Fisheries Journal, 16 (3), 1366-1372 (2026)
http://doi.org/10.29303/jp.v16i3.2225

COMPARATIVE STUDY OF ENDOPARASITE INFECTIONS IN THE DIGESTIVE TRACT OF RED TILAPIA (*Oreochromis niloticus*) UNDER DIFFERENT AQUACULTURE SYSTEMS

Studi Komparatif Infeksi Endoparasit pada Saluran Pencernaan Ikan Nila Merah (*Oreocromis* niloticus) dengan Sistem Budidaya yang Berbeda

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(Received May 7th 2026; Accepted June 10th 2026)

ABSTRACT

Red tilapia (*Oreochromis niloticus*) is a freshwater commodity that is widely cultivated and has become one of the most popular fish for consumption among communities. Red tilapia is extensively farmed because it has several advantages, such as rapid growth, tolerance to both low and high temperatures, and euryhaline characteristics. In addition to these advantages, red tilapia farming also has weaknesses, one of which is parasitic infection. One of the causes of decreased productivity is parasite infection. Parasites are microorganisms that can infect many fish species; therefore, the researcher is interested in conducting this study to increase knowledge about the types of endoparasites, which is very important to facilitate handling when fish are infected by endoparasites. This research will be conducted for one month, and fish samples will be collected from different aquaculture systems. Parasite observations will be carried out at the Laboratory of the Fish Quarantine Station for Quality Control and Safety of Fishery Products (SKIPM) Class I Gorontalo. This study uses a descriptive method with a comparative approach. This research method is intended to describe every existing phenomenon, which may include forms, activities, characteristics, changes, relationships, similarities, and differences among phenomena (Rosita et al., 2023). When this method is combined with a comparative approach, the focus is on comparing two or more groups. Endoparasite examination will be conducted using the native method. The target organs examined include the digestive tract organs, namely the stomach and intestine.

Keywords: Endoparasites, Red Tilapia, *Oreochromis niloticus*

ABSTRAK

Ikan nila (*Oreochromis nilocitus*) merupakan komoditi air tawar yang sering dibudidayakan dan menjadi salah satu ikan konsumsi yang sangat digemari oleh Masyarakat. Ikan nila merah

banyak dibudidayakan karena mempunyai kelebihan seperti pertumbuhan yang cepat, toleransi terhadap suhu rendah dan tinggi serta sifat euryhaline. Selain kelebihan di atas, beternak ikan nila merah juga memiliki kelemahan yaitu adanya infeksi parasit. Salah satu penyebab penurunan produktivitas ini adalah infeksi parasit. Parasit merupakan salah satu mikro orgnaisme yang dapat menginfeksi banyak spesies ikan, oleh karena itu peneliti tertarik untuk melakukan penelitian ini agar menambah pengetahuan tentang jenis-jenis endoparasit sangat penting untuk memudahkan penanganan bila ikan terinfeksi endoparasit. Penelitian ini akan dilaksanakan selama satu bulan, sampel ikan diambil dari system budidaya yang berbeda. Pengamatan parasit akan dilakukan di Laboratorium Stasiun Karantina Ikan Pengendali Mutu Dan Keamanan Hasil Perikanan (SKIPM) Kelas 1 Gorontalo. Penelitian ini menggunakan metode deskriptif dengan pendekatan komparatif. Metode penelitian ini ditunjukan untuk mendeskripsikan setiap fenomena yang ada, dapat berupa bentuk, aktivitas, karakteristik, perubahan hubungan, kesamaan dan perbedaan antar fenomena (Rosita et al., 2023). Ketika metode ini digabungkan dengan pendekatan komparatif, fokusnya adalah membandingkan dua atau lebih kelompok. Pemeriksaan endoparasit dilakukan dengan metode natif. Organ target yang diperiksa meliputi bagian tubuh saluran pencernaan yaitu lambung dan usus/ intestine.

Kata Kunci: Endoparasit, Ikan Nila Merah, *Oreocromis nilotiicus*.

INTRODUCTION

Tilapia (Oreochromis nilocitus) is a freshwater commodity that is often cultivated and is one of the food fish that is very popular with the public. The productivity of tilapia fish is quite high and has a large body weight. Tilapia fish are not only cultivated in ponds but can be cultivated in various media such as earth ponds, concrete ponds, plastic ponds, fast water ponds, and floating net cages. One of the causes of this decrease in productivity is parasitic infections. Parasites are microorganisms that can infect many fish species. Fish are living creatures that are never free from the threat of various diseases, one of which is infectious diseases, where infectious diseases are diseases caused by disturbances in fish metabolism by foreign organisms, such as viruses, bacteria and parasites (Melisa, et al., 2023).

One of the infectious diseases can be caused by endoparasites. Endoparasites are parasites that live in organs in the body such as the liver, spleen, brain, digestive system, blood circulation, abdominal cavity, muscle and other body tissues. Each type of parasite has a different habitat in the host as a place to live. The presence of endoparasites can cause death in the host population and can cause losses to the fishing industry (Lopes Amaral et al., 2024). Currently research on parasites in fish is still being carried out, therefore researchers are interested in conducting research "Comparative Study of Endoparasitic Infections in Red Tilapia (Oreochromis nilocitus) with Different Cultivation Systems". Knowledge about the types of endoparasites is very important to facilitate handling if fish are infected with endoparasites.

RESEARCH METHODS

This study employed a descriptive method with a comparative approach. Descriptive methods are used to describe phenomena occurring in the research object, such as its form, activity, characteristics, relationships, similarities, and differences between the observed phenomena (Rosita et al., 2023). The comparative approach was used to compare endoparasite infection levels in red tilapia (Oreochromis niloticus) reared in different cultivation systems: intensive, semi-intensive, and traditional.

The study was conducted over a one-month period. Fish samples were collected at several red tilapia cultivation locations using different cultivation systems. The obtained fish

samples were then taken to the Class I Gorontalo Fish Quarantine Station Laboratory for Quality Control and Safety of Fishery Products (SKIPM) for endoparasite examination. Endoparasite examination was conducted using the native method. The target organs observed included the fish's digestive tract, namely the stomach and intestines. These organs were dissected and then observed under a microscope to identify the types of endoparasites found. Parasite identification was based on morphological characteristics visible on the observation slides.

The main parameters in this study included the prevalence and intensity of endoparasites in red tilapia. Prevalence was calculated to determine the percentage of fish infected with parasites in the sample population, while intensity was calculated to determine the average number of parasites infecting each infected fish. In addition to the main parameters, water quality parameters were also measured as supporting parameters. Observed water quality parameters included physical parameters such as temperature and chemical parameters such as pH. Water quality measurements were conducted each time samples were taken at each research location. Data from the identification of endoparasite types were analyzed descriptively and presented in the form of descriptions and images of the observation results. Data on endoparasite prevalence and intensity were presented in tabular form to compare parasite infection levels in each cultivation system (Azisah et al., 2023).

RESULT

The research on "Comparative Study of Endoparasite Infections in the Digestive Tract of Red Tilapia (Oreochromis niloticus) with Different Cultivation Systems" was carried out in stages including fish sampling, endoparasite identification, and comparative data analysis between cultivation systems. Red tilapia samples were taken from three different cultivation systems: earthen ponds, tarpaulin ponds, and floating net cages. Each sampling location was selected based on representative cultivation conditions, with a sufficient number of fish to provide statistically significant test results. The examination stages were carried out systematically in the laboratory, observing fish parasite examination standards.

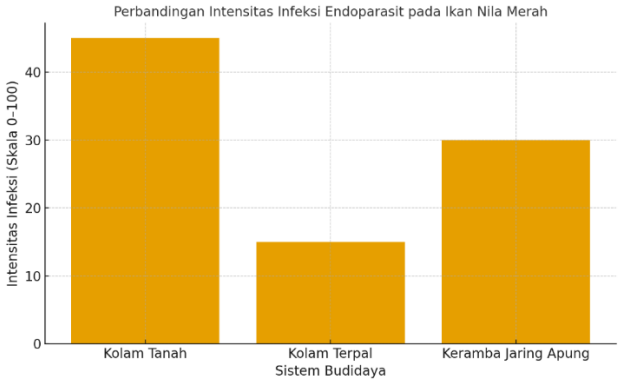

Figure 1. Comparison of Endoparasite Infection Intensity in Red Tilapia

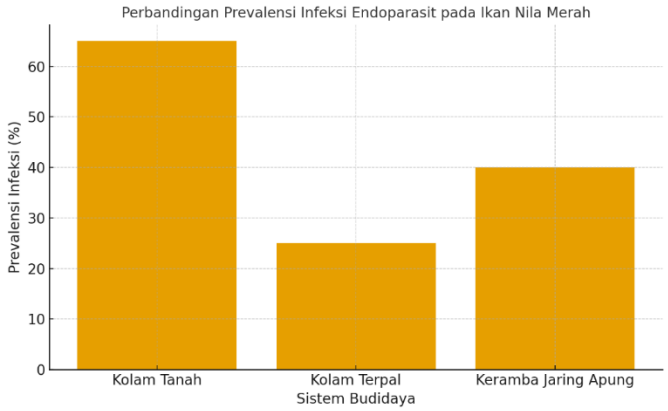

Figure 2. Comparison of the prevalence of endoparasite infections in red tilapia

Examination results showed differences in the levels of endoparasite infection in the digestive tracts of red tilapia between different culture systems. Fish reared in earthen ponds showed a higher infection prevalence compared to those in tarpaulin ponds and floating net cages. The dominant endoparasite species found included Dactylogyrus sp., Gyrodactylus sp., and Camallanus sp., with varying intensity depending on the aquatic environment and the culture system. Factors such as water quality, stocking density, and feeding management also influenced the infection rate.

In the tarpaulin pond system, results showed a relatively low infection rate. This is likely due to the more controlled environment, ease of cleaning, and minimal contact with natural sources of infection such as mud or wild organisms. Meanwhile, in the floating net cage system, mild to moderate infections were found, likely caused by open water flow that allows parasites to enter from the surrounding environment. These findings suggest that closed culture systems tend to be safer from the risk of parasite infection than open systems.

Laboratory analysis showed changes in the morphology and physiology of infected red tilapia, such as damage to the intestinal wall, excess mucus, and weight loss. Furthermore, infected fish exhibited decreased feeding activity and slower movement compared to healthy fish. These observational data reinforce the hypothesis that endoparasite infections significantly impact the health and growth of red tilapia, especially when not accompanied by proper culture management.

Overall, the results of this study provide a comprehensive overview of the relationship between culture systems and endoparasite infection levels in red tilapia. These findings are expected to inform the development of more effective parasitic disease control strategies. Furthermore, this research will provide farmers with a basis for selecting appropriate culture systems to minimize infection risk, increase productivity, and maintain optimal quality and ensure consumption.

DISCUSSION

Comparison of Endoparasite Infection Intensity in Red Tilapia

Based on the comparison of endoparasite infection intensity in red tilapia, it appears that the cultivation system influences the level of parasite infection in the fish. The highest infection intensity was found in the earthen pond cultivation system, at around 45, while the lowest was found in the tarpaulin pond, at around 15. Meanwhile, the floating net cage cultivation system showed a moderate intensity value, at around 30. This difference indicates that the cultivation environment significantly influences the development and spread of endoparasites in red tilapia (Oreochromis niloticus). The high infection intensity in earthen ponds is thought to be due to the pond bottom being in direct contact with the soil, allowing

for a higher accumulation of organic matter, leftover feed, and fish feces. These conditions can provide a favorable environment for the development of parasite eggs and larvae. Furthermore, water exchange in earthen ponds is generally lower than in other cultivation systems, making water quality more susceptible to deterioration and conducive to the spread of endoparasites. A poorly controlled aquatic environment can make fish more susceptible to stress and disease infection.

In the tarpaulin pond system, the endoparasite infection intensity was lowest. This is thought to be because tarpaulin ponds offer easier environmental management, such as a clean pond bottom and more regular water changes. The pond bottom, which is not in direct contact with the ground, also reduces the presence of parasite-carrying organisms. Furthermore, water quality in tarpaulin ponds tends to be more stable, suppressing endoparasite development and improving the health of red tilapia. Meanwhile, in the floating net cage system, infection intensity was moderate. This condition is likely influenced by the open water cultivation location, which allows for good water circulation and reduces the buildup of organic matter. However, the floating net cage system still carries the risk of parasite transmission from the surrounding environment and from other organisms living in the water. Fish density in the cage can also be a factor influencing parasite spread between fish.

Overall, the results of this study indicate that the cultivation system influences the intensity of endoparasite infections in red tilapia. Cultivation systems with good water quality and sanitation management tend to have lower infection rates. Therefore, environmental management, water quality monitoring, and biosecurity implementation are important factors in preventing endoparasite attacks and increasing the productivity of red tilapia cultivation.

Comparison of the Prevalence of Endoparasir Infection in Red Tilapia

Based on the results of a comparison of the prevalence of endoparasite infections in red tilapia (Oreochromis niloticus), differences in prevalence rates were observed across each culture system. The highest prevalence rate was found in earthen ponds, at approximately 65%, while the lowest prevalence rate was found in tarpaulin ponds, at approximately 25%. Meanwhile, the floating net cage culture system showed a prevalence rate of 40%. These results indicate that the culture system influences the rate of endoparasite spread in red tilapia.

The high prevalence of infection in earthen ponds is thought to be due to the culture environment being more easily contaminated by leftover feed, mud, and other organic matter. This accumulation of organic matter can provide a breeding ground for parasite eggs or larvae, increasing the risk of infection. Furthermore, water quality management in earthen ponds is generally more difficult to control than in other culture systems. Poor water quality can cause stress to fish, which weakens their immune system and makes them more susceptible to endoparasite infections.

In tarpaulin ponds, the prevalence of endoparasite infections was lowest compared to other culture systems. This is likely due to the cleaner and more easily controlled environment in tarpaulin ponds. More regular water changes and minimal direct contact with soil can reduce the presence of disease-causing organisms and parasite growth media. Furthermore, easier pond sanitation can also help suppress the spread of endoparasites in red tilapia.

Meanwhile, the prevalence of infection in floating net cage systems is moderate. This is likely influenced by the open water environment, which has adequate water circulation, which reduces the accumulation of organic matter. However, fish raised in cages are still potentially exposed to parasites from the surrounding environment, wild organisms, and other fish in the waters. High fish density in cages can also accelerate the spread of parasites from one fish to another if cultivation management is suboptimal.

Overall, the results of this study indicate that different cultivation systems influence the

prevalence of endoparasite infections in red tilapia. Cultivation systems with good water quality management and environmental hygiene tend to have lower infection prevalence rates. Therefore, implementing good cultivation management, water quality control, and maintaining environmental sanitation are important steps to prevent the spread of endoparasites and improve the health and productivity of red tilapia.

CONCLUSION

Based on the research results, it can be concluded that different cultivation systems affect the prevalence and intensity of endoparasite infections in red tilapia (Oreochromis niloticus). Earthen pond cultivation systems showed the highest infection rates, while tarpaulin ponds had the lowest, and floating net cages had a moderate level. These differences are influenced by the cultivation environment, water quality, sanitation, and fish management. Cultivation systems with more controlled water quality and better sanitation tend to suppress endoparasite development, thereby improving the health and productivity of red tilapia.

ACKNOWLEDGEMENT

Thank you to Gorontalo State University for the 2025 PNBP Grant with contract number 1854.a/UN47.B10/PT.01.03/2025 dated July 7, 2025. The author also expresses his gratitude and appreciation to all parties who have helped, both directly and indirectly, so that this research can be completed well.

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