp. infection in Lymnaea rubiginosa snails originating from rice fields and ponds shows that the spread of these worms is widespread. If it is suspected that the worm is capable of preying on the Fasciola gigantica miracidium, then Chaetogaster sp. more effective for use as a biological control. If the Lymnaea rubiginosa snail has been infected with E. hystricosum, then the snail cannot be infected again with other trematodes such as Trichobilharzia brevis. There seems to be a mechanism that inhibits the occurrence of mixed infections. Trematode and oligochaete worm infections in the snail's body can affect the development and growth of the snail. There is no mixed infection between two types of trematodes, namely Echinostoma sp. and Streigidae in a snail Lymnaea rubiginosa supports the phenomenon of antagonism.

KEYWORDS *Lymnaea Rubiginosa, Survival, Growth Rate, Fasciolosis, Control Biologis*

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INTRODUCTION

Each species has a specific place to live, known as a niche. An ecological niche is a particular place of a species in its community and the habitat it occupies, as a result of the structural adaptations it obtains through physiological adjustments or adaptations as well as special behavioral patterns in terms of making good use of its potential. So an ecological niche is a certain combination of physical factors (microhabitat) and biotic relationships (roles) that are needed by a species for its life activities and continued existence in a community. Niche width is the volume area or volume of the niche. This depends on the number of environmental dimensions. Species that have a wide niche indicate their ability to exploit available resources (food, habitat, time, etc.) (Abubakar *et al*, 2018). The species found were *Brotia subgloriosa*, *Brotia peninsularis*, *Brotia castulata*, *Pomacea diffusa*, *Pomacea paludosa*, *Filopaludina polygramma*, *Filopaludina sp*, *Melanoides tuberculate*, *Lymnaea sp*, *Emilia sp*, *Corbicula sumatrana*, *Corbicula fluminea*, *Corbicula japonica*, *Pilsbryoconcha exilis*, and *Anodonta sp*. *Lymneae rubiginosa* by current flow, The gastropods markers in the Babura river are *Lymnaea rubiginosa* and *Clea (Anentome) helena*. Gastropod community in the river consisted of : 6 genera, namely, (1) Pomacea, (2) Filopaludina, (3) Lymnaea, (4) Terebia, (5) Melanoides, (6) Thiara and 1 sub-genera, namely Clea (Anentome) (Sinambela *et al*, 2023).

Snails can also be infected by *Fasciola gigantica* and by other trematodes such as *Echinostoma sp*. and *Trichobilharzia sp*. (Lie *et al*., 1973; Ong and Kuan, 1973; E, 1992b), as well as oligochaeta worms, namely *Chaetogaster sp*. (Khalill, 1961; Michelson, 1964). The presence of trematode and oligochaete worm infections in the snail's body can affect the development and growth of the snail (Ong and Kuan, 1973). According to Backlund (1949) and Khalill (1961), *Chaetogaster sp*. can prey on *Fasciola hepatica* and *Fasciola gigantica* cercariae.

According to Widjajanti, 1998, the longer the snail's house, the shorter its survival rate and the less egg production it will produce. The time required to hatch is between 10-14 days and to reach a cochlea length of 1 cm it takes approximately 6 weeks. There is no mixed infection between two types of trematodes, namely *Echinostoma sp*. and Streigidae in a snail *Lymnaea rubiginosa* supports the phenomenon of antagonism. The presence of Chaetogaster sp. in *Lymnaea rubiginosa* snails originating from rice fields and ponds shows that the distribution of these worms is very wide. If it is suspected that the worm is capable of preying on the *Fasciola gigantica* miracidium, then *Chaetogaster sp*. It is more effective to be used as a biological control for fasciolosis, because of its wide spread, but still needs further research.

The longer the snail's house, the shorter its survival rate and the less egg production it will produce. The time required for *Lymnaea rubiginosa* snail eggs to hatch is between 10-14 days, which is almost the same as the time required for *Lymnaea truncatula* snail eggs in summer at temperatures between 21-30^{0}C, namely between 11-12 days (Kendall 1953). Actually, the egg hatching time for *Lymnaea sp*. snails.

Those in countries that have four seasons are greatly influenced by environmental temperature.

For example, *Lymnaea truncatula* snail eggs at temperatures between 10-11^{0}C can only hatch after 29-32 days, whereas at temperatures between 16-21^{0}C the eggs can hatch after 12-13 days (Kendall, 1953). The ability of newly hatched snails to reach maturity and produce eggs is also influenced by the temperature of their environment. For example, the snail *Lymnaea truncatula* first produces eggs when the cochlea is 4.42 mm long, namely 38 days at a temperature of 16^{0}C and 15 days at a temperature of 25^{0}C (Smith, 1981). Meanwhile, *Lymnaea tomentosa* begins to produce eggs after 5 weeks with a cochlea length of between 6-8 mm (Boray, 1964). In this study, the time required for the snail *Lymnaea rubiginosa* to reach a cochlea length of 1 cm (10 mm) was 6 weeks at a temperature of 27^{0}C. However, the ability of these snails to produce eggs was not explored/observed further, due to limited research time. Moreover, the number of snails that can reach this size is relatively small, namely between 10-23 individuals.

Echinostoma sp infection. This occurs at a higher rate in large snails than in small snails, which indicates that the trematode infection is continuous or over a long period so that large snails are more likely to be infected. The final hosts of these trematodes are thought to be animals around the rice fields such as mice and frogs. On the other hand, small snails were more infected with Streigidae than large snails. This is probably because small snails are more sensitive to Streigidae infections, their cochlea is thinner than large snails, and infections only occur at certain times. This incident is the same as that stated by Lie *et al*. (1973), who found that if the snail *Lymnaea rubiginosa* was infected with *E. hystricosum*, the snail could not be infected again with other trematodes such as *Trichobilharzia brevis*. So, it is as if there is a mechanism that inhibits the occurrence of mixed infections. E, (1998) found that there was a strong antagonism phenomenon between *E. revolutum* and *Fasciola gigantica* larvae, because within 30 days after *Lymnaea rubiginosa* snails were infected simultaneously with both types of larvae, *Lymnaea rubiginosa* snails were only infected by *E. revolutum*. From the observations of Ong and Kuan, (1973), it is known that *E. audyi* can damage the digestive glands and reproductive organs of *Lymnaea rubiginosa* snails, so that it can disrupt the snail's reproductive process, resulting in a decrease in egg production.

RESEARCH METHOD

Rivers are dynamic ecosystems that are open, allowing external factors to influence river ecosystems. River ecosystems are influenced by natural and human activities in the river basin. In general, human activities that affect river ecosystems include agricultural, residential and industrial activities. Directly or indirectly, garbage, or agricultural, residential and industrial waste entering rivers can cause changes in the physical, chemical and biological properties of rivers and reduce the quality and use value of river water. There are four research stations as in Figure 1.

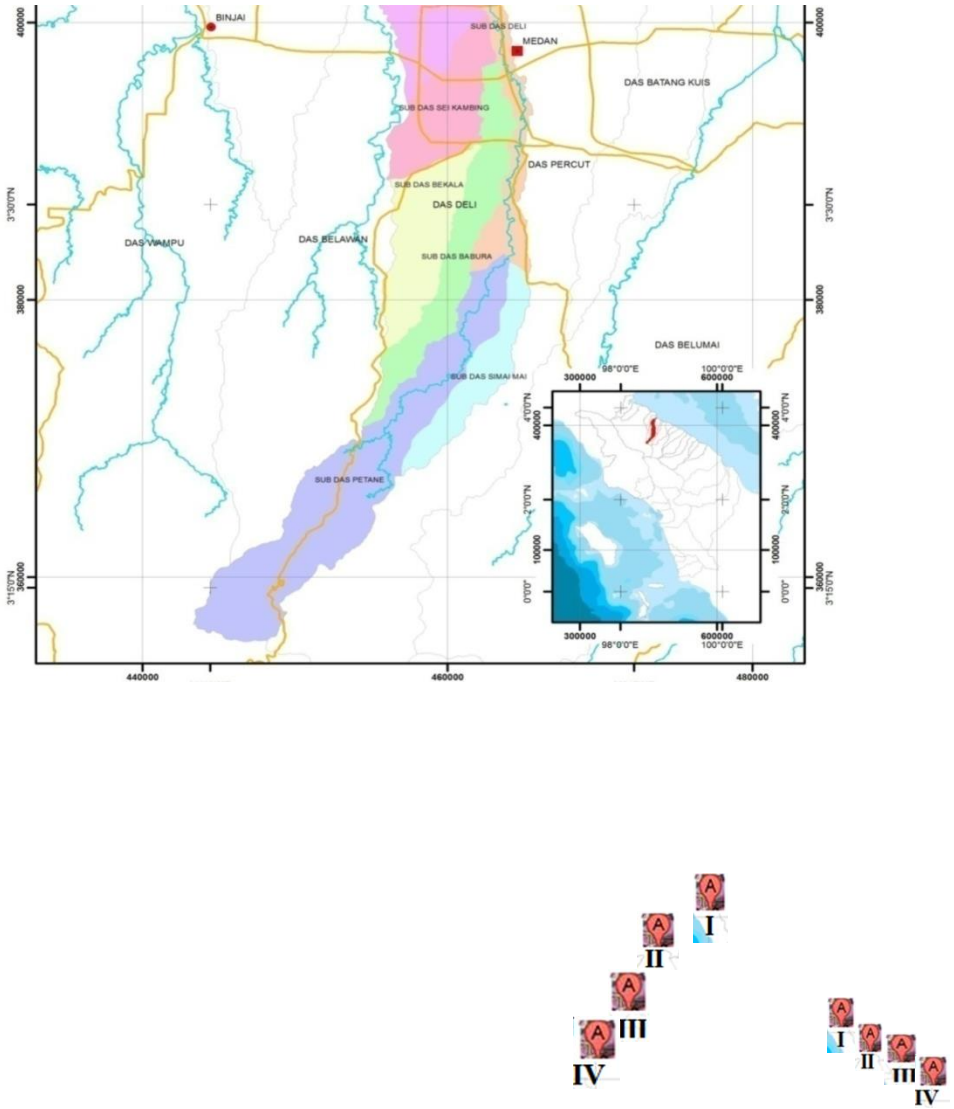


Figure 1. Sampling Research Station on the Babura River
(modifikasi from Sinambela *et al*, 2019)

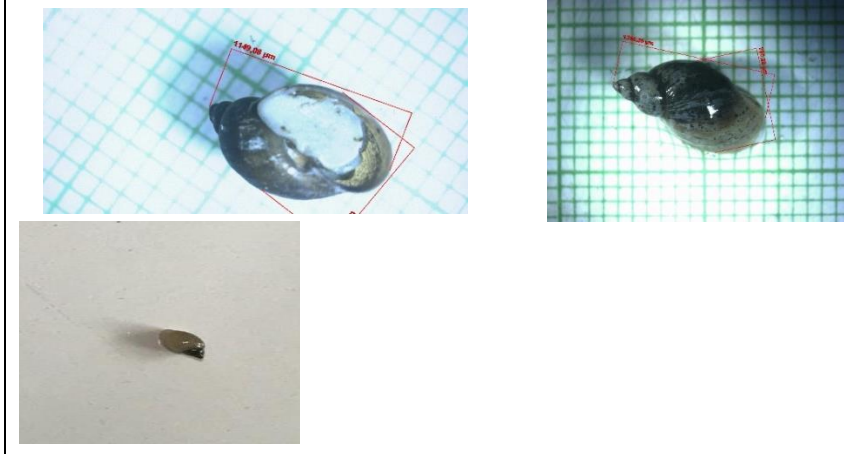
RESULT AND DISCUSSION

The Thiaridae family is the most frequently found family with 3 species, then the Cyclophoridae, Dyakidae, Trochomorphidae, Ariophantidae, Pachychilidae, and Lymnaeidae families, 1 species each (Sulistiyawati *et al*, 2023). A river is a dynamic system with all activities taking place between environmental components within and around it. These dynamics will cause a river to be in ecological balance as long as it does not receive foreign materials from outside. Within a certain range, the influence of foreign materials can still be tolerated and balance conditions can still be maintained (Barus, 2020).

Lymnaea sp.

Lymnaea sp. is one of the mollusks included in the class Gastropoda which breathes through the lungs (pulmo) so that in the classification it is classified as a subclass Pulmonata, while Yasin (1988) included it in the order Pulmonata. Complete taxonomic position of *Lymnaea sp*. according to Yasin (1988) as follows:

Kingdom : Animalia
Phylum : Mollusca
Class : Gastropods
Order : Pulmonata
Sub order : Basommatophora
Family : Lymnaeidae
Genus : Lymnaea
Species : *Lymnaea rubiginosa*.



a b c

Figure 2. a and b were discovered in 2017 and c was discovered in 2023

Based on Sinambela's research in 2017, 2 individuals found *Lymnaea rubiginosa* in adult form, while in 2023 one individual found *Lymneae rubiginosa* in juvenile form.

According to Sinambela *et al*, 2023, only 1 species of *Lymnaea sp* was found out of 104 individuals at station 2 on a sand substrate.

The classification of all these animal groups consists of three major races of local variation under the super species *Lymnaea auricularia* (L.). Species that are often studied include *Lymnaea rubiginosa* with other names *Lymnaea javanica* (Jutting, 1956) and *Lymnaea stagnalis* (Adiyodi and Adiyodi, 1983). According to E, (1998), *Lymnaea rubiginosa* snails infected with E. revolutum have high growth rates and mortality rates and egg production is hampered due to damage to the gonads.
Morphological characteristics of *Lymnaea sp*.

The shell is 30-34 mm high, 18-20 wide, aperture 20-24 mm high. The shell is thin, has approximately six shell rounds with the bottom round being slightly flat, the sutures are clearly visible, the peripheral part of the whorl is rounded. The shell has a mulberry yellow or bright yellow color, sometimes there are longitudinal color stripes with the surface of the shell covered by a thin layer of periostracum and is often mixed with other materials. The shell aperture is wide and sharp and has no operculum. The legs are wide, the tentacles are flat triangular in shape with the eyes located at the base of the tentacles (Jutting, 1956). The diameter of the shell reaches 20 mm, oval, with small and pointed tendrils, the round is slightly puffy, the bottom round is large and puffy, the edge of the shell is rounded or angled. The umbilicus (navel) is closed, the columella (shell axis) is twisted, the shell mouth is large, the edge (shell lip) is thin and brittle. *Lymnaea sp*. is a snail that is commonly found (cosmopolitan) in Indonesia, living in calm and slow-flowing fresh waters, swamps and lakes. Able to live from waters near the coast to waters at an altitude of 2,000 above sea level, sometimes it can also be found in warm water (34°C) (Jutting, 1956). In dry conditions, these animals migrate downward by digging holes and sleeping during the bad dry season. The ability of this animal to survive in laboratory conditions can survive for more than three years (Pennak, 1991).

This snail is hermaphrodite, the marriage is cross fertilization. The eggs produced are collected in gelatin material and placed on aquatic plants, rocks or objects in the water (Pennak, 1991). According to Adiyodi and Adiyodi (1983), mollusk egg membranes generally consist of a primary membrane (vitelline membrane), a secondary membrane (chorion) which is formed in the gonad and a tertiary membrane which is formed by accessory glands or the reproductive tract. *Lymnaea stagnalis* has 2 perivitelline membranes in which there is perivitelline fluid containing galactogens and proteins; The first perivitelline membrane contains sulfate, while the second is a mixture of sulfate and non-sulphate-mucopolysaccharide. That perivitteline fluid is a source of embryo nutrition, especially containing galactogens, protein and calcium.

A characteristic of the early development of gastropod embryos is the spiral cleavage type, as well as in Lymnaea (Slack, 1991) where after stage 4 blastomeres, the cells resulting from the next division (micromeres) occupy an area that is clockwise or counterclockwise. O'clock. The results of previous observations by researchers showed that after the embryo was 72 hours old, the formation of the embryo began to

elongate and at the age of 84, signs of the formation of the heart, eyes and mouth began to appear.

Macrozoobenthic species in the former clay mining reservoir area of PT Semen Indonesia (Persero) Tbk Tuban factory from 2017 to 2023 consist of 19 species with the macrozoobenthic species that are always found being *Bellamya javanica*, *Lymnaea rubiginosa*, *Pomacea canaliculata*, and *Tarebia granifera* which have functions and roles. as a bioindicator of water quality, decomposer, control of invasive aquatic plants, detritivores, intermediate parasite hosts, sediment bioturbation agents, and biocontrol of aquatic food chains (Oktafitria *et al*, 2024). The types of gastropods that are distributed and develop in rice fields, ponds, irrigation, rivers and lakes can be found in the types *Pomacea canaliculata*, *Melanoides tuberculata*, *Bellamnya javanica*, *Pila scutata*, and *Pila ampullacea*, *Lymnaea rubiginosa*, *Contradens contradens*, *Brotia testudinaria* (Fadhilah *et al*., 2013).

CONCLUSION

If *Lymnaea rubiginosa* has been infected with *E. hystricosum*, the snail can no longer be infected by other trematodes, namely *Trichobilharzia brevis*. There seems to be a mechanism that inhibits the occurrence of mixed infections. Trematode and oligochaete worm infections in the body of the snail *Lymnaea rubiginosa* can affect the development and growth of the snail. *Lymnaea rubiginosa* eggs hatch between 10-14 days and to reach a cochlea length of 1 cm it takes about 6 weeks. There is no mixed infection between two types of trematodes, namely *Echinostoma sp*. and Streigidae in a snail *Lymnaea rubiginosa* supports the phenomenon of antagonism.

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