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ANALYSIS OF PREVALENCY, INTENSITY, AND CORELATION OF PARASITE WITH ENVIRONMENTAL CONDITIONS IN MILKFISH (*Chanos chanos*) IN TRADITIONAL POLYCULTURE PONDS OF KEDANYANG VILLAGE

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ABSTRACT

This study aimed to examine the relationship between parasite prevalence in milkfish and water quality in the Traditional Fishponds of Kedanyang Village, Gresik Regency. The research was conducted for one month in April 2023. Random samples of milkfish were taken from two ponds, with a total of 40 fish. Parasite examination was performed by observing ectoparasites on mucus, gills, fins, and scales, as well as endoparasites in the fish's internal organs. The identification results revealed the presence of two types of parasites in the traditional polyculture ponds of Kedanyang Village, namely Dactylogyrus found in the gills and Cappilaria sp. found in the digestive tract. The prevalence and intensity of these parasites ranged from 2.5% to 5% and 1-2, respectively, which can be classified as low. The water quality in the ponds was categorized as good and well-tolerated by the fish. Correlation analysis showed that temperature, salinity, ammonia, nitrite, and nitrate had a weak positive relationship with parasite prevalence, while pH, dissolved oxygen (DO), and biochemical oxygen demand (BOD) had a weak negative relationship.

Keywords: Intensity, Milkfish, Parasites, Prevalence, Water quality.

INTRODUCTION

Milkfish is one of the leading fishery commodities in Indonesia. The production of milkfish in Indonesia is quite high, so this fish is included in the top 10 fish with the highest production in the country (Suharno et al, 2017; Arsad et al, 2019). The demand for milkfish both domestically and abroad tends to continue to increase. Milkfish is one of the cheap sources of protein, has good meat flavor, relatively affordable price, and can be cultivated in polyculture with other commodities (WWF, 2014). In addition, this fish is able to tolerate salinity up to 45 ppt (Dharma et al, 2019). This makes many farmers cultivate milkfish, including in Kedanyang village.

Milkfish farming mostly still uses traditional cultivation systems. Traditional cultivation is characterized by the absence of water quality control during cultivation and low density (Ssekyanzi et al, 2022). Controlling the environmental conditions of aquaculture is important, this is to optimize the organisms that live or are maintained (Irawan et al, 2021). Poor water quality in aquaculture can make fish easily stressed, causing disease in fish (Maniagasi et al, 2013). Inappropriate environmental conditions that result in the growth of parasites in fish are typically to blame for the spread of disease in these fish (Sri, 2022). The development of diseases or parasites in these fish needs to always be considered, so that large disease outbreaks can be avoided.

Parasites are small organisms that live outside or inside other larger organisms to obtain food. According to Azmi's, (2013) in aquatic organisms, especially fish, parasites can be divided into two, endoparasites and ectoparasites. Endoparasites are parasites that live inside the organs of the fish body and ectoparasites are parasites that live outside the fish body. Several previous studies have shown that water quality is an important factor affecting the presence of parasites in fish (Iriawan et al., 2021). In this study will see the relationship between parasites and environmental conditions. This research is expected to provide knowledge to the community, related to better management of traditional ponds. Implementation of appropriate management practices can help reduce endoparasite infections, improve fish health and growth, and increase overall pond productivity.

MATERIAL AND METHOD

Research Location and Time

This research was conducted in Kedanyang Village Traditional Pond, Kebomas District, Gresik Regency. The research was conducted for 1 (one) month in April 2023. Water quality checks were carried out at the Gresik Regency Regional Health Laboratory.

Materials and Equipment

The materials used in this study include milkfish, ammonia test kit, NaCl, and distilled water. While the tools used include a microscope, dissecting tool set, thermometer, pH meter, DO meter, rake, bucket, Petri dish, tray, label paper, glass object, glass cover, digital scales, ruler, stationery, and camera.

Sampling

The milkfish used were taken randomly (random sampling) from two ponds used in raising milkfish in Kedanyang Village. Fish were taken as much as 5% of the fish population in the pond. Each pond has a population of 400 fish, each pond was taken 20 fish, with a total sample of 40 fish.

Data collected

Ectoparasite examination includes observation of mucus, gills, fins, and scales. Observation of mucus on the fish body is done by scraping (Trujillo-gonz, et al. 2015). Endoparasite examination includes observations on the inside of the fish body, namely the liver, heart,

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stomach, and intestines. Observations were made using a microscope with 100x magnification.

Observation Parameters

The main parameters in this study were the types of parasites and the prevalence of parasites attacking milkfish. Water quality measured included temperature, pH, salinity, DO, ammonia, nitrite, nitrate, COD, and BOD. Supporting parameters included length and weight of milkfish.

Data Analysis

The data obtained was then analyzed descriptively based on related literature (Lau and Kuziemsky, 2017).

Prevalensi

Prevalence describes the percentage of fish infected by a particular parasite in a fish population. The calculation of prevalence uses the formula (Kabata, 1985) as follows:

$$P = \frac{N}{n} x100\%$$

Where P is the prevalence (%); N is the number of parasitized fish; and n is the number of fish examined.

Intensity

Intensity describes the number of parasite densities that can infect fish can be calculated using the formula (Kabata, 1985) as follows:

$$P = \frac{\mathrm{p}}{n}$$

P = Number of endoparasites infecting the fish
n = Number of fish infected with endoparasites.

RESULTS AND DISCUSSION

Parasites Found

Observations of 40 milkfish samples from two traditional polyculture ponds in Kedanyang Village showed two types of parasites found, namely Dactylogyrus in the gills and Cappilaria sp in the digestive tract.

Dactylogyrus

Dactylogyrus is a parasite that belongs to the monogenea group, considering the faster life cycle of parasites compared to that of their hosts (Benovics et al., 2021). This parasite was found attached to the gills of milkfish. *Dactylogyrus* sp. is a parasite that often attacks the gills, especially in milkfish. This parasite lives in the body and will only leave its host when the host dies, then hundreds of newly hatched *Dactylogyrus* sp. larvae will look for a new host (Dwinanti et al., 2022)

Dactylogyrus is worm-like, measuring up to 2 mm in length and 400um in body width, has 2 pairs of eye spots on the interior end, and the mouth is located near the anterior end of the body. *Dactylogyrus* sp. often attacks the gills of freshwater, brackish and marine fish. Some previous studies also found dactyogyrus in milkfish (Iriawan et al., 2021; Marlina, 2021).

Infection by the parasite *Dactylogyrus* sp has a harmful impact on fish, especially on the gill organs. This parasite uses its hooks to invade the gills, which causes discoloration of the gill

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filaments to become slightly pale. The infection can also cause damage and destruction of the gill lamellae, as well as bleeding. As a result, blood clots and the respiration process of the fish is disrupted Marlina (2021)

According to research conducted by Benovics et al., (2021), high infestation of monogenea parasites in the gills can cause various damages. These include erosion of gill filaments, increased cell growth (hyperplasia), fusion of gill filaments, and rupture of blood vessels in the gills (aneurysm). When ectoparasites attach to fish, they frequently cause wounds on their bodies, making the fish weak and reducing the effectiveness of its immune system (Marlina, 2021)

Cappilaria sp

Capillaria sp. is a nematode genus that includes various species of parasites that can infect fish (Belizario and Totanes, 2014). This parasite is generally transparent in color with a cylindrical shape, hair-sized diameter with the ability to move actively (Munar et al, 2016).

The abundance of Capillaria sp. parasites found in the intestine of milkfish is since the intestine is an organ rich in food material, which makes it a desirable source of nutrients for parasites. As mentioned by Bosi et al., (2022), Due to factors like the easy availability of nutrients and the presence of cell tissues, body fluids, blood, and other food substances that can be easily found in the small intestine, the gut is a preferred location for parasites. Khalifa et al., (2020), stated that fish infected with *Capillaria* sp. with high intensity have a high risk of mortality.

Parasite Prevalence and Intensity

The prevalence and intensity of milkfish disease in traditional polyculture ponds in Kedanyang Village can be seen in Table 1.

Table 1. Prevalence and Intensity of Parasites in milkfish

Pond	Parasite	Prevalence (5%)	Intensity
1	*Dactylogyrus*	10	2
	Cappilaria sp	5	1
2	*Dactylogyrus*	5	1
	Cappilaria sp	5	1

Source: Writer, 2023

In this study, milkfish reared in two different ponds were observed. Each pond was examined for parasite infestation in the fish. In this analysis, the two types of parasites found were Dactylogyrus and Capillaria.

In Pond 1, out of a total of 20 milkfish examined, it was found that 10% of the milkfish were infected by the parasite Dactylogyrus. This indicates a low prevalence rate. Moreover, the intensity of Dactylogyrus infestation in infected milkfish was 2 parasites on average. In addition, there was also a Cappilaria infestation with a prevalence of 5%. The intensity of Capillaria infestation in infected milkfish was 1 parasite.

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Meanwhile, in Pond 2, similar results were found. Of the 20 milkfish examined, about 5% were infected with the parasite Dactylogyrus. The intensity of *Dactylogyrus* infestation in infected milkfish in Pond 2 was 1 parasites on average. In addition, there was Capillaria infestation with the same prevalence of 5%. The intensity of Capillaria infestation in infected milkfish was 1 parasite.

Based on the results of the prevalence and intensity of *Dactylogyrus* and *Cappilaria* sp parasites, this value is in the low category which is not yet at a level that can cause harm to aquaculture activities (Maulana et al, 2017)

Dactylogyrus sp parasites are only found in the gills of milkfish, this is in line with research (Dhaneswara, 2018) which states that Dactylogyrus that attacks the gills shows specific organ characteristics in attacking its host. Other studies have revealed that Dactylogyrus infects gill tissue because the organ contains cells which are a source of food that can be digested by the parasite (Ramudu et al., 2020)

Water Quality

Water samples were collected and measured in two traditional polyculture ponds in Kedanyang Village. Water quality measurements include temperature, pH, dissolved oxygen (DO), ammonia, nitrite, nitrate, COD, and BOD. The results of water quality measurements can be seen in table 2.

Table 2. results of water quality measurements

Parameter	Pond 1	Pond 2
Temperature (°C)	25,5	26,8
pH	7	6
Salinity (ppt)	14	13
DO (mg/l)	4,5	4,2
Ammonia (mg/l)	<0,1	<0,1
Nitrite (mg/l)	0,066	0,13
Nitrate (mg/l)	0,7	1,1
BOD5 (mg/l)	80	43

In this study, water quality measurements were taken in two different ponds, namely Pond 1 and Pond 2. The results of water quality measurements recorded included temperature, pH, salinity, DO (Dissolved Oxygen), ammonia, nitrite, nitrate, and BOD (Biochemical Oxygen Demand).

Based on the measurement results, the water temperature in Pond 1 was 25.5°C while that in Pond 2 was 26.8°C. The temperature recorded is within the acceptable range for milkfish (Rohman et al., 2019). The pH value of water in Pond 1 is 7, while in Pond 2 is 6. The

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difference in pH value between the two ponds indicates a slight acidity in Pond 2 water.

The salinity of water in Pond 1 is 14 ppt, while in Pond 2 is 13 ppt. Both salinity values are within the range suitable for milkfish (Dharma et al, 2019). The DO (Dissolved Oxygen) content in Pond 1 was 4.5 mg/l, while in Pond 2 was 4.2 mg/l. Although the DO value is slightly lower than ideal, it is still within acceptable limits for milkfish survival (Reksono et al., 2019). The ammonia content in both ponds was less than 0.1 mg/l, indicating good water quality because low amounts of ammonia do not adversely affect fish (Iriawan et al., 2021).

The nitrite content in Pond 1 is 0.066 mg/l, while in Pond 2 is 0.13 mg/l. The nitrate content in Pond 1 is 0.7 mg/l, while in Pond 2 is 1.1 mg/l. Nitrite levels are safe for brackish fiss growth is less than 3 mg/L (Wahyuni et al., 2020). Nitrite content in pond 2 shows above the threshold for milkfish. This can be one of the causes of parasite prevalence values in Pond 2 higher than Pond 1.

BOD (Biochemical Oxygen Demand) in Pond 1 is 80 mg/l, while in Pond 2 is 43 mg/l. Lower BOD values in Pond 2 indicates a lower level of organic pollution compared to Pond 1. However, the BOD content in both ponds classified into heavily polluted (Daironi and Arisandi). Hatta (2014), which states that the BOD value will increases with increasing organic matter in the water.

Correlation of Parasite Prevalence with Environmental Conditions

The results of statistical analysis in the form of correlation coefficient (R^2) between water quality and parasite prevalence in milkfish. The results of the temperature regression equation with parasite prevalence obtained the equation y = 24.407x0.0478 with R^2 = 0.3333, there is a weak positive relationship between temperature and parasite prevalence. Each unit increase in temperature will contribute to an increase of 24.407x0.0478 in parasite prevalence The coefficient of determination (R^2) of 0.3333 indicates that 33.33% of the variation in parasite prevalence can be explained by variations in temperature. This is in line with Iriawan's research, (2021) that the correlation coefficient between temperature and parasite prevalence shows a low value.

The correlation between salinity and parasite prevalence obtained a regression equation y = 12.178x0.0713 with R^2 = 0.3333, there is a weak positive relationship between salinity and parasite prevalence. Each unit increase in salinity will contribute to an increase of 12.178x0.0713 in parasite prevalence. This is consistent with Saha's research (2013), who explains that an increase in pH will enhance the prevalence of parasites. The coefficient of determination (R^2) of 0.3333 indicates that 33.33% of the variation in parasite prevalence can be explained by the variation in salinity. For

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the correlation between pH and parasite prevalence, the regression equation y = 8.0186x-0.148 with R^2 = 0.3333, there is a weak negative relationship between pH and parasite prevalence. Each unit increase in pH will contribute to a decrease of 8.0186x0.148 in parasite prevalence. The coefficient of determination (R^2) of 0.3333 indicates that 33.33% of the variation in parasite prevalence can be explained by the variation in pH.

The correlation between DO (Dissolved Oxygen) and parasite prevalence obtained a regression equation y = 4.7821x-0.066 with R^2 = 0.3333, there is a weak negative relationship between DO and parasite prevalence. Each unit increase in DO will contribute to a decrease of 4.7821x0.066 in parasite prevalence. The coefficient of determination (R^2) of 0.3333 indicates that 33.33% of the variation in parasite prevalence can be explained by the variation in DO. In the correlation between ammonia and parasite prevalence, the regression equation y = 0.082x0.1013 with R^2 = 0.3333, there is a weak positive relationship between ammonia and parasite prevalence. Each unit increase in ammonia will contribute to a 0.082x0.1013 increase in parasite prevalence. The coefficient of determination (R^2) of 0.3333 indicates that 33.33% of the variation in parasite prevalence can be explained by the variation in ammonia is consistent with Iriawan's, (2021) that the correlation coefficient between ammonia and parasite prevalence shows a low value.

The correlation between nitrite and parasite prevalence obtained a regression equation y = 0.0363x0.652 with R^2 = 0.3333, there is a weak positive relationship between nitrite and parasite prevalence. For nitrate, the regression equation y = 0.47x0.4347 with R^2 = 0.3333, there is a weak positive relationship between nitrate and parasite prevalence. Each unit increase in nitrite will contribute to an increase of 0.0363x0.652 in parasite prevalence. Each unit increase in nitrate will contribute to a 0.47x0.4347 increase in parasite prevalence. The coefficient of determination (R^2) of 0.3333 indicates that 33.33% of the variation in parasite prevalence can be explained by the variation in nitrite. The same value was also obtained for nitrate.

The correlation between BOD and parasite prevalence obtained a regression equation y = 138.26x-0.597 with R^2 = 0.3333, there is a weak negative relationship between BOD and parasite prevalence. Each unit increase in BOD will contribute to a 138.26x0.597 decrease in parasite prevalence. The coefficient of determination (R^2) of 0.3333 indicates that 33.33% of the variation in parasite prevalence can be explained by the variation in BOD. These findings are in line with previous research (Obayemi et al., 2023) that states a correlation

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between BOD and the prevalence of parasites in fish.

CONCLUSIONS

Identification of parasites in traditional polyculture ponds in Kedanyang Village revealed two types of parasites, Dactylogyrus found in the gills and Cappilaria sp found in the digestive tract. The prevalence and intensity of these parasites were low. Water quality in the ponds used is still in the good category and can be tolerated by fish. Correlation analysis revealed that temperature, salinity, ammonia, nitrite, and nitrate had a weak positive relationship with parasite prevalence, while pH, DO, and BOD had a weak negative relationship with parasite prevalence.

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