Parasites prevalence which infecting freshwater fishes in Mulur Reservoir of Sukoharjo District, Indonesia

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Abstract. Iriansyah AH, Budiharjo A, Sugiyarto. 2020. Parasites prevalence infecting freshwater fishes in Mulur Reservoir of Sukoharjo District, Indonesia. Bonorowo Wetlands 10: 66-71. Mulur Reservoir is one of the natural fish habitats and consumption fish cultivation in Sukoharjo District, Indonesia. Excessive use of the reservoir area causes the decreasing of water quality which affects fish life sustainability, one of them can cause the fish susceptibility to infection by parasites. The purpose of this research was to identify the types of parasites which infect on consumption of fish in Mulur Reservoir and calculate the prevalence value. Samples were taken by purposive sampling for gourami (Osphronemus gouramy), tilapia (Oreochromis niloticus), betutu fish (Oxyeleotris marmorata), catfish (Clarias batrachus), and jambal (Pongasias djambal) 10 fishes for each type. The parts of fish infected by ectoparasites such as body mucus, fin mucus, head mucus, and gills were taken by scraping and observed under a microscope with magnification between 10-400x. The results showed that 5 types of ectoparasites were Epistylis sp., Ichthyophthirius multifilis, Trichodina sp., Dactylogyrus sp., and Gyrodactylus sp. with an average prevalence of more than 50%. There are more ectoparasites in domesticated fish than in wild fish.

Keywords: Ectoparasites, freshwater fish, consumption fish, Mulur Reservoir Sukoharjo

INTRODUCTION

Sukoharjo District, Central Java, Indonesia is one of the areas that develop inland aquaculture. Inland fishery production in Sukoharjo has increased from year to year, both in public waters, aquaculture with ponds, and cages. Mulur Reservoir, located in Mulur Village, Bendosari Sub-district, Sukoharjo District, is a freshwater ecosystem as a natural habitat for various types of fish. Its main function is to irrigate agricultural areas and besides that, it is also used as a means of fisheries management (Faradiana et al. 2018).

The fishery business carried out in the Mulur reservoir is divided into two types, namely fish caught and fish cultivated through cages. Both types of fish live in the same waters and environment. If there is a change in the environment, it will affect the survival of both of them. Likewise with the presence of parasitic infections in fish. Factors that can affect fish distribution include DO, water flow velocity, and food sources (Muchlisin and Azizah 2009).

Parasites are organisms that live on the bodies of other organisms and generally hurt the host organism. Parasites in fish can be divided into two types, namely ectoparasites and endoparasites. Ectoparasites are parasites that live on the outer surface of the host’s body and in the host’s skin burrows (Azmi 2013). Endoparasites live in internal organs such as the digestive system, liver, blood circulation, abdominal cavity, and other body tissues. Parasite attacks on fish cause fish to lose their appetite, then slowly weaken and lead to death. Clinical symptoms caused include spots on the fish that cause itching so that the fish will rub their bodies against objects around them, loss of appetite, and excessive mucus production (Kurniawan 2012).

Parasitism is a symbiosis in which one organism lives on the sacrifice of its host, both biochemically and physiologically (Anshary 2008). Parasites that infect fish, especially fish that are consumed, have not been shown to affect humans. However, these parasites will affect fish life, especially in metabolism where the energy from metabolism that should be used for growth must be used for energy protection or defense from these parasites. Fish infected by parasites are likely to have an impact on the appearance of the fish such as slow growth, small fish size, and damage to certain organs.

Knowledge of parasites in waters needs to be known as information about the ecology of parasites and their hosts in these waters. Research on parasites that infect fish, especially in the Mulur Reservoir, has never been done before, so there is no scientific information on this matter, therefore it is important to research to identify the types of ectoparasites that attack fish in these waters and the prevalence of ectoparasites to determine the level of parasitic infection that can cause infection. occurs in consumption fish.
MATERIALS AND METHODS

The study was conducted from November 2018 to January 2019. Fish sampling was carried out in Mulur Reservoir, Mulur Village, Bendosari Sub-district, Sukoharjo District, Central Java Province, Indonesia. Parasite examination and identification were carried out at the Biology Laboratory, Faculty of Mathematics and Natural Sciences, Sebelas Maret University, Surakarta, Indonesia.

The tools used in this study were object-glass, cover glass, light microscope, surgical instruments (tweezers, scalpel, scissors), dropper, cooler box, paraffin tub, stationery, ruler, camera, and tools to measure water quality such as a thermometer, pH meter, DO meter, and Secchi disk.

The materials used in this study were distilled water and fish samples, namely goramy (Osphromenus goramy), tilapia (Oreochromis niloticus), marble goby fish (Oxyeleotris marmorata), catfish (Clarias batrachus), and pangas catfish (Pangasius djambal) taken from Mulur Reservoir as many as 10 individuals from each fish species. The fish samples obtained were identified using the identification book by Kottelat et al. (1993) and Saanin (1984). Sampling was carried out six times using the purposive sampling method at three predetermined points. The samples taken were fish that live wild in reservoirs and fish cultivated in floating net cages.

Examination of ectoparasites was carried out using macroscopic and microscopic. The macroscopic examination is carried out by examining the presence or absence of clinical symptoms of parasites on the outside of the fish body, while the microscopic examination is by scraping the surface of the body, head, fins, tail, and gills and then observed under a microscope with a magnification of 100-400x. Examination of the gills was carried out by opening the operculum and then cutting the fish gill lamellae using scissors, placing it on a glass object, dripping with distilled water, then observing it under a microscope with a magnification of 100-400x.

Each parasite found on ectoparasite examination was recorded and collected for further identification. Identification of ectoparasites using the Kabata identification book (1985).

Data analysis

The results of a quantitative examination of ectoparasites were calculated using the formula according to Margolis et al. (1982) as follows:

\[
\text{Prevalence} = \frac{\text{infected fish}}{\text{sample fish}} \times 100\%
\]

\[
\text{Intensity} = \frac{\text{parasite found}}{\text{infected by parasite}}
\]

The results of the identification of ectoparasites that attack consumption fish in the Mulur Reservoir were analyzed descriptively and the data was presented in the form of images. The results of the calculation of the prevalence and intensity of ectoparasites obtained were analyzed descriptively quantitatively and the data were presented in tabular form (Steel and Torrie 1993).

RESULTS AND DISCUSSION

Excessive use of reservoirs will affect the condition of these waters, especially for the survival of the fish that inhabit these waters. According to Tjokrokusumo (2008) differences in environmental conditions in the inlet and outlet areas result in variations in distribution patterns, behavior, and fish composition. The daily activities of the community around the reservoir such as residential areas and rice fields can also affect the balance of the reservoir ecosystem.

According to PP No. 82 of 2001, waters suitable for use as freshwater fishery facilities are classified into second and third class water with certain quality standards (Table 1). The condition of the waters of the Mulur Reservoir has water quality that is not under the quality standards specified in PP No. 82 of 2001 so that it can be said that the waters are not suitable for fish life. Low oxygen levels can interfere with the respiratory process in fish and low light penetration levels can interfere with the vision of some types of fish. The temperature and acidity of the water are still within the quality standard (Table 1).

Types of ectoparasites

The parasites found were Epistylis sp., Ichthyophthirius multifilis, Trichodina sp. (protozoa), Dactylogyrus sp., and Gyrodactylus sp. (monogenea).

| Variable          | Unit | Sampling point | Average | Quality standards |
|-------------------|------|----------------|---------|-------------------|
|                   |      | 1 2 3          |         |                   |
| Temperature       | °C   | 30 30.7 32.3   | 31      | 26-32             |
| pH                |      | 8.5 7.9 7.9    | 8.1     | 6-9               |
| DO                | mg/L | 2.8 1.1 1.6    | 1.8     | ≥ 3               |
| Water clarity     | cm   | 26 27 28       | 27      | ≤ 10              |

Table 1. Abiotic environmental parameters of Mulur Reservoir, Sukoharjo District.
Epistylis sp.

*Epistylis* sp. is an ectoparasite of the type of protozoa with a bell-like morphology in the form of an elongated tube, translucent whitish in color. In its cells, there is a small nucleus, and the cells can contract. Posteriorly there is a pair of cilia that look like stalks. *Epistylis* sp. is a protozoan measuring 45-250 μm with a solitary life morphology, whitish in color, has a small macronucleus, does not contract, cells can contract, and has paired capsules (Irvansyah et al. 2012). An elongated zooid consists of a ciliated peristomial stalk, food vacuole, micronucleus, and macronucleus. These small protozoa have handles, usually in colonies consisting of 2-5 individuals (Saglam and Sarieyyupoglu 2002). According to Andriyanto and Fachri (2014), this parasite is a parasite that mostly attacks freshwater fish and is generally from the Cyprinidae group and settles on the skin and fins of its host using cilia branches. This parasite has a protease enzyme secretion organ that is used to take protein from the skin of the host (fish) so that it can cause secondary infection by bacteria.

Ichthyophthirius multifilis

*Ichthyophthirius multifilis* is an ectoparasite of the type of protozoa that has a round morphology and there is a large macronucleus in its cells. Usually, these parasites lodge in the layers of the skin and fins and damage the epithelial tissue so that it can cause bleeding. *I. multifilis* clusters in large numbers to form white spots on fish, so it is called white spot disease. *I. multifilis* has a round body shape where the whole body is ciliated and moves amoeba-like, the inside of the body there is a transparent horseshoe-shaped macronucleus and a micronucleus attached to the macronucleus. This parasite is the most virulent protozoan parasites in fish (Nofyan et al. 2015; Rahmi 2012).

Trichodina sp.

*Trichodina* sp. is a type of ectoparasite from the protozoa group with a transparent circular shape resembling a cup or wheel with several cilia surrounding the cell. At the center, there are three concentric circles called the adhesive plate. *Trichodina* sp. is a type of parasitic protozoa from the ciliates group that has vibrating feathers. *Trichodina* sp. is a circular shape like a cup measuring 50-100 μm with vibrating hairs strung on both sides of the cell (Irianto 2005).

![Figure 1. Epistylis sp. with magnification of 100x](image1.png)

![Figure 2. Ichthyophthirius multifilis with magnification of 400x](image2.png)
**Figure 3.** *Trichodina* sp. with magnification of 400x

**Figure 4.** *Dactylogyrus* sp. with magnification of 100x and 400x

**Figure 5.** *Gyrodactylus* sp. with magnification of 100x

*Dactylogyrus* sp.

*Dactylogyrus* sp. is an ectoparasite of the monogenean trematode worm group with an elongated, transparent shape with a smaller anterior end. This ectoparasite can be easily recognized by the presence of two pairs of eyespots on the anterior end of its body. The mouth is located near the anterior end of the body with the digestive tract towards the posterior. At the posterior end of the body, an attachment apparatus consists of two pairs of large hooks surrounded by smaller hooks called opisthaptors.
**Gyrodactylus sp.**

*Gyrodactylus sp.* is an ectoparasite of the monogenean trematode worm group. Elongated transparent cylindrical parasite with a V-shaped anterior end, there are 2 protrusions or lobes, without eyespots or eyespots as in *Dactylogyrus* sp. This parasite has a hook-shaped anchor on the posterior, surrounded by marginal hooks that attach to the host’s body tissues, namely the skin and gills.

**Ectoparasite prevalence and intensity**

*Ichthyophthirius multifilis* is the most dominant parasite because this ectoparasite infection occurs evenly in the waters as evidenced by the presence of infection from the parasite in all fish samples. *Ichthyophthirius multifilis* is also referred to as a cosmopolitan ectoparasite because it can attack almost all types of freshwater fish, but it is also generally found in all types of freshwater ecosystems.

Some parasites are only found in certain types of fish. *Trichodina* sp. is a parasite that attacks tilapia and pangas catfish. The attack of this parasite on both fish occurred with a prevalence value of 100% and also a relatively high intensity, but no *Trichodina* sp. attack was found in other types of fish. Likewise with *Epistylis* sp. was found to attack only goramy and tilapia in the least amount. *Dactylogyrus* sp. attacks catfish and pangas catfish and *Gyrodactylus* sp. attacks tilapia and pangas catfish. *Epistylis* sp. found attacking the outer surface of the body, *Ichthyophthirius multifilis* and *Trichodina* sp. found attacking the outer surface of the body and gills, *Dactylogyrus* sp. found attacking the gills, and *Gyrodactylus* sp. found attacking the gills. Differences in the distribution of ectoparasites in fish body parts are influenced by species.

The results showed that domesticated fish were more affected by ectoparasites than wild fish, both in terms of the type and number of infections that occurred. It can happen because fish outside the cage have a place to live with a wider range so that if an infection occurs in one fish, the risk of spreading that will occur is relatively low. In contrast to domesticated fish, if an infection occurs in one fish, the risk of spreading the parasite infection is relatively higher, supported by physical contact between one fish and another.

| Type of fish     | Source       | Type of ectoparasites | Σ Parasite | Σ Infected sample | Σ Sample observed | Prevalence (%) | Intensity (parasite / fish) |
|------------------|--------------|-----------------------|------------|------------------|------------------|----------------|-----------------------------|
| Goramy           | Domesticated | *Epistylis* sp. I. multifilis | 5 23       | 3 8              | 10 80            | 30 2.87        | 55 2.27                    |
| Average Wild     |              |                       |            |                  |                  |                |                             |
| Average          |              |                       |            |                  |                  |                |                             |
| Tilapia          | Domesticated | *Trichodina* sp. I. multifilis | 151 11 1 1 | 5 3 1 1          | 5 60 20 1        | 100 3.67       | 50 8.96                    |
| Average          |              |                       |            |                  |                  |                |                             |
| Wild             |              |                       |            |                  |                  |                |                             |
| Average Wild     |              |                       |            |                  |                  |                |                             |
| Marble goby      | Domesticated | *I. multifilis*       | 32 13 6 2 1 | 9 4 3 1 1       | 10 80 60 20 1   | 90 3.56        | 90 3.56                    |
| Average Wild     |              |                       |            |                  |                  |                |                             |
| Average          |              |                       |            |                  |                  |                |                             |
| Catfish          | Domesticated | *I. multifilis* Dactylogyrus sp. | 13 1 6 2 1 | 4 1 3 1 1       | 5 80 60 20 1   | 80 3.25        | 50 2.12                    |
| Average Wild     |              |                       |            |                  |                  |                |                             |
| Average          |              |                       |            |                  |                  |                |                             |
| Pangas catfish   | Domesticated | *Gyrodactylus* sp. *Dactylogyrus* sp. *I. multifilis* *Trichodina* sp. | 13 182 13 8 2 2 | 4 5 2 1 1 | 5 56 40 20 1 | 80 3.25 40 4 2 | 60 11.41 | 60 4.6 |
The conclusion of this study is that the types of ectoparasites that attack freshwater fish species in the Mulur reservoir are Epistyli sp., Ichthyophthirius multifiliis, Trichodina sp., Dactylogyrus sp., and Gyrodactylus sp. The average prevalence rate of ectoparasites by type of fish, in goramy, is 55%; in domesticated tilapia by 50%; in wild tilapia by 70%; in marble goby fish by 90%; in domesticated catfish by 50%; in wild catfish by 60%; in domesticated pangas catfish by 60%; and in wild pangas catfish by 60%.

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