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Intensity and prevalence of parasites in Tilapia *Oreochromis niloticus* in freshwater aquaculture ponds in Karangploso, Malang Regency, East Java.

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ABSTRACT

Parasitic infection in aquaculture can lead to primary infection due to decreased immunity of fish, making it easier for other microorganisms, both bacteria and viruses, to enter the fish's body. This study aims to determine and analyze the prevalence and intensity of parasites found in the freshwater aquaculture ponds of fish cultivator groups in Karangploso District, Malang Regency. This study used the scraping method by analyzing gills, mucus from the skin, fins and digestive tract on a glass object which was then observed microscopically using a light microscope with a 40x magnification. The results showed that there were 6 types of parasites from the ectoparasite group consisting of *Trichodina, Tetrahymena, Gyrodactylus, Dinoflagelata, Epistylis* and *Dactylogyrus*. There were no parasites from the endoparasites and hematozoa groups. The highest prevalence was *Dactylogyrus* with a prevalence rate of 54% and the lowest was *Dinoflagella* with a prevalence rate of 10%. The highest and lowest parasite intensity is Epistylis. (18.0 ind / infected fish) and *Dactylogyrus* (2.8 ind /infected fish), respectively. It can be concluded that the level of parasite infection in the fish farm groups is at a low level based on William and Bunkley's prevalence criteria.

Key words *: Tilapia, Fish Parasite, Bacteria, Dactylogyrus, Gyrodactylus*

Introduction

Aquaculture is an important sector in the national development process. Fish from the Cichlidae family are found in various waters as non-native fish (Insani *et al.,* 2020; Hasan *et al.,* 2021). Fish from the Cichlidae family can even live and breed in Indonesian waters where this region is far from their native area (Serdiati *et al.,* 2021; Wijayanti *et al.,* 2021). They are even deliberately cultivated and are a type of promadonna fish that are widely cultivated in the Malang area both as ornamental fish and consumption fish. This is due to their defensive capabilities against extreme environmental conditions.

One aspect of the success of fish farming is the cultivator's ability to control fish health and environmental stability. The emergence of diseases in the cultivation process often causes high mortality rates for fishery commodities and causes economic losses both nationally and internationally (Monir *et al.,* 2015; Aftabuddin *et al.,* 2016; Dias dan Martins, 2017)

Parasites can be an entry point for primary infections caused by bacteria and viruses (Afriantodan Liviawaty, 1992; Fidyandani, 2012; Dias and Martins, 2017; Smit *et al*., 2017). Fish parasites are divided into two types, namely ectoparasites and endoparasites. The parasites reported to appear in

freshwater fish farming are *Trypanosoma* sp., *Sanguinicola* sp., *Haemogregarina* sp. which is an endoparasite (Alamanda *et al.,* 2007), *Trichodina* sp. (Daulae *et al.,* 2015; Kumalasari, 2016), *Ichthyophtyriusmultifilis* (Daulae *et al.,* 2015; Kumalasari, 2016; Jørgensen, 2017), *Chilodonella* sp., *Dactylogyrusus* sp., and *Gyrodactylu*s sp. (Daulae *et al.,* 2015; Kumalasari, 2016; Rizki *et al.,* 2016), *Schyzocotyleacheilognathi* (Kuchta *et al.*, 2018), *Camallanus* sp. (Rizki *et al.,* 2016) which is an ectoparasite.

This study aims to identify parasites, calculate the prevalence and intensity of parasites found in freshwater aquaculture ponds, Karangploso District, Malang Regency. The identification data, prevalence and intensity of parasites obtained are expected to be one of the considerations in the prevention of diseases, especially those caused by parasites, so that potential losses due to the emergence of parasitic diseases can be reduced.

Material and Methods

The study was conducted in April - August 2020. Semi-structured interviews were conducted to determine and understand the history of disease emergence and cultivation management carried out by the Tilapia Farmers Group in Karangploso District, Malang Regency, East Java.

Observation of Fish Parasites

Observation of ectoparasites on the skin and gills of fish was carried out using the scraping method (Noga, 2010). Scraping is carried out on both sides of the fish body starting from the anterior head to the tail of the posterior fin. The examination of the gills is carried out by examining the gill lamellae directly using a microscope. Endoparasites were observed by dissecting fish. The observed organ was part of the tracusdigestivus. Furthermore, the mucus is taken from the surface of the intestine and stomach using the scraping method (Noga, 2010). Ectoparasites and endoparasites were observed under a light microscope with magnification of 100-400X. Observation of hematozoan parasites following the procedure of Kelly *et al*. (2018) by making a blood smear, fixed using methanol and stained with Giemsa, then observed microscopically. Parasite identification is based on morphology that refers to the Image Guide for Common Freshwater Fish Parasites (Deborah *et al.,* 2005).

The calculation of the prevalence of parasites was carried out by comparing the number of fish infected with the parasite with the number of fish observed (William and Bunkley, 1996). Percentage data is obtained by the formula:

$$Prevalence = \frac{\Sigma \text{ infected fish}}{\Sigma \text{ fish observed}} \; x \; 100 \; \% \qquad .. (1)$$

Parasitic intensity was carried out by comparing the number of parasites infecting fish with the total number of fish infected with the parasite (Kabata, 1985; William and Bunkley, 1996). Parasitic intensity data is obtained by the formula:

$$Intensity \; ({}^{ind.}/_{fish}) = \frac{\Sigma \; Parasite}{\Sigma \; infected \; fish} \qquad .. (2)$$

Data Analysis

The identification data, prevalence and intensity of parasites will be analyzed descriptively by comparing the data with similar studies that have been published.

Result and Discussion

Location Study

The Tilapia cultivator group in the research location still uses a semi-intensive cultivation system, which consists of ponds of land, tarpaulin and concrete. About 30 ponds with 15 active ponds are used for rearing tilapia. The stocking density is 200-250 / m^2. Fish disease outbreaks have not been reported. The source of water for concrete ponds and tarpaulin is well water, while irrigation water is used for ground ponds. Farmers never use probiotics or antibiotics. Treatment of disease is done by separating the infected fish and providing additional vitamin boosters. Fish samples were taken randomly by using purposive sampling method from 10 selected ponds with a sample size of 30 tilapia fish.

Parasites found

Parasites are organisms that attack the outside of the host's body and parts of the body associated with the external environment (Widyastuti, 2002). The results showed that the parasites found were ectoparasites. Ectoparasites are found on the body surface which includes skin, fins, gills and generally causes physical reactions of the host such as scratching, flicking the tail and so on. Ectoparasite fish are found in waters as potential pathogenic organisms.

The results showed that there were 6 types of ectoparasites that were identified to infect tilapia. Most of the parasites are found on the skin and fins. Whereas in the gills only Dactylogyrus sp. was found. The identified parasites are presented in Table 1.

This study shows that there only extoparasites found in the location. No endoparasites were seen in the gastrointestinal tract, as were the blood smears. No hematozoa parasites were found.

Parasite Prevalence

Prevalence is the percentage of disease transmission in a population, so that the expected prevalence value can represent the level of disease transmission in an environment. The results showed a prevalence rate of 56.7%, which means 17 out of 30 *Tilapia* samples were infected with parasites with different prevalence values for each type of parasite. The most common parasite sites are on the skin with 5 types of parasites. The highest prevalence is *Dactylogyrus* sp. with a value of 40%, the lowest parasite prevalence was the Dynoflagella group with a prevalence rate of 10%. The prevalence of parasites identified at the study site is described in Figure 1.

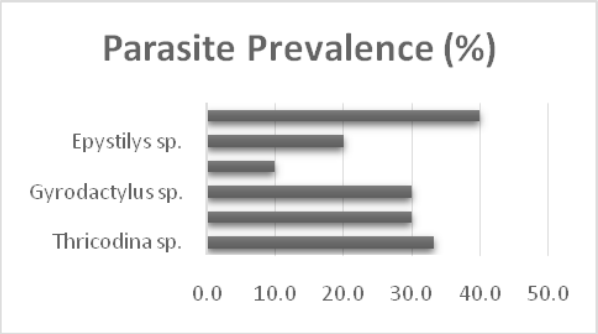

Fig. 1. The prevalence of parasites (%) in the tilapia ponds of the location fish farmer group based on the types of parasites identified.

Based on the results of the study, the observed prevalence of parasites identified in tponds ranged from 10-40%. Based on William and Bunkley's (1996) prevalence criteria, The locetion is at the level of parasite incidence criteria in the range of 29-49%. The level of parasite prevalence can be influenced by water quality, the amount of organic matter in the waters and the presence or absence of water pollution in the aquaculture pond. Ciliate parasites often occur in aquaculture ponds that have high concentrations of organic matter (Pouder *et al.,* 2005; Jørgensen, 2017). The number of identified groups of sessile cilia indicate that the organic matter content in the pond is quite high (Deborah *et al.,* 2005).

The results showed that the high prevalence of parasites did not always determine the intensity of parasites. The highest parasite intensity is *Epistylis* sp. with an intensity value of 18 infected fish with a prevalence value of 20%. While the lowest intensity is *Dactylogyrus* sp. With an intensity value of 2.8 ind / infected fish with a prevalence value of 40%. The comparison of parasite intensity values according to

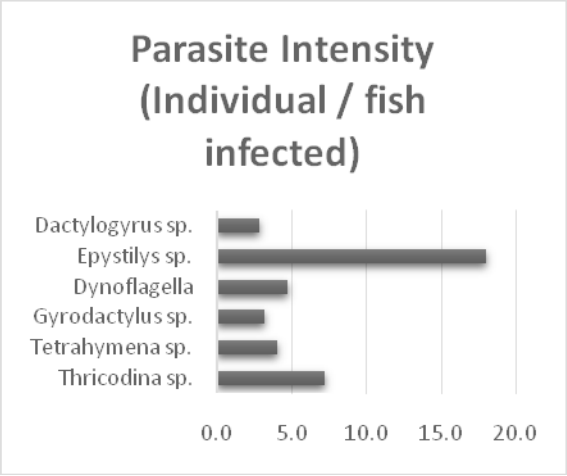

Fig. 2. Fish Parasite Intensity Level (Ind./ Infected Fish) in location Farmer Group Ponds Based on Identified Parasite Types.

Table 1. Types of parasites identified from samples of Tilapia in the study area

No	Parasites Ectoparasites	Targeted organ	The pathological anatomy
1	*Trichodina*sp.	Skin, Fins	Torn fins, scales off
2	*Tetrahymena* sp.	Skin, Fins	skin erosion, and hemorrhage, muscular degeneration and necrosis along with gills edema
3	*Gyrodactylus*sp.	Skin, Fins	Scales loose, damaged fins, gills bleeding
4	Dinoflagelata	Skin, Fins	Normal
5	*Epistylis*sp.	Skin, Gills	Scales loose, damaged fins
6	*Dactylogyrus*sp.	Gills	Pale gills, Bleeding gills and gill cover damaged

the identified parasites is shown in Figure 2.

The intensity of *Tilapia* parasites identified ranged from 2.8-18 fish/infected fish. Based on the criteria for parasite intensity according to Williams and Bunkley (1996), the parasite infection rate is still at low-moderate levels because it is in the range 1-55 ind. / infected fish. Parasite intensity can be affected by the stocking density applied in the culture pond which allows the transfer of parasites from one fish to another. In addition, the size of the fish is also one of the factors that influence the intensity value of parasites. The low intensity of parasites in the aquaculture ponds studied indicates that the sample fish size is still relatively small and the cultivators have not applied high stocking density in the aquaculture ponds.

The existence of parasites in fish cannot be separated from poor environmental conditions and management that decrease immun system of fish (Islamy *et al.*, 2017; Islamy and Hasan, 2021). Other factors that play a role in the spread and development of fish parasites in the local environment are the presence of non-native fish or exotic fish, introduced species, allochthonous species, non-indigenous species, and alien species (Wargasasmita, 2005) such as Tilapia (Hasan and Tamam, 2019; Hasan *et al.*, 2019), Jaguar cichlid (Hasan *et al.*, 2020), Arapaima (Fadjar, 2019), Mozambique tilapia (Hasan *et al.*, 2019), Alligator gar (Hasan *et al.*, 2019), The green terror (*Andinoacara rivulatus*) (Serdiati *et al.*, 2020). The prevention can be done by increasing the fish immune system through the diet of an immunostimulant derived from bioactive plants or animals (Islamy, 2019; Kilawati and Islamy, 2019)

Conclusion

There are 6 types of parasites from the ectoparasite group consisting of *Trichodina, Tetrahymena, Gyrodactylus, Dinoflagelata, Epistylis* and *Dactylogyrus*. The level of parasite infection in the fish farmer groups' ponds is at a low level based on William and Bunkley's prevalence criteria.

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