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Intensity and Prevalence of Ectoparasites in Tilapia (*Oreochromis niloticus*) from Floating Net Cages in Lake Batur, Bali

Gusti Ayu Putu Cintya Pratami Yogi[1*], Pande Gde Sasmita Julyantoro[1], Dewa Ayu Angga Pebriani[1], Putu Eka Sudaryatma[2]

[1]Aquatic Resources Management Study Program, Faculty of Marine and Fisheries, Udayana University, Jl. Raya Unud Campus, Badung Regency, Bali, Indonesia
[2]Marine and Fisheries Product Quality Control and Supervision Agency
Jl. Sunset Road No.77, Badung Regency, Bali, Indonesia

Correspondence:
cintyapratami053@student.unud.ac.id

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ABSTRACT

Tilapia (*Oreochromis niloticus*) is one of the most cultivated freshwater fish. The problem that is often faced in fish farming is diseases caused by parasitic attacks (ectoparasites) which can cause a decrease in fish production levels. To overcome these problems, research is needed on the intensity and prevalence of ectoparasites in tilapia (*Oreochromis niloticus*) to determine the density of ectoparasite attacks and the percentage of ectoparasites in tilapia. Tilapia (*Oreochromis niloticus*) samples were taken from the Floating Net Cage (KJA) of Lake Batur, Songan Village, Kedisan and Trunyan. Sampling is carried out by purposive sampling or determining location points. The tilapia (*Oreochromis niloticus*) samples examined were 36 fish samples with a size of 14.7-21 cm tilapia niwana. The ectoparasite found only in the gills of tilapia, namely *Dactylogyrus* sp. (506 ind) and *Gyrodactylus* sp. (13 ind). The highest intensity in the genus Dactylogyrus was 14.06 ind/head in the medium category, while in the genus Gyrodactylus it was 1.86 ind/head in the low category. The highest prevalence value in the genus Dactylogyrus is 100% with the always category while for the genus Gyrodactylus is 19.44% with the frequent category. The data supporting water quality in this study includes temperature, pH, and DO. The temperature of lake water in floating net cages during the study ranged from 23°C-28°C, pH or acidity degree ranged from 8.1-9 and DO range from 4.8-5.6 mg/L. The results of the water quality in this study are classified as optimal for tilapia rearing.

INTRODUCTION

Tilapia (*Oreochromis niloticus*) is a type of freshwater fish that is often cultivated in Floating Net Cages (KJA). Floating net cages are a means of maintaining aquatic life or fish whose skeleton is made of wood, bamboo, or square-shaped paralon pipes with nets and buoys (Sambu & Amir, 2017). Tilapia (*Oreochromis niloticus*) cultivation is very closely related to water quality and diseases that attack cultivated organisms. Polluted water quality causes disease attacks due to unbalanced interactions between fish, environmental conditions, and disease-causing organisms or agents. One of the agents or pathogens that often attack cultivated tilapia is parasites (Ode, 2014). Parasites that attack farmed fish will affect the survival of fish such as delayed growth that disrupts the metabolic system and damages organs to cause death in fish. Parasites in fish can be classified into two types, namely endoparasites and ectoparasites. Ectoparasites are parasites found on the outside of the fish's body or in parts that still receive air from the outside. This type of parasite usually attacks the skin, fins, and gills of fish (Riko *et al*., 2012). Examples of ectoparasites that are often found in tilapia are *Dactylogyrus* sp., *Trichodina* sp., and *Argulus* sp.

Extoparasitic infections in tilapia can be caused by two factors, namely extrinsic and intrinsic factors. Extrinsic factors are factors caused by the environment and habitat of tilapia, one of the extrinsic factors is water quality which can lower the immune system of fish so that they are susceptible to diseases (Lestari *et al*., 2020). Intrinsic factors are factors that cause infection in tilapia which can be determined by the size and sex of the catfish can be seen from the level of ectoparasitic infection in fish which can be determined by the level of intensity and prevalence of ectoparasites that attack tilapia. According to Sari *et al*. (2022) at the Sangeh Fish Seed Center (BBI) by obtaining results from several types of ectoparasites that infect tilapia, namely *Dactylogyrus* sp. are classified as severe infections. This is related to high density, lack of nutrients and poor water quality.

Differences in water quality conditions in a watershed, especially in lakes, are due to vulnerable fluctuations such as changes in water temperature, rainfall levels and climate change that can cause differences in the types and levels of ectoparasites found and until now there is still little information about ectoparasites that infect tilapia farmed in floating net cages, especially in Bali. Therefore, it is necessary to conduct research on the intensity and prevalence of ectoparasites that infect tilapia. This study uses types of tilapia cultivated in the Lake Batur Floating Net Cage (KJA), in order to later provide information to the public about the condition of tilapia cultivated in the Lake Batur Floating Net Cage (KJA).

METHODS

Time and Place of Research

The research will be carried out from September 2024 to October 2024. Fish sampling at the Lake Batur Floating Net Cage, Bangli Regency, Bali Province at 3 location points, namely Kedisan Village, Songan Village location point, and Trunyan Village location point. and the location of the research was carried out at the Fisheries Laboratory, Faculty of Marine Affairs and Fisheries, Udayana University. The determination of the location point is carried out using purposive sampling is a method used in determining the location of sampling by considering certain conditions in carrying out the research (Sugiyono, 2016).

Research Methods

The research method is carried out in a quantitative descriptive manner, which is a method used by analyzing an object to solve a problem (Suryana, 2010). The sample to be used in this study is tilapia (*Oreochromis niloticus*) with a fish size of 15-23 cm with a weight ranging from 40-300 grams. The number of fish samples used in this study is 36 tilapia with a total of 2 tilapia samples from each location point with a total of 6 tilapia every week. Samples are taken directly from the location and then put into plastic bags containing oxygen.

Research Procedure

Samples were taken one by one from the container and then placed on a tray, then numb the nerves of the brain by piercing the fish's head, then take the organs of the body, especially the ectoparasites such as fins, mucus, eyes and gills. Then it is placed on a glass object, covered with a glass cover that has been given a physiological NaCl solution of 0.9% and observed under a binocular microscope. The identification process was carried out at the Fisheries Laboratory, Faculty of Marine Affairs and Fisheries, Udayana University. Parasite observation was carried out using a binocular microscope with a magnification of 10× and parasite identification using the book Kabata (1985).

Data Analysis

The data analysis that will be carried out in this study includes several calculations the value of intensity, prevalence, and quality of water to be treated using the Microsoft Excel 2016 program. The results obtained will be displayed in the form of tables and graphs to see the difference in values.

Intensity found in tilapia (*Oreochromis niloticus*) According to Jahja (2009) the intensity of parasite attacks on fish is calculated using the following formula:

$$\text{Int} = \frac{\sum \text{P}}{\text{N}}$$

Where:

Int : Intensity of parasite attack (ind/tail)
∑P : Number of parasites attacking (ind)
N : Number of fish infected with parasites (tail)

The prevalence of tilapia (*Oreochromis niloticus*) according to Jahja (2009) the prevalence of parasites against fish is calculated using the following formula:

$$\text{Prev} = \frac{\text{N}}{\text{n}} \text{x} 100\%$$

Where:

Prev : Prevalence (%)
N : Number of fish infected with parasites (tail)
n : Number of samples observed (tail)

RESULTS

Sampling of Tilapia *(Oreochromis niloticus)*

Tilapia cultivated in the Floating Net Cage (KJA) of Lake Batur, Bangli, Bali comes from a type of nirvana tilapia with the species *Oreochromis niloticus*. In the sampling of tilapia, 36 fish samples were used. Tilapia sampling in September was 12 tilapia and in October as many as 24 tilapia. In this study, ectoparasite samples were found on gill organs with the phylum Platyhelminthes (genus Dactylogyrus and Gyrodactylus). The difference that can be seen from the two genera is, in the different body structure where in the genus Gyrodactylus has a body structure in the shape of a head like the letter V and there are two protrusions like ears, while

the genus Dactylogyrus on the anterior part of the head has four ear or lobe protrusions with two pairs of eye spots.

Ectoparasite Intensity in Tilapia *(Oreochromis niloticus)*

Based on the research that has been carried out, the intensity of ectoparasitic attacks in Tilapia (*Oreochromis niloticus*) the highest infection of the 36 fish studied came from the genus Dactylogyrus, which was 14.06 ind/fish, while for ectoparasites from the genus Gyrodactylus it was 1.86 ind/fish. The total ectoparasitic intensity value was 15.92 ind/fish which was included in the category of moderate infection. The genus Dactylogyrus infested 36 tilapia, out of the total fish examined, while the genus Gyrodactylus infested as many as 7 tilapia out of a total of 36 tilapia examined in this study. The results of the intensity calculation can be seen in the following figure 1:

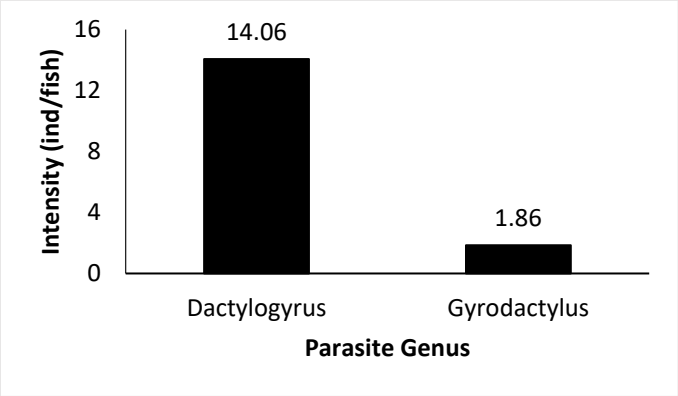

Figure 1. Ectoparasite Intensity in Tilapia (*Oreochromis niloticus*)

Prevalence of Parasites in Tilapia *(Oreochromis niloticus)*

Based on the research that has been carried out, the highest prevalence value of a total of 36 tilapia fish (*Oreochromis niloticus*) examined is from the genus Dactylogyrus, which is 100%, then in the genus Gyrodactylus by 19.44%. The infection rate by *Dactylogyrus* sp. are classified as always or very severe infections, and infections caused by *Gyrodactylus* sp. classified as frequent or frequent infections. The results of the prevalence value in this study showed the percentage of parasitic genus in the fish examined. The results of the prevalence calculation can be seen in figure 2:

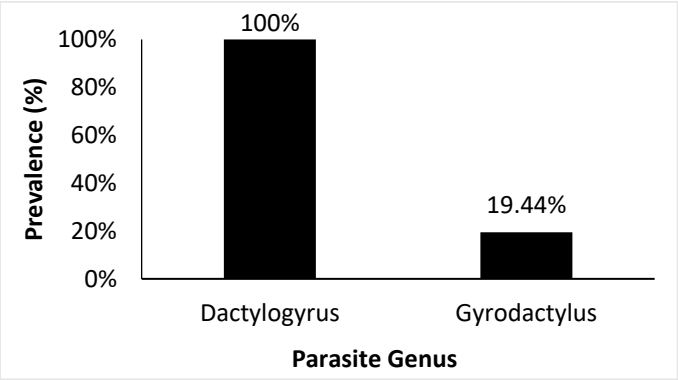

Figure 2. Prevalence of Ectoparasites in Tilapia (*Oreochromis niloticus*)

Water Quality

Based on research, water quality measurements have been carried out including temperature, pH, and DO. The temperature of lake water in floating net cages during the study ranged from 23^{o}C-28^{o}C, pH or acidity degree ranged from 8.1-9 and DO or dissolved oxygen

ranged from 4.8-5.6 mg/L. The results of the water quality in this study were classified as normal for fish farming. The results of the water quality calculation can be seen in table 1:

Table 1. Water Quality Data

Parameters	Data Obtained	Data According to the Journal
Temperature (°C)	23-28	22-32 (Pramana, 2018)
pH	8.1-9	7.5 – 9.0 (Wijaya *et al*., 2012)
DO (mg/L)	4.8-5.6	>3 (SNI 7550:2009)

DISCUSSION

Ectoparasite Intensity in Tilapia *(Oreochromis niloticus)*

Based on research conducted by the genus Dactylogyrus, it is an ectoparasite with a higher intensity compared to Gyrodactylus. Dactylogyrus and Gyrodactylus are parasitic genera of the phylum Platyhelmintes that are found to attack the gill organs because the parasites are worms with a life cycle and habitat in the gills of fish. According to Pujiastuti (2015) *Dactylogyrus* sp. It is almost found on the entire surface of the body and gills. Some are found in the gills of fish, which are the most important organs in the respiratory system and *Dactylogyrus* sp. reproduce by producing eggs, then the eggs are carried by water currents and then attach to the gills when the fish breathe and the number of ectoparasites that attack tilapia in the gills is due to the fact that the gills are respiratory organs that are in direct contact with the surrounding environment that filter dissolved materials, filter feed particles and bind oxygen (Yanti *et al*., 2017).

Mora *et al*., 2022 stated that fish infected with *Dactylogyrus* sp. Usually it will be thin, swimming jerking, the gill cap cannot close perfectly because the gills are damaged, and the skin of the fish looks no longer clear, just like what is seen when taking fish samples, it is found that the condition of the fish sample with a rather thin physique. The value of Dactylogyrus parasitic infection, which is 14.06 ind/fish, which is classified as moderate. The genus Gyrodactylus in this study has an intensity value of 1.86 ind/fish, which is relatively low. Where the number of *Dactylogyrus* sp. 506 individuals were found, while the number of *Gyrodactylus* sp. 13 individuals. Gyrodactylosis is a disease caused by *Gyrodactylus* sp. namely parasites that attack the gills and skin of fish (Nurcahyo, 2018). The incidence of Gyrodactylosis causes a lot of losses to fish farmers. In addition to causing poor fish performance, an infestation of this parasite in excess can cause death. This is caused by damage to the gills caused by the parasite (Piasecki, 2014). Other factors that affect the appearance of parasites in fish besides internal factors, can be caused by external factors such as temperature, pH, dissolved oxygen, water quality and nutrients (Hasyimia *et al*., 2016).

Prevalence of Ectoparasites in Tilapia *(Oreochromis niloticus)*

Prevalence is the percentage of infected fish compared to all fish samples examined, the purpose is to determine the level of attack of a type of parasite on the fish population in the cultivation site. Prevalence also provides a broad picture of the level of parasite attacks on fish populations in an area. Based on the results of the research that has been carried out, it shows that the prevalence varies in each type of ectoparasites obtained Fish samples were obtained from the Lake Batur Floating Net Cage (KJA). Of the 36 samples, 36 fish were infected with parasites of the genus Dactylogyrus and 7 fish were infected with the genus Gyrodactylus. The type of parasite with the highest prevalence is in the genus Dactylogyrus with a percentage of 100% while in the genus Gyrodactylus at 19.44%. The organ most susceptible to parasite

attacks is the gills. This is in accordance with the opinion of Mora *et al*. (2022) that the location of gills, structure and contact mechanisms with the environment make gills very vulnerable to changes in environmental conditions and become the right place for infection by disease-causing pathogenic organisms such as parasites.

Based on research conducted by Sari *et al*. (2023), the pravelence category of *Dactylogyrus* sp. that infects tilapia gills in BBI Sangeh is included in the category always with an average value of 92% and a value of *Gyrodactylus* sp. Included in the usual category with an average score of 78%. Average value of *Dactylogyrus* sp. showed that it was always found in every tilapia gills that were sampled by this parasite, while the average value of *Gyrodactylus* sp. shows that this parasite usually infects fish. The prevalence value of *Dactylogyrus* sp. and *Gyrodactylus* sp., Jasmanindar (2011) stated that the prevalence of each type of parasite is not always the same because of many influencing factors, one of the influencing factors is the size of the host. In some fish samples, the larger the size/weight of the host, the higher the infestation by the parasite. Older hosts can contain a larger number of parasites, although the fish have adapted so the host becomes tolerant of its parasites and also environmental factors that affect and support the life of these ectoparasites.

Water Quality

Water quality indirectly affects the survival of farmed fish. Based on the results of the research that has been carried out, the water temperature in the floating net cage of Lake Batur from 3 sampling locations ranges from 23-28^{o}C. The water temperature in Lake Batur is generally still the same as other tropical lakes with a range between 22.9–26.4°C. In general, this value is still supportive for the life of fish and other aquatic life. This temperature range is still classified as suitable for the survival of tilapia. Where according to Pramana (2018) explained that the optimal temperature for cultivation ranges from 22-30^{o}C. In addition, temperature also affects the reproduction of parasites in the body of fish. According to Hassan (2008), the Monogenea parasite will produce more eggs when the water temperature is medium (around 30-32^{o}C), while when the temperature is low, the process of parasite development becomes slower.

The pH value obtained during this study ranged from 8.1-9. The pH in Lake Batur tends to be alkaline or alkaline with a pH range between 7.5 – 9.0 and this pH value is still classified in the normal range for the survival of tilapia in Lake Batur floating net cages. According to Wijaya et al. (2012) if the pH is too low, the appetite of tilapia decreases. Automatically a pH that is too low or too high will cause fish to be stressed so that it can inhibit the process of increasing growth and survival rate in fish. The dissolved oxygen level or DO obtained during this study ranged from 4.8-5.6 mg/L. Where according to SNI 7550:2009 the optimal dissolved oxygen level for tilapia rearing is more than 3 mg/L. So that the DO level in tilapia rearing media is in the optimal range. According to Amirullah *et al*. (2012) dissolved oxygen levels that are low or less than 4 mg/L can cause monogeneic parasites to produce more eggs.

CONCLUSION

The intensity of ectoparasite infestation in Tilapia (*Oreochromis niloticus*) cultivated in floating net cages (KJA) in Lake Batur was recorded at 15.92 individuals per fish, which falls into the moderate infection category. Among the 36 fish examined, the highest intensity of infection was attributed to ectoparasites of the genus Dactylogyrus, with an average of 14.06 individuals per fish, classified as a moderate infection. Meanwhile, ectoparasites of the genus Gyrodactylus showed a lower intensity of 1.86 individuals per fish, falling under the low

infection category. The prevalence of Dactylogyrus infestation reached 100%, indicating that all sampled fish were infected, and is therefore classified as a very severe infection. In contrast, Gyrodactylus had a prevalence rate of 19.44%, which is considered a frequent infection.

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