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Intensity and Prevalence of Ectoparasites in Carp in Cirata Reservoir KJA, Cianjur Regency, West Java

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ABSTRACT

One of the problems that arise in fish farming is the occurrence of disease attacks that can cause losses to farmers. Parasites that are classified as ectoparasites themselves usually live outside the host. The purpose of this study was to analyze the level of intensity and prevalence of ectoparasites in goldfish in Floating Net Cages (KJA). The study used a survey method, fish samples were taken using *purposive sampling* method*. The* results showed that the highest intensity value at station 1 was *Tricodina* sp. 7 ind/head, station 2 was *Ichthyophtirius multifilis which was* 2.5 ind/head, station 3 was *Dactylogyrus* sp. which was 2.75 ind/head with a low-medium category. The lowest intensity value is station 1 *Lernea* sp. and *Ergasilus* sp. 1 ind/head, station 2 namely *Vorticella sp.* and *Gyrodactylus sp. namely 1 ind/head*, station 3 *Chilodonella sp.* and *Gyrodactylogyrus sp.* namely 1 ind/head with a low category. The prevalence value of station 1 is *Dactylogyrus* sp. 20%, station 2 *Dactylogyrus* sp. 20.00%, station 3 *Dactylogyrus* sp. 20.00% with frequent category. The lowest station 1 *Lernea* sp. 3.33%, *Tricodina sp. 3.*33%, *Ergasilus sp. 3.33%,* and *Ichthyophtirius multifilis* 3.33%. Station 2 *Chilodonella* sp. 3.33%, and Vorticella sp. 3.33%. Station 3 *Gyrodactylus* sp. 3.33% with the category sometimes.

INTRODUCTION

Indonesia is one of the countries that has the potential of aquaculture business. Freshwater fish farming that has good prospects is carp farming. The carp farming business is growing day by day, in line with Indonesia's population growth (Dyara, 2019). In 2022 the amount of carp production was 531,233 tons with a value of 14.93 trillion and experienced a decrease in production of around 20.51% when compared to the previous year reaching 668,308 tons with a value of 18.44 trillion (Directorate General of Aquaculture, 2023).

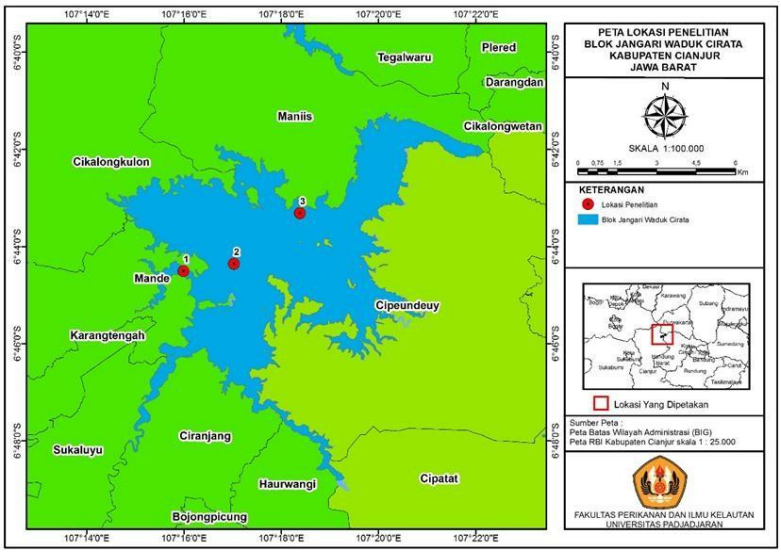
In the fisheries sector, problems often occur that can reduce the level of fish production. One of the fishery activities in freshwater reservoirs is fishery activities in floating net cages (KJA). Carp farming activities in floating net cages (KJA) that

develop in reservoir waters include Cirata reservoir. Cirata Reservoir with a covered area of 7,111 hectares covers the areas of Cianjur, Purwakarta, and Bandung. The Cianjur area itself includes Mande, Sukaluyu, Haurwangi, Cikalong Kulon, and Ciranjang sub-districts with an area of 2,976 ha. The number of KJAs in Cirata Reservoir that initially operated was around 74 units, while in 2017 the number of KJAs reached 56,000-77,000 plots (Nurhayati & Herawati, 2018). In 2019 the number of KJA jumped quite a lot to reach 93,641 plots, while the number of KJA listed in the regulation issued by the Governor of West Java No. 660.31/Kep.923-DKP/2019 concerning the number of Floating Net Cages (KJA) in Cirata Reservoir, Saguling Reservoir, and Jatiluhur Reservoir that meet the environment is limited to 7,204 KJA plots (for Cirata Reservoir). The number of KJAs in Cirata Reservoir has exceeded the carrying capacity and capacity, which can cause a high pollution load and will have an impact on poor environmental conditions which will have an impact on fish farming there, one of which will result in mass fish deaths that can occur every year (Sutjinurani & Suharyanto, 2016).

One of the problems that arise in fish farming is the occurrence of disease attacks that can result in losses for farmers. According to Handayani et al. (2004) one type of fish disease is parasites. Parasites are harmful organisms that live in the host, parasites are one of the fish diseases that often have a negative impact on the host. Parasites that are classified into ectoparasites parasites themselves usually live outside the host, one part of the fish body that is often found in the presence of several types of parasites is usually found in body parts such as gills, fin skin. The initial stage of overcoming the spread of parasites is to identify the types of ectoparasites, parasite intensity to calculate the number of parasites that invade organisms in a space and time, and parasite prevalence to calculate the number of parasite-invaded fish in a population. The purpose of this study was to analyze the level of intensity and prevalence of ectoparasites in carp in the Jangari Block Floating Net Cage (KJA) of Cirata Reservoir, Cianjur Regency, West Java.

METHOD

The research was conducted from March to April 2024. The research location was in Jangari Block of Cirata Reservoir, Cianjur Regency, West Java. This research used survey method, fish samples were taken using *purposive sampling* method. This study was conducted *in situ (*temperature, brightness, pH, DO) and *ex situ* (ammonia and BOD5) at the Aquatic Resources Laboratory (SDP) Faculty of Fisheries and Marine Science, Padjadjaran University Jatinangor. Identification of ectoparasites in fish samples from Floating Net Cages (KJA) conducted *ex situ* at the Aquaculture Laboratory, Faculty of Fisheries and Marine Science, Padjadjaran University Jatinangor.



Picture 1. Map of Research Stations in Jangari Block of Cirata Reservoir, Cianjur Regency**.**

Carp samples were taken directly from three floating net cages (KJA) in Cirata Reservoir, Cianjur Regency, West Java. Sampling of carp as many as 30 fish with sizes 4-12 cm were taken using a net. Each station in the floating net cage (KJA) was taken 10 fish.

Ectoparasite Identification

Identification of ectoparasites using a microscope and using the guidelines of Kabata (1985), Gusrina (2008), Esti Handayani Hardi (2015) and the internet.

Intensity and Prevalence

Intensity and prevalence were calculated using the formula for analyzing ectoparasite attacks according to Yudhistira (2004) as follows:

$$intensity\ ind/head\ = \frac{Jumlah\ ektoparasit\ A\ yang\ menginfeksi}{Jumlah\ sampel\ ikan\ yang\ terserang\ parasit\ A}$$

$$Prevalence\ (\%)\ = \frac{Jumlah\ sampel\ ikan\ yang\ terserang}{Jumlah\ sampel\ ikan\ yang\ diperiksa} x100\%$$

Table 1. Criteria for ectoparasite intensity according to William and Bunkley (1996)

No	Intensity (ind/head)	Category
1	<1	Very low
2	1 - 5	Low
3	6 - 50	Medium
4	51- 100	Severe

No	Intensity (ind/head)	Category
4	>100	Very severe
5	>1000	Super severe
6	<1	Very low

Table 2: Criteria for ectoparasite prevalence according to William and Bunkley (1996).

No	Prevalence (%)	Category	Description
1	100 - 99	Always	Very severe
2	98 - 90	Almost always	Severe
3	89 - 70	Usually	Medium
4	69 - 50	Very often	Very often
5	49 - 30	Generally	Regular
6	29 - 10	Often	Often
7	9 - 1	Sometimes	Sometimes
8	< 1 - 0,1	Rare	Rare
9	< 0,1 - 0,01	Very rare	Very rare
10	< 0,01	Almost never	Infection never

Data analysis techniques

Data obtained from the results of the study in the form of types, number of ectoparasites, intensity, prevalence, and supporting data, namely water quality measurements analyzed descriptively quantitative. Data obtained from the results of the study in the form of types, number of ectoparasites, intensity, prevalence, and supporting data, namely water quality measurements which were analyzed descriptively quantitatively.

Research Tools

Plastic size 60 cm x 100 cm, pH meter with accuracy of 0.01 mg/L, DO meter with accuracy of 0.01 mg/L, Thermometer with accuracy of 0.10 C, Secchi disk, camera and stationery, Coolbox, ruler (accuracy of 1 mm), scales (accuracy of 0.01 grams), Millimeter block, aquarium and fiber, aerator (stone, faucet, aeration hose), dissecting set (scissors, scalpel), to dissect fish samples, binocular microscope (10x magnification), petri dish, tray, object glass and cover glass, label paper, tissue, camera, camera, scalpel), tweezers, scalpel), to dissect fish samples, binocular microscope (10x magnification), petri dish, tray, object glass and cover glass, label paper, tissue, camera and stationery, Winkler bottle, 100 ml erlenmeyer, measuring cup volume 25 ml test tube, spectophotometer, 10 ml pipette, 5 m pipette, 30 ml test tube, 500 ml measuring cup, incubator, and 25 ml burette.

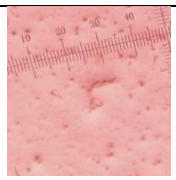
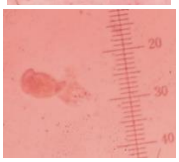
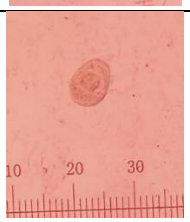
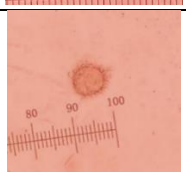
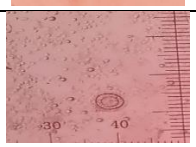
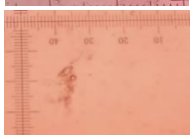
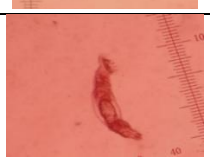
Research Materials

30 carp/species with a body length of 5-12 cm, physiological NaCl, glycerin, and giemsa, siegnette solution, nessler solution, NH3 standard solution, MnSO 4 50%, O2 reagent, 0.01N sodium thiosulfate, 1% amylum indicator, concentrated H2 SO4 , and filter paper.

RESULT AND DISCUSSION

The results of the examination of ectoparasites in *carp* (*Cyprinus carpio*) in floating net cages (KJA) in Jangari Block of Cirata Reservoir, Cianjur district, West Java found 8 types of ectoparasites consisting of the phyla Arthropoda, Protozoa, Echinodermata, Platyhelminthes, and Ciliophora.

Table 3. Ectoparasites of the Phylum Arthropoda, Ciliophora, Protozoa, Platyhelminthes (at 10x objective lens and 10x ocular lens magnification)

No	Filum	Genus	Documentation
1	Arthropods	*Lernea* sp.	
		Ergasilus sp.	
2	Ciliophora	*Chilodonella* sp.	
3	Protozoa	*Ichthyophtirius multifilis*	
4	Protozoa	*Tricodina* sp.	
		Vorticella sp	
5	Platyhelminthes	*Dactylogyrus* sp.	

No	Filum	Genus	Documentation
		Gyrodactylus sp.	

The results of the examination of carp at station 1 found 8 fish infected with ectoparasites, station 2 found 9 fish infected with ectoparasites, and station 3 found 9 fish infected with ectoparasites.

Table 4. Types and Number of Ectoparasites in Goldfish (*Cyprinus carpio*)

No	Types of Parasites	Location Station 1	Location Station 2	Location Station 3
1	*Lernea sp.*	1	-	-
2	*Chilodonella sp.*	8	-	3
3	*Tricodina sp.*	7	1	2
4	*Ergasilus sp.*	1	-	-
5	*Ichthyophtirius multifilis*	2	5	-
6	*Dactylogyrus sp.*	23	13	22
7	*Gyrodactylus sp.*	5	4	1
8	*Vorticella sp.*	-	1	-
	Total	**47**	**24**	**28**

INTENSITY

Intensity of ectoparasites infecting *carp* (*Cyprinus carpio*) in floating net cages (KJA) of Jangari Block, Cirata Reservoir, Cianjur Regency, West Java with intensity criteria according to William and Bunkley (1996).

Table 5. Ectoparasite intensity

Location	Ectoparasite Type	Intensty (Ind/Head)	Description
1	*Lernea sp.*	1	Low
	Chilodonella sp.	4	Low
	Tricodina sp.	7	Medium
	Ergasilus sp.	1	Low
	Ichthyophtirius multifilis	2	Low
	Dactylogyrus sp.	3,83	Low
	Gyrodactylus sp.	1,66	Low
2	*Tricodina sp.*	1	Low
	Ichthyophtirius multifilis	2,5	Low

Location	Ectoparasite Type	Intensty (Ind/Head)	Description
	Dactylogyrus sp.	2,16	Low
	Gyrodactylus sp.	2	Low
	Vorticella sp.	1	Low
3	*Chilodonella sp.*	1	Low
	Dactylogyrus sp.	2,75	Low
	Gyrodactylus sp.	1	Low

The value of parasite intensity at station 1 was higher at 3.1 ind/head compared to station 2 at 2 ind/head, and station 3 at 2.3 ind/head. The parasite genus that has the highest intensity at station 1 is *Tricodina* sp. 7 ind / fish or 7 individuals per fish which is included in the medium category. This is because *Tricodina* sp. attaches to the surface of the body which will rotate 360o by using cilia so that it will damage the surrounding cells and will eat part of the epithelial cells that have been destroyed so as to cause irritation on the surface of the body of fish that have been infected with *Tricodina sp.* Ectoparasites that have the lowest intensity value are *Lernea sp*. because at the time of sampling *Lernea sp. is* still at the *copepodid* stage or at this stage the *Lernea* sp. parasite.

At station 2 ectoparasites that have an intensity value of 2 ind/head and the genus of parasites that have the highest intensity is *Ichthyophtirius multifilis*, which is 2.5 ind/head and is included in the low category, because this parasite reproduces by binary division where this division occurs in ± 24 hours. The lowest intensity value at station 2 is for the parasite genus *Vorticella* sp. 1 ind/head and *Gyrodactylus* sp. which is 1 ind/head at point 2. The lowest intensity value for these ectoparasites is because the conditions in the Cirata Reservoir do not support the growth of these parasites.

At station 3 ectoparasites that have an intensity value of 2.3 ind/head in the genus of parasites with the highest intensity is *Dactylogyrus* sp. which is 2.75 ind/head and is included in the low category. *Dactylogyrus* sp. parasites usually attack the fin organs and also the gills, fish attacked by this parasite are usually limp, do not move much, there are protrusions on the gill filaments that make damage to the gills, and can also make bleeding in the gill organs if they have a high enough intensity value in the fish farming environment (Annur *et al.,* 2021). And the lowest intensity value at station 3 is the genus *Chilodonella* sp. which is 1 ind / tail and *Gyrodactylogyrus* sp. which is 1 ind / tail, the low intensity value of these two parasites is due to the cultivation environment that does not support the development of these parasites.

PREVALENCE

Prevalence values of ectoparasites infecting *carp* (*Cyprinus carpio*) in floating net cages (KJA) of Jangari Block, Cirata Reservoir, Cianjur Regency, West Java with prevalence criteria according to William and Bunkley (1996).

Table 6. Prevalence of Ectoparasites

Location	Ectoparasite Type	Prevalance (%)	Description
1	*Lernea sp.*	3,33	Sometimes
	Chilodonella sp.	6,66	Sometimes
	Tricodina sp.	3,33	Sometimes
	Ergasilus sp.	3,33	Sometimes
	Ichthyophtirius multifilis	3,33	Sometimes
	Dactylogyrus sp.	20,00	Often
	Gyrodactylus sp.	10,00	Often
2	*Tricodina sp.*	3,33	Sometimes
	Ichthyophtirius multifilis	6,66	Sometimes
	Dactylogyrus sp.	20,00	Often
	Gyrodactylus sp.	6,60	Sometimes
	Vorticella sp.	3,33	Sometimes
3	*Chilodonella sp.*	10,00	Often
	Dactylogyrus sp.	26,60	Often
	Gyrodactylus sp.	3,33	Sometimes

The highest ectoparasite prevalence value at station 1 is *Dactylogyrus* sp. 20%, which means that the number of fish infected with *Dactylogyrus* sp. parasites is 6 fish out of the total number of fish observed at point 1, namely 10 fish, the prevalence rate at station 1 which is included in the frequent category or which means that parasitic infections are often found. The lowest prevalence value at station 1 is *Lernea* sp. 3.33%, *Tricodina sp.* 3.33%, *Ergasilus* sp. 3.33%, *Ichthyophtirius multifilis* 3.33% which means the number of fish infected with parasites *Lernea sp.* at station 1 is 1 fish, *Tricodina* sp. 1 fish, *Ergasilus sp. 1 fish,* and *Ichthyophtirius multifilis 1 fish* from the number of fish observed at station 1 and is classified into the category generally or commonly attacking fish. *Lernea* sp. is one type of parasite found with low infection, because the parasite *Lernea* sp. usually lives swimming freely looking for its host to continue its life cycle.

The highest prevalence value at station 2 was *Dactylogyrus* sp. 20.00% which means that the fish infected with the parasite *Dactylogyrus* sp. as many as 6 fish out of the total number of fish examined as many as 10 fish from station 2. The lowest prevalence value at station 2 is *Tricodina sp.* 3.33% which means that the fish infected with the parasite *Tricodina sp. as many as* 1 fish out of the total number of fish examined as many as 10 fish at station 2 and is classified as a category

sometimes which means that the parasite *Tricodina sp.* is sometimes found and not too dominating. The lowest prevalence value is *Vorticella* sp. 3.33%, which means that fish infected with *Vorticella* sp. parasites are 1 fish out of a total of 10 fish examined at point 2 and are categorized as sometimes or *Vorticella* sp. parasites sometimes attack fish and their population is not too dominating.

The highest prevalence value at station 3 is *Dactylogyrus* sp. 26.60% which means that the fish infected with *Dactylogyrus* sp. parasites are 8 fish out of the total number of 10 fish examined at point 3 and are categorized as frequent or *Dactylogyrus* sp. parasites often attack *carp* (*Cyprinus carpio*). The lowest prevalence value is *Gyrodactylus* sp. 3.33%, which means that fish infested with *Gyrodactylus* sp. parasites as much as 1 fish out of a total of 10 fish examined at station 3 and is categorized as sometimes or *Gyrodactylus* sp. parasites sometimes attack fish. *Gyrodactylus* sp. is a parasite that attacks the skin and gills, fish infected with the parasite *Gyrodactylus* sp. especially in the gills will look like opening and closing like a lack of oxygen and the production of more mucus and fish swimming to the surface.

WATER QUALITY

Poor environmental conditions can trigger the growth of parasites. The results of observations of water quality in Cirata Reservoir Jangari Block are still quite good for fish life, as can be seen in the table below.

Table 7. Water Quality Parameters (According to the Quality Standard of PP RI No. 22 of 2021)

Parameters	Units	Station 1	Station 2	Station 3
Temperature	° C	28	29	29
pH	-	7,9	8,3	8,2
Brightness	Meter	1	1,5	1
DO	mg/L	6,7	7,1	7,3
BOD	mg/L	2,2	1,5	1,9
Ammonia	mg/L	0,005	0,017	0,011

The temperature of Cirata Reservoir waters at 08.00-09.00 WIB tends to be quite warm, which is around 28-29°C. Where the safe and optimum temperature for carp farming is around 2 8-30°C (Laila, 2018). The average pH of Cirata Reservoir waters in Jangari Block is 7.9-8.3, which is normal for fish life. Based on PP RI No. 22 of 2021, the pH that supports fisheries activities and other aquatic organisms ranges from 6-9. In fish farming, a good pH value is 5-9 (Gunawan *et al.,* 2020). Cirata Reservoir waters have a general depth ranging from 40-67 meters. Water brightness was measured using a *Secci Disk* tool and obtained values ranging from 1 meter at station 1, 1.5 meters at station 2, and 1 meter at station 3. Station 1 and station 3 have very low brightness values, this is because at both points there is high human

activity. The results of DO measurements in the waters of Cirata Reservoir Jangari Block showed a range of 6.7 mg/l at station 1, DO at station 2 ranged from 7.1 mg/l, and DO at station 3 ranged from 7.3 mg/l. Based on the DO results obtained in the Cirata Reservoir waters, Jangari Block is still classified as suitable for the survival of cultivated biota. The value of BOD measurements at station 1 was 2.2 mg/l, at station 2 was 1.5 mg/l, and at station 3 was 1.9 mg/l. The results of the BOD value show that the range of values is still in accordance with the water quality standards because it has not exceeded the threshold determined by PP RI No. 22 of 2021. The ammonia value in Cirata Reservoir waters shows a value of 0.005-0.017 mg/l. Water ammonia levels are usually less than 0.1 mg/l (McNeely *et al.,* 1979 in Effendi, 2003). Freshwater should have an ammonia value of no more than 0.02 mg/l. If the ammonia content in fresh waters is more than 0.02 mg/l then the waters are categorized as toxic waters for some species of fish (Sawyer and McNeely, 1978 in Effendi, 2003).

CONCLUSIONS

Based on the research conducted on fish samples from the Jangari Block Floating Net Cage (KJA) of Cirata Reservoir, Cianjur Regency, West Java as many as 30 fish with 10 fish from each station, it can be concluded that the intensity value with the highest parasite genus is *Tricodina* sp. 7 ind/head with a moderate category, and the lowest intensity at point 1 is *Lernea* sp. 1 ind/head and *Ergasilus* sp 1 ind/head. The highest prevalence value was *Dactylogyrus* sp. 20.00% with frequent category, and the lowest were *Lernea sp*. 3.33%, *Ergasilus* sp. 3.33%, and *Tricodina sp. 3.*33%.

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