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Inventory of Ectoparasites in Majalaya Carp (*Cyprinus carpio*) With Different Sizes

Inventarisasi Ektoparasit pada Ikan Mas Majalaya (Cyprinus carpio) dengan Ukuran Berbeda

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Abstract

Majalaya carp (*Cyprinus carpio*) is one of the essential commodities used to increase fisheries production in Indonesia. However, this cultivation activity is often hampered by disease problems caused by parasites. Therefore, it is necessary to research the inventory of ectoparasites in Majalaya carp with different sizes. This study aims to determine the type, intensity, and prevalence of ectoparasites in Majalaya carp of different sizes. Samples were taken by random sampling from cultivation ponds in the North Minahasa Regency, North Sulawesi Province. The research method used a descriptive method, and for ectoparasite examination, a native method was used by examining the surface of the fish's body, mucus, fins, gills, and eyes. The study results found six types of ectoparasites: *Dactylogyrus* sp, *Argulus* sp, *Ichthyophthirius multifiliis*, *Trichodina* sp, *Vorticella* sp, and *Gyrodactylus* sp. At a size of 4-7 cm, more *Dactylogyrus* sp were found. On the gills, size 8-14 cm *I. multifiliis* on mucus and size 23-30 cm *Argulus* sp on the surface of the fish body. The intensity level of ectoparasites produced on *Dactylogyrus* sp reached a value of 5.14 Ind/fish (low infection), *I.multifiliis* 4.27 Ind/fish (low infection), and *Argulus* sp of 3.80 Ind/fish (low infection). Then, the prevalence level of ectoparasites produced on *Dactylogyrus* sp reached a value of 70% (moderate infection), *Ichthyophthirius multifiliis* 50% (persistent infection), and *Argulus* sp 67% (persistent infection). This study emphasizes the importance of water quality management and fish density regulation.

Keywords: *Cyprinus carpio*, Ectoparasites, Intensity, Prevalence

Abstrak

Ikan mas majalaya (*Cyprinus carpio*) merupakan salah satu komoditas penting dalam meningkatkan produksi perikanan di Indonesia. Namun, kegiatan budidaya ini sering kali terkendala masalah penyakit yang disebabkan oleh parasit. Oleh karena itu, perlu dilakukan penelitian tentang inventarisasi ektoparasit pada ikan Mas Majalaya dengan ukuran berbeda. Penelitian ini bertujuan untuk mengetahui jenis, intensitas dan prevalensi ektoparasit pada ikan mas majalaya dengan ukuran berbeda. Sampel diambil secara *random sampling* dari kolam-kolam budidaya yang ada di wilayah Kabupaten Minahasa Utara, Provinsi Sulawesi Utara. Metode penelitian menggunakan metode deskriptif dan untuk pemeriksaan ektoparasit menggunakan metode natif dengan melakukan pemeriksaan pada bagian permukaan tubuh ikan, lendir, sirip, insang dan mata. Hasil penelitian ditemukan 6 jenis ektoparasit, yaitu *Dactylogyrus* sp, *Argulus* sp, *I.multifiliis*, *Trichodina* sp, *Vorticella* sp, dan *Gyrodactylus* sp. Pada ukuran 4-7 cm lebih banyak ditemukan *Dactylogyrus* sp. pada bagian insang, ukuran 8-14 cm *I. multifiliis* pada lendir dan ukuran 23-30 cm *Argulus* sp pada permukaan tubuh ikan. Tingkat intensitas

ektoparasit yang dihasilkan pada *Dactylogyrus* sp. mencapai nilai 5,14 Ind/ekor (infeksi rendah), *I.multifiliis* 4,27 Ind/ekor (infeksi rendah) dan *Argulus* sp. 3,80 Ind/ekor (infeksi rendah). Kemudian tingkat prevalensi ektoparasit yang dihasilkan pada *Dactylogyrus* sp mencapai nilai 70% (infeksi sedang), *Ichthyophthirius multifiliis* 50% (infeksi sangat sering) dan *Argulus* sp 67% (infeksi sangat sering). Penelitian ini menekankan pentingnya manajemen kualitas air dan pengaturan kepadatan ikan.

Kata kunci: *Cyprinus carpio*, Ektoparasit, Intensitas, Prevalensi

1. Introduction

Majalaya carp (*Cyprinus carpio*) is one of the cultivated fishery commodities that contributes the most to increasing foreign exchange for Indonesia (Iskandar et al., 2023). Along with the increasing knowledge and understanding of the community regarding the importance of good protein sources for body health, Majalaya carp has become one of the leading commodities for cultivators to cultivate so that production increases. Majalaya carp cultivation is crucial in increasing fishery production in Indonesia to meet food and nutritional needs. However, (Dawo et al., 2023) said that Majalaya carp cultivation activities are still often hampered by the problem of disease attacks.

In general, the emergence of diseases in fish is caused by fish as hosts, pathogens, and less than optimal environmental quality. Therefore, cultivation activities will not be free from diseases, one of which is caused by parasites (Pasaribu et al., 2023). Parasites in fish can cause various health problems that fish will experience to the point of death. Therefore, this study needs to be conducted to determine the type of ectoparasite and the level of intensity and prevalence of ectoparasites in Majalaya carp of different sizes.

2. Material and Method

2.1. Time and Place

This research was conducted from September 9 to October 2, 2024, in North Minahasa Regency, North Sulawesi Province.

2.2. Methods

This study used a descriptive method, and samples were taken randomly. Sampling was conducted directly from North Minahasa Regency, North Sulawesi Province ponds. The Majalaya Carp sampled were 4-7 cm, 8-14 cm, and 23-30 cm in size, with 30 fish each, so the total number of samples to be observed was 90 fish. Ectoparasite examination was done using the native method, which examined the surface of the fish's body, mucus, fins, gills, and eyes. The stages of ectoparasite examination follow (Hoffman, 2019).

2.3. Data Analysis

The main parameters observed in this study were intensity and prevalence. Water quality, including temperature, pH, DO, ammonia, nitrite, and nitrate, were supporting parameters. Ectoparasite type data, intensity, and prevalence were analyzed descriptively; then, data processing was carried out using Microsoft Excel. Intensity is the number of parasite individuals from one species found in fish. This intensity focuses on calculating how many parasites are in fish by finding the average value of the number of parasites with the number of fish infected. While prevalence is the percentage of fish infected with parasites, this prevalence focuses on calculating the number of fish infected with parasites by the total number of fish examined. The intensity and prevalence values can be calculated using the Kabata in Sumahiradewi et al. (2023) as follows:

$$\text{Intensity} = \frac{\text{Total number of parasites infecting fish}}{\text{Number of fish infected with parasites}}$$

$$\text{Prevalence} = \frac{\text{Number of fish infected with parasites}}{\text{Number of fish examined}} \text{ x } 100\%$$

3. Result and Discussion

3.1. Types of Ectoparasites Found in Majalaya Carp with Different Sizes

The results of the examination that has been carried out found six types of ectoparasites that infect Majalaya carp, including *Dactylogyrus* sp, *Argulus* sp, *I.multifiliis*, *Trichodina* sp, *Vorticella* sp, and *Gyrodactylus* sp. The number and types of ectoparasites that infect Majalaya carp with different sizes can be seen in the Table 1.

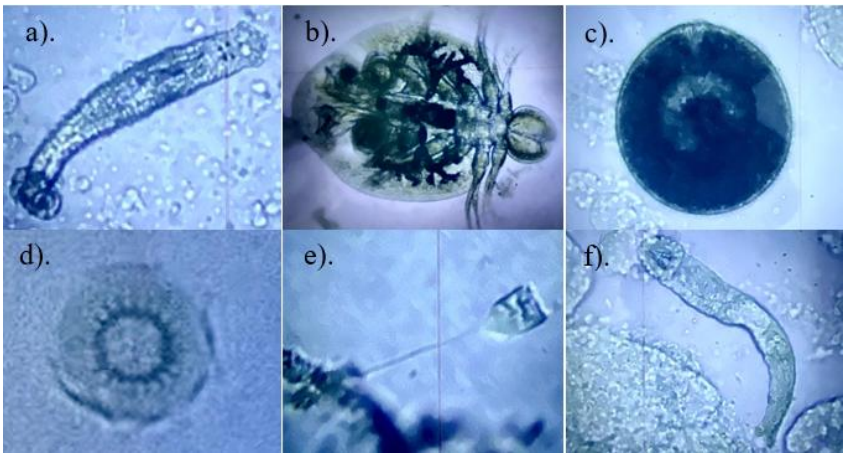

Figure 1. a). *Dactylogyrus* sp, b). *Argulus* sp, c). *Ichthyophthirius multifiliis*, d). *Trichodina* sp, e). *Vorticella* sp, f). *Gyrodactylus* sp.

Table 1. Number and type of ectoparasites infecting Majalaya carp of different sizes

No.	Types of Parasites	Size (cm)			Total
		4-7	8-14	23-30	
1.	*Dactylogyrus* sp.	108	16	6	130
2.	*Argulus* sp.	-	-	76	76
3.	*Ichthyophthirius multifiliis*	-	64	-	64
4.	*Trichodina* sp.	-	9	-	9
5.	*Vorticella* sp.	4	-	-	4
6.	*Gyrodactylus* sp.	-	1	-	1
Total					284

Table 1 shows the relationship between different sizes and types of ectoparasites, namely at sizes 4-7 cm. The most dominant type of parasite is *Dactylogyrus* sp. This type of parasite tends to attack Majalaya carp at a size of 4-7 cm, and it is thought that the fish's immune system is not yet fully developed at this size. According to (Wijianto & Effendi, 2022), fish measuring 4-7 cm are still classified as fish that need to improve their immune system because fish at this size still have soft tissue and are easily penetrated by parasites. Furthermore, at 8-14 cm, the most dominant type of parasite is *I. multifiliis*. This type of parasite tends to attack Majalaya carp at a size of 8-14 cm, allegedly because the pond for this size has a density of up to 900 fish with a pond size of 15 x 20 m (300 m^2) which allows the spread of this type of parasite to be more significant, according to Saparinto (2021) stated that generally the type of parasite *I. multifiliis* attacks fish at a size of 8-14 cm because usually fish kept at this size have a higher density compared to the density of other fish sizes. Then, finally, at a size of 23-30 cm, the most dominant type of ectoparasite is *Argulus* sp. This type of parasite tends to attack Majalaya carp at a size of 23-30 cm, allegedly because the larger body size can provide a larger area for this type of parasite to occupy, according to Iskandar et al. (2023), who stated that fish at a size of 23-30 cm have more body fluids needed by *Argulus* sp.

3.2. Intensity

Intensity is the average number of parasites that attack fish from the number of infected fish. The results of calculating the intensity of ectoparasites in Majalaya carp with different sizes show different intensity levels. Of the six types of ectoparasites, they have an infection level that can be categorized as low infection because they have an intensity value ranging from 1.00-5.14 Ind/fish. The difference in intensity values is not too high significantly because it is still classified as a low infection, according to the category of Bunkley & William in Sumahiradewi et al. (2023), which state that intensity values ranging from 1-5 can be categorized as low infection. The level of ectoparasite intensity produced can be seen in Figure 2.

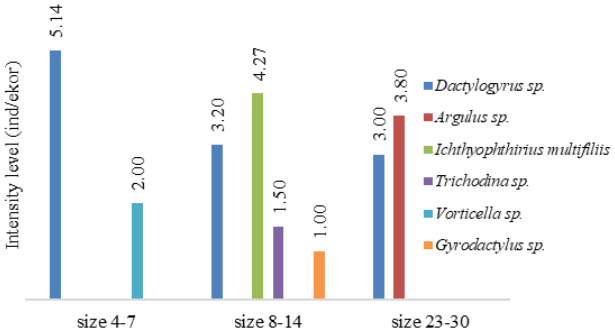

Figure 2. Level of ectoparasite intensity in Majalaya carp with different sizes

The difference between the size and intensity level of infected ectoparasites can be seen in the graph above. Namely, the highest intensity level at a size of 4-7 cm is *Dactylogyrus* sp 5.14 Ind/fish, then the size of 8-14 cm is *I.multifiliis* 4.27 Ind/tail, and the last at a size of 23-30 cm is *Argulus* sp. 3.80 Ind/fish. Tarigan et al. (2024) stated that the host body is a place for parasite colonization, so the longer the time the fish has to interact with the parasite and the wider the surface area of the fish's body, the parasite colony will also increase and ultimately affect the increasing value of the parasite intensity.

3.3. Prevalence

The prevalence is a percentage of Majalaya carp infected with parasites from the fish sample examined. From calculating the prevalence of ectoparasites in Majalaya, carp with different sizes have different prevalence rates depending on the environmental conditions around the pond, which other living things can undoubtedly influence. According to Putri et al. (2023), the high prevalence rate of disease in sample fish is due to suboptimal water quality resulting from less than optimal water management in cultivation ponds, for example, pond water that is rarely changed or filtered so that organic material in the pond accumulates and ammonia in the pond becomes high.

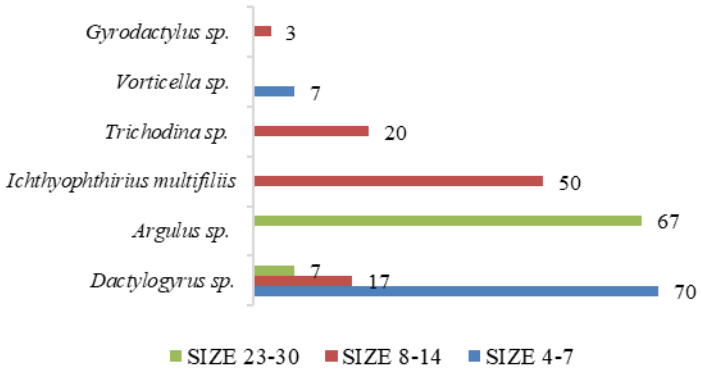

Figure 3. Prevalence level of ectoparasite attacks on Majalaya carp of different sizes

Difference between size and levelThe prevalence of infected ectoparasites can be seen in Figure 3; namely, the highest prevalence rate at a size of 4-7 cm is *Dactylogyrus* sp 70%, then a size of 8-14 cm is *I. multifiliis* 50%, and the last at a size of 23-30 cm is *Argulus* sp 67%. The difference in prevalence values is too high significantly because the results of the prevalence calculation produce different values; therefore, it can be categorized into several categories, namely occasional infection, common infection, persistent infection, and moderate infection, according to Bunkley & Williams in Sumahiradewi et al. (2023) which states that prevalence values ranging from 1-9% are categorized as occasional or occasional infection, 10-29% are classified as frequent or common infection, 50-69% are categorized as very frequent or very frequent infection and 70-89% are categorized as usual or moderate infection.

3.4. Water Quality

The water quality parameters measured include temperature, pH, dissolved oxygen, ammonia, nitrite, and nitrate. Data collection of water quality parameters was carried out as supporting data in this study. The average temperature, pH, dissolved oxygen, ammonia, and nitrite and nitrate measurements are shown in Table 2.

Table 2. Water quality measurements

No.	Parameter	Seed Pool	Enlargement Pool	Prospective Parent Pool
1.	Temperature (°C)	25.7±0.59	25.0±0.41	27.2±1.25
2.	pH	7.90±0.20	7.49±0.16	7.90±0.32
3.	Dissolved oxygen (mg/L)	4.4±0.85	3.7±0.58	4.5±0.82
4.	Ammonia (mg/L)	0.34	0.22	0.32
5.	Nitrite (mg/L)	0.013	0.010	0.013
6.	Nitrate (mg/L)	8.3	14.1	9.2

Table 2 shows the conditions of water quality in seed ponds that have an average high pH (7.90±0.20), high ammonia levels (0.34 mg/L), and high nitrite (0.013 mg/L) support parasite development. This shows that water quality is prosperous in organic matter, and less stable environmental parameters can increase the risk of parasite infestation in small fish. Then, in the rearing pond, water quality that has a lower temperature (25.0±0.41°C), a lower average pH (7.49±0.16), and the lowest dissolved oxygen levels (3.7±0.58 mg/L) can cause fish to experience stress, making them more susceptible to parasite attacks. These parasites are more likely to develop in environments with high-density levels and stressful environmental conditions, such as fluctuating pH and low

DO. Next, the last condition of water quality in the prospective broodstock pond, which has the highest average temperature (27.2±1.25°C), stable pH (7.90±0.32), and the highest DO level (4.5±0.82 mg/L) supports fish metabolic activity. However, it is not enough to inhibit parasite development. In addition, nitrate with an optimal value (9.2 mg/L) in this pond supports fish survival without suppressing parasite development

4. Conclusions

This study concludes that six types of ectoparasites were found that infect Majalaya carp, including *Dactylogyrus* sp, *Argulus* sp, *I.multifiliis*, *Trichodina* sp, *Vorticella* sp, and *Gyrodactylus* sp. Ectoparasites that dominate based on size produce different results. Namely, *Dactylogyrus* sp dominates the size of 4-7 cm with a predilection in the gills, *I.multifiliis* dominates the size of 8-14 cm with a predilection in the mucus, and *Argulus* sp dominates the size of 23-30 cm with a predilection on the surface of the fish's body. The level of ectoparasite intensity produced varies significantly in value from sizes 4-7 cm, 8-14 cm, and 23-30 cm, namely *Dactylogyrus* sp. with a value of 5.14 Ind/fish (low infection), *I. multifiliis* with a value of 4.27 Ind/fish (low infection) and *Argulus* sp. with a value of 3.80 Ind/tail (low infection). Similarly, the prevalence rate of ectoparasites produced values that varied greatly from sizes of 4-7 cm, 8-14 cm, and 23-30 cm, namely *Dactylogyrus* sp with a value of 70% (moderate infection), *I. multifiliis* with a value of 50% (persistent infection) and *Argulus* sp with a value of 67% (persistent infection).

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