Prevalence and Intensity of Ectoparasites of Tilapia (*Oreochromis niloticus*) in Ponds with Low, Medium and High Stocking Density

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Abstract. Research has been conducted on the difference in intensity value and prevalence of tilapia (*Oreochromis niloticus*) ectoparasites in ponds with low, moderate and high density in February to March 2018. This study aims to identify ectoparasite species and calculate the prevalence and intensity of ectoparasites maintained in solid low, medium and high stocking. Based on the results, the parasites were *Trichodina nobilis*, *Dactylogyrus* sp, *Gyrodactylus* sp and *Oodinium* sp. The highest prevalence values were found in low stocking densities of 100% including the very severe category and the highest intensity was 158.95 individuals/tail. The lowest prevalence values were found in medium and high stocking density of 78.3% and 70% included in the usual infection category and the highest intensity values had a value of 2.45 and 4.97 individuals/tail.

Keywords. Intensity, Prevalence, Stocking Density.

1. Introduction

Tilapia has economic value and is an important commodity in the freshwater fish business (Wardoyo, 2007). Tilapia has advantages such as easy to maintain, fast growth and can adapt well enough to the environment (Manurung and Gaghenggang, 2016). Based on the Statistics and Information Data Center of the Ministry of Maritime Affairs and Fisheries (2015) it states that tilapia fish production has increased from 2010 to 2014 by 53.5%. Perikanan and Kabupaten Banyuwangi (2016) state tilapia aquaculture production increased by 84% from the total production of 150,826kg in 2012 to 980,005kg in 2016.

Based on SNI 6141: 2009, 5-8cm tilapia aquaculture was cultivated with stocking densities of 50-100 tails/m² (medium stocking density), thus the determination of low stocking density of 20 tails/m² and high stocking density of 114 tails/m². The stocking density will certainly cause different stresses in fish life. High fish stocking density can result in the impact of competition for getting dissolved oxygen, food competition and space for movement (Karlyssa et al., 2010). Low fish stocking density will provide more space to move than high stocking density. One of the impacts that occur in fish stocking density is the level of stress on the fish, which can cause a reduction in the immune system.
Decreasing the immune system in fish can cause fish to be susceptible to disease attacks. One of the diseases that often attacks fish is parasites. Parasites are organisms that live on or inside other organisms with the aim of taking food and breeding (Subekti and Mahasri, 2016). Based on the location of the infected organ, parasites are divided into two groups, namely ectoparasites and endoparasites. Ectoparasites are parasites found on the outside or surface of the fish's body. Factors that cause an ectoparasite attack are fish density in high aquaculture ponds, lack of nutrition and poor water quality. High stocking density can cause fish to intersect with each other so that ectoparasites will easily spread to other fish (Zheila, 2013).

Basically, ectoparasite infection in fish does not cause harm as much as losses due to infection of other pathogens, such as viruses and bacteria, but ectoparasite infection is one of the causes of secondary attacks that can cause viral and bacterial diseases. Ectoparasites that attack cultured fish can also affect the survival of fish, namely the growth of fish becomes inhibited (Nofyan et al., 2015). In addition, the consequences of ectoparasite attacks on fish are a decrease in the quality and quantity of products, which has implications for economic losses for farmers (Alifudin et al., 2002).

Based on the results of research by Manurung and Ganghenggang (2016), it has been reported that the type of ectoparasite found in tilapia in the Hiung Village cultivation ponds are *Dactylogyrus*, *Oodinium*, *Lernea*, *Gyrodactylus* and *Trichodina*. The highest prevalence was *Dactylogyrus* at 86.67% (ordinary infection), and the lowest *Gyrodactylus* and *Trichodina* were 6.67% (rare infections). According to other studies, Lianda et al. (2015) have reported types of parasites that attack tilapia in irrigation Barabung, Aceh Darussalam Besar District, namely *Dactylogyrus* and *Gyrodactylus*. The highest prevalence is *Dactylogyrus* by 73.1% (ordinary infection) and the lowest *Gyrodactylus* by 11.5% (frequent infections).

Based on the explanation above, it is necessary to conduct research on the prevalence and intensity of parasites that attack tilapia that are kept with different stocking densities. The results of this study can be used as a reference to find out the distribution of tilapia parasites and as preliminary data in subsequent studies.

2. Experimental

2.1. Research method
The method used in this study is a survey method that is carried out through sampling at the study site directly to identify the type of ectoparasite in tilapia. The sampling technique is done by random sampling.

2.2. Sampling
Samples taken were tilapia in aquaculture ponds with low, medium and high stocking densities in Banyuwangi Regency. Determination of stocking density refers to SNI 6141: 2009 of 50-100 tails/m² (medium stocking density), for the determination of low stocking density of 19 tails/m² and high stocking density of 170 tails/m². Sampling was done twice as many times with a one-week interval. Sampling refers to Ossiander and Wedemeyer (1973) in The World Organization for Animal Health (OIE) (2003). The number of tilapia in low stocking densities of 4,000 head, the total of samples taken was 60. The number of tilapia in medium stocking density was 2,500 tails, the total samples taken were 60 tails. The number of tilapia in high stocking densities was 9,000 tails, the total sample taken was 60 tails. The total sample is 180 tails.

2.3. Sample examination
Samples that were taken were then weighed and body length measured. Macroscopic examination of ectoparasites is done using a magnifying glass. Macroscopic ectoparasites were found and then put into a microtube containing 70% alcohol solution. The next step is the examination of the ectoparasites carried out by native method by scraping on the surface of the body, gills and fins and then making preparations for the screw and dripping with distilled water and examined under a microscope. The
The gill sheet is then placed on a glass object and observed under a microscope and identified based on the key identification.

2.4. Research parameters
The main parameters observed in this study are the calculation of the prevalence and intensity of parasites in tilapia fish seeds. Prevalence shows the number of occurrences of parasitic infestations in a particular population. Calculation of parasite prevalence uses the Mamani et al. (2004) formula, namely:

\[
\text{Prevalence (\%) } = \frac{\sum \text{fish attacked by parasites}}{\sum \text{fish examined}} \times 100\%
\]  \hspace{1cm} (1)

The calculation of parasitic intensity using the Mamani et al. (2004) formula is as follows:

\[
\text{Intensity } = \frac{\sum \text{parasite found}}{\sum \text{infected fish}}
\]  \hspace{1cm} (2)

3. Result and discussion
The research results show that of the total sample of 180 fish tails that were examined, 60 tails (100%) showed signs of positive sentiments infested ectoparasite in low stocking density, 47 tails (78%) showed signs of positive sentiments infested ectoparasite in medium stocking density and 42 tails (70%) showed signs of positive sentiments infested ectoparasite in high stocking density. Ectoparasites found are *Trichodina nobilis*, *Dactylogyrus* sp, *Gyrodactylus* sp. and *Oodinium* sp on body surface, gill and fin.

3.1. *Trichodina nobilis*
*Trichodina nobilis* has a rounded shape and it is apparent that they have cilia on part of the edge of a circle does it keep its body. *Trichodina nobilis*, on observation, are a part of the body denticle. Based on the results of direct observation, *Trichodina nobilis* have average body diameter 70.39µm and the number of denticles is 24. *Trichodina nobilis* is found on the surface of the body, the fin as well as gills. *Trichodina nobilis* is presented on Figure 1.

![Figure 1. Trichodina nobilis](image)

3.2. *Oodinium sp*
*Oodinium* sp. the result of the observation showed shaped tapering, colony and a rhizoid upon the posterior. *Oodinium* sp. was found on observation of colony with the sum of 5 - 11 colonies and found on the fins and the surface of fish body. *Oodinium* sp. is presented in Figure 2.
3.3. *Dactylogyrus* sp.

*Dactylogyrus* sp. was observed on four head organs and two pairs of eyes on the anterior part. *Dactylogyrus* sp. had ophisthaptor in posterior body. *Dactylogyrus* sp. was found in the gills of fishes. *Dactylogyrus* sp. is presented in Figure 3.

![Figure 3. Dactylogyrus sp.](image)

3.4. *Gyrodactylus* sp.

*Gyrodactylus* sp. was observed on two head organs in anterior body. *Gyrodactylus* sp. were also ophisthaptor in body posterior. *Gyrodactylus* sp. was found on body surface and the fin of fish. *Gyrodactylus* sp. is presented in Figure 4.

![Figure 4. Gyrodactylus sp.](image)

The results of the calculation of the value of rates show prevalence of ectoparasite and intensity of results in different stocking density. The results of the calculation of the value of rates, the prevalence of and intensity of ectoparasites can be seen in Table 1.
Table 1. Prevalence and intensity of ectoparasites of Nila on low, medium and high stocking density.

| No. | Stocking Density | Prevalence (%) | Category (Williams and Williams, 1996) | Intensity (ind/tail) | Category (Williams and Williams, 1996) |
|-----|------------------|----------------|----------------------------------------|---------------------|----------------------------------------|
| 1.  | Low              | 100            | Always                                 | 158.95              | High                                   |
| 2.  | Medium           | 78.33          | Usually                                | 2.45                | Low                                    |
| 3.  | High             | 70             | Usually                                | 4.97                | Low                                    |

Based on the above obtained data, the value of rates of prevalence of ectoparasites on low stocking density is 100% (always), medium stocking density is 78.33% (usually) and high stocking density is 68.33% (usually). Based on the data obtained, prevalence of the lowest is found in a high stocking density, included in the usually category and the prevalence having the highest poverty rate in a low stocking density is included in the always category. Intensity of ectoparasite on stocking density has a different value. Ectoparasite intensity in a low stocking density is 155, 96 individu/tail included in the high category; ectoparasite intensity in medium stocking density is 2.42 individu/tail included in low category; and ectoparasite intensity in high density is 4.95 individu/tail included in the low category.

Prevalence of ectoparasite infest Nila on stocking density had different values. Based on the results of calculation of the value of rates, the prevalence in low stocking density is 100% included in the always category; medium stocking density is 78.33% in the usually category; and high stocking density is 70% included in the usually category. Low stocking density had highest prevalence and intensity, the condition is dominated by Trichodina nobilis. This could be caused by the life cycle Trichodina nobilis being more rapid. Baticados (1992) on Afifah et al. (2014) The life cycle of Trichodina is binary fission at cleavage speed of every ½ hour and the transmission of Trichodina is through the water as well as direct contact with infected fishes. Trichodina nobilis is parasite which often attacks freshwater fish (Rahayu et al., 2013). Trichodina nobilis is found extensively on the body surface of fish because the body surface contains mucous, which is food and a live ectoparasite. In addition, the surface of the body deals directly with the environment and is easy to attack by Trichodina nobilis (Afifah et al., 2014).

The value of the prevalence and intensity of the lowest is found in medium stocking density and high stocking density has a value of intensity of 2.45 individu/tail and 4.97 individu/tail and can be classified as in the low category. This shows that there is no difference in value intensity between a medium stocking density and high stocking density. This shows that the stocking density fishes is not the main factor of the spread of a parasitic process in the waters, but rather an interaction between the environment, fish and the parasitic pathogens. If the interaction of above the other in layers which eventually causes the cash movements is thought to cause stress in fish, so that the immune system of fish too weak and the parasite on it can easily enter into the body of the fish (Cahyono et al., 2006).

4. Conclusion

Ectoparasites found are Trichodina nobilis, Oodinium sp, Dactylogyrus sp, and Gyrodactylus sp. The highest prevalence is low stocking density of 100% and included in s the always category. The lowest prevalence is medium stocking density of 78.33% and high stocking density is 70% and included in the usually category. The highest intensity is low stocking density 158,95 individu/tail include high category. The lowest intensity is medium stocking density at 2.45 individu/tail and included in the low category and high stocking density is 4.97 individu/tail and included in the low category.

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