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DEGREE OF INFECTION AND PREVALENCE OF ECTOPARASITES IN CARP (*Cyprinus carpio*) IN BATANG DISTRICT

Derajat Infeksi dan Prevalensi Ektoparasit pada Ikan Mas (*Cyprinus carpio*) di Kabupaten Batang

Linayati[1], Tri Yusufi Mardiana[1*], Nur Fadhilah Adimahsyaf[1], Muhammad Zulkham Yahya[1], Tristiana Yuniarti[2]

[1]Aquaculture Departement, Faculty of Fisheries, Pekalongan University, [2]Aquaculture Departement, Faculty of Fisheries and Marine Science, Diponegoro University

Sriwijaya Street No.3, Bendan, West Pekalongan District, Pekalongan Regency, Central Java 51119

*Corresponding Author: yusufihanum@yahoo.co.id

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ABSTRACT

Disease attack is one of the obstacles in aquaculture that can cause a decrease in productivity. Fish diseases can be caused by parasites both endoparasites and ectoparasites. The purpose of this study was to determine the type, prevalence, and intensity of ectoparasites in carp cultivated in ponds at the Fish Seed Center in Batang Regency, Central Java. The method used in the study was the survey method. The samples taken were 30 fish. Data were analyzed descriptively quantitatively. The results showed that the type of parasite found in carp was Argulus sp. with an infection rate of 10.7 individuals/head and a prevalence of 67%. The degree of infection is categorized as moderate and the prevalence is categorized as very frequent infection.

Keywords : *Argulus* sp., Degree of infection, Ectoparasites, Goldfish, Prevalence.

ABSTRAK

Serangan penyakit merupakan salah satu kendala dalam budidaya ikan yang dapat menyebakan turunnya produktivitas. Penyakit pada ikan dapat disebakan parasit baik endoparasit maupun ektoparasit. Tujuan dari penelitian ini untuk mengetahui jenis, prevalensi, dan intensitas ektoparasit pada ikan mas yang dibudidayakan dalam kolam di Balai Benih Ikan di Kabupaten Batang, Jawa Tengah. Metode yang digunakan dalam penelitian dengan metode survei. Sampel yang diambil sebanyak 30 ekor. Data dianalisis secara deskriptif kuantitatif. Hasil penelitian menunjukkan jenis parasit yang ditemukan pada ikan mas adalah Argulus sp. dengan nilai derajat infeksi 10,7 individu/ekor dan prevalensi 67%. Derajat infeksi masuk dalam kategori sedang dan prevalensi masuk dalam kategori infeksi sangat sering.

Kata kunci : *Argulus* sp, Derajat infeksi, Ektoparasit, Ikan mas, Prevalensi.

INTRODUCTION

All types of goldfish (*Cyprinus carpio*) is one of the freshwater fish that has quite large cultivation opportunities and is liked by many people because it has delicious, thick, tender meat and high nutritional value (Juniarsih *et al.,* 2017). Carp have been cultivated commercially in all provinces in Indonesia. Based on data from the Ministry of Maritime Affairs and Fisheries (2021), total national carp production in 2019 was close to 536 thousand tons. Affordable prices also influence the high demand for goldfish on the market (Afifah *et al.,* 2014). Carp farming activities are certainly not free from problems such as the emergence of disease attacks from bacteria, viruses and parasites, both ecto- and endoparasites. This can certainly hamper and reduce fish farming production. According to Mahardika *et al.,* (2018), stated that ectoparasite attacks on fish can cause mortality. High prevalence rates of ectoparasites are also often found, one of which is in tilapia, namely *Gyrodactilus* sp which reaches 80% (Alimudin *et al.,* 2022) which can affect productivity levels. Batang Regency Fish Seed Center (BBI) is one of the fish breeding centers that provides fish needs for farmers, one of which is goldfish. Currently there is not enough data regarding ectoparasite attacks on goldfish kept at BBI, Batag Regency . For this reason, further research is needed on ectoiparasites found in goldfish.

There are 2 types of diseases caused by parasites based on the location of infection, namely endoparasites and ectoparasites. Endoparasites are parasites that infect parts of the fish's body organs, while ectoparasites are parasites that infect the outside of the fish's body (Linayati *et al.,*2021). In general, diseases resulting from parasite attacks rarely have immediate negative effects. It's just that if the intensity of the attack is high in a limited area, it can have a negative impact on the fish being farmed (Linayati *et al.,* 2022). Apart from that, the presence of parasites can become a vector for secondary infections caused by bacteria or viruses (Indahsari *et al.,* 2019)

Some examples of endoparasites are *Cappilaria sp.* as found in the intestinal organs of Betta fish in Pekalongan City with a prevalence value of 13.33% and 36.5% in the group of fish measuring 3.5-5.6 cm (Linayati *et al.,* 2021) and *Anisakis* sp. found in tuna fish in Pekalongan City with a prevalence value above 60% (Linayati & Madusari, 2019). Meanwhile, for example, the type of ectoparasite found in betta fish is *Ichtyoptirius multifilis* with a prevalence value above 30%, and *Tetrahymena* sp. with a prevalence value above 40% (Linayati *et al.,* 2022). There are also ectoparasites of *the Argulus type sp* found in goldfish with prevalence values of 26.7% and 65% (Juniarsih *et al.,* 2017).

Parasite attacks *Argulus* sp. In goldfish it is also called Argulosis disease. Based on statements from Kumar *et al.,* (2012); Saha & Bandyopadhayay (2015), location of infection from parasites *Argulus* sp. located in the operculum, head, fins and body surface of the fish. Clinical symptoms arising from fish infected with this parasite include loss of appetite, rubbing the body on objects around it, excessive mucus production, wounds on the surface of the body, and even bleeding (Taylor *et al.,* 2005; Ode, 2012; Juwahir *et al.,* 2016).

Parasitic infections are one of the causes of losses in fish farming business activities. In order to carry out appropriate control, it is necessary to know the level of infectivity by calculating the prevalence value and degree of infection (intensity) of the parasites that attack the fish. According to Jasmanindar (2011), prevalence is a value that shows the level of parasite attack incidence, and the degree of infection (intensity) is a value that shows the number of parasite attacks on each fish. This research aims to identify the types of ectoparasites in goldfish (*Cyprinus carpio*) and determine the prevalence rate and degree of infection in goldfish.

METHODS

The research was carried out from April 25 to May 10 2024. Samples were taken from goldfish rearing ponds in Batang Regency. Microscopic observations of parasites were carried

out at the Batang Regency Maritime Fisheries and Livestock Service. Data from the research results were analyzed descriptively and presented in the form of figures and tables.

Samples of 30 goldfish were taken. The goldfish examined were broodstock with a weight of 1.2 kg. The fish samples examined only showed signs of illness such as weak movements, solitude, and wounds on the fish's body.

The equipment used includes sesers, basins, bench scales, objects glass, cover glass, microscope, DO meter, and pH meter. Observations *Argulus* sp. on goldfish is done directly (macroscopic). Sampling and observations are carried out directly when the fish are in the cultivation pond to avoid *Argulus* sp changed places. Observations *Argulus* sp is carried out on the body surface, operculum, dorsal, pectoral , ventral, anal and caudal fins. Apart from parasite checks, water quality checks are also carried out in sampling ponds. The water quality parameters measured include DO, pH and temperature. After examination and observation, the next step is to calculate the prevalence rate and degree of parasite infection using the Kabata (1985) formula as follows:

$$Prevalence = \frac{\sum Fish\ are\ infected\ with\ disease}{\sum Inspected\ fish} \times 100\%$$

$$Degree\ of\ infection = \frac{\sum Parasites\ found}{\sum Infected\ fish}$$

The prevalence rate and degree of infection were determined by referring to Table 1 and Table 2 from William and William (1996) and the data obtained were then tabulated and analyzed descriptively.

Table 1. Prevalence Level Categories

No.	**Prevalence (%)**	**Category**	**Information**
1	100-99	Always	The infection is very serious
2	98-90	Almost Always	Infection critical
3	89-70	Usually	Infection currently
4	69-50	Very often	Infections are very frequent
5	49-30	Generally	Infection normal
6	29-10	Often	Infection often
7	9-1	Sometimes	Infection sometimes
8	<1-0.1	Seldom	Infection seldom
9	<0.1-0.1	Very rarely	Infection is very rare
10	<0.01	Almost No Once	Infection No Once

Table 2. Categories of Degree of Infection

No.	**Degree of infection of each parasite**	**Category**
1	<1	Very low
2	1-5	Low
3	6-55	Currently
4	51-100	Critical
5	>100	Awfully
6	>1000	Super infectious

RESULTS

Prevalence Level and Degree of Infection of *Argulus* sp.

Based on observations from a total sample of 30 goldfish examined, 20 fish were found to be infected with *Argulus sp*. The location of infection is found on the surface of the fish's body, including operculum , abdominal, dorsal, pectoral, ventral, anal, and caudal fins.

Table 3. Data on *Argulus Prevalence Levels* sp.

Type Parasite	Prevalence (%)	Category Value (%)	Information
Argulus sp.	67	69-50	Very Frequent Infections

Argulus prevalence rate *sp* sp. (Table 3) in goldfish, 67% fell into the category of very frequent infections (William and William, 1996).

Table 4. Data on Degree of Infection

Type Parasite	Degrees Infection	Category Value	Information
Argulus sp.	10.7	6-55	Currently

Meanwhile, for the degree of *Argulus infection sp* (Table 4) in goldfish was 10.7 *Argulus* sp. per individual fish, included in the medium category. High prevalence and degree of infection *Argulus* sp. in goldfish can be caused by several factors, such as choosing fish that are infected with *Argulus* sp. from the previous place of origin.

Water quality

The results of water quality measurements for carp rearing including DO, pH and temperature are presented in Table 5

Table 5 . Measurement results Quality Goldfish Cultivation Pond Water

Parameter	Mark	
	Sampling Pond	SNI 01- 6131 - 1999
DO (mg/L)	5.2	≥ 5
Ph	7.6	6.5 – 8.5
Temperature (^{o}C)	27.7	25 – 30

Based on results data measurement water quality in research This can seen Goldfish rearing water quality shows optimal conditions and still in threshold SNI limits.

DISCUSSION

Biology of *Argulus* sp. and Clinical Symptoms of Infection

Study against a sampling of 30 goldfish taken from pond maintenance in the District Trunks, only found One type parasite that is *Argulus* spp. which infects goldfish (*Cyprinus carpio*). According to Ali *et al.,* (2013), body *Argulus* spp. shaped flat round measuring 6-6.5 mm in diameter for females and 2-3 mm for male, as well divided become three part namely the cephalothorax, thorax and abdomen (Figure 1). Parasite This has a large sucker on the ventral part that functions as an attachment organ to the host . Body dorsal part of *Argulus sp* sp. protected by a covering carapace almost all over his body and can moved resemble wing.

Figure 1. *Argulus* spp.

Parasite *Argulus* spp. in a way whole own cycle live 30-100 days depends condition water temperature. According to Sari (2014), once lay eggs *Argulus* spp. capable produces 50-250 items egg and attached to the substrate hard like glass aquarium, rocks, water plants. Egg *Argulus* spp. at a temperature of 35 ° C can hatch in 10 days, while at a temperature of 15 ° C need time 61 days (Steckler & Yanong, 2012). Survival rate life *Argulus* sp. in conditions without water according to Sari (2014), when drying One until four day with temperature space, happens decline Power hatch linearly up to remaining 19%, 14%, 12.5%, and 3.5%. Furthermore explained that content Oxygen also influences attendance Ectoprasites. During pregnancy oxygen low not enough than 2 ppm then capable push development ectoparasites (Suratno & Faziansyah, 2022).

Infected fish parasite *Argulus* spp. usually give rise to a number of symptom clinical. Based on results observations made in the research This is an infected fish *Argulus* spp. give rise to symptom clinical like exists injury to the part fish tail and head (Figures 1 and 2), weak fish movements, and excessive mucus production. This matter in accordance with Kurniawan's statement (2012), several symptom clinical outcomes when the fish is attacked parasite *Argulus sp* sp. like appearance irritation, decline weight, production mucus excess, scales revealed until regardless, appear point blood on the used area bite, as well usually fish rub together his body to the edge area or base containers and objects loud surroundings (Kurniawan, 2012).

Figure 2a. Infected Goldfish *Argulus* spp.

Figure 2b. Wound on the tail consequence infection *Argulus* spp.

Prevalence Rate and Degree of Infection *Argulus* spp.

Presence parasite in cultivation can caused by several factor that is high fish density, granting feed that is not unsuitable and poor water quality. Prevalence rate High *Argulus* sp. by 67% or enter in category infection is very common in cases This found in goldfish with big size with weighs 1.2 kg and has an average age of 3 years. Furthermore explained that prevalence parasites in fish can influenced by fish age, immunity body and factors environment (Zulfikli & Nurekawati, 2019). The more old the age of the fish increases big its potential attacked parasite because forever maintenance in pond so that possible happen contact with parasite. The same thing pointed out by Maulana *et al.,*(2017), that prevalence parasite including *Argulus* sp. high reaching 100% found in betok fish with the longest size in the sample 11.02-13.01 cm and 13.02-15.01 cm.

Degrees infections in the study showing category currently or 10.7 fish per fish. Things that influence condition the is large fish body so that provide enough space lots for parasite for infect. Besides that availability source food for parasites in large fish big become support main many parasite *Argulus* sp. on each fish tails reaching 10.7 individuals. This matter supported Rohde's (1982) statement that parasite more like host with body organs more big so that easy occupied , provide source sufficient food , as well adequate space For support development parasite the .

Presence parasite endoparasite or ectoparasites through prevalence parameters nor degree infection is greatly influenced by factors environment nor nutrition. When taking samples carried out in April – May still enter in season raining with sufficient intensity can influence attack ectoparasites. According to Paremme & Salosso (2018), rain enlarge presence ectoparasites in cultivation. Rainwater can bring egg *Argulus* sp. enter to in pond. This matter because egg *Argulus* sp. can stick to objects hard or equipment supporter later cultivation carried away by rainwater. According to Harrison *et al.,* (2007) that egg *Argulus sp* can stick to something hard like board wood so that must issued from pond water. Equipment supporter cultivation that does not sterilized moreover I can do it first too become parasite vector enters to location cultivation.

Infected fish *Argulus* sp. the condition will weakened in a way slowly because blood sucked by *Argulus* sp. nor because the wound that forms consequence bite *Argulus sp*. The wound potential become infection secondary causes other microorganisms such as bacteria, fungi or viruses. Existence wounds will too cause bleeding and affecting fish health. This matter in line with Samsi *et al.,* (2016), who stated that attack *Argulus* sp. in goldfish can cause bleeding and injury to tissue outside the fish.

Prevalence value of *Argulus* sp was 67.9% of admissions category infections are very frequent and severe infection while 10.7 *Argulus* sp in each individual need attention and vigilance. This matter because existence ectoparasites on site cultivation influence productivity and ownership potency spread to another pond.

High prevalence and degree of infection *Argulus* sp. can controlled with use a number of material like noticed papaya seeds with optimal dose 80 ppt (Inaya *et al.,* 2015) and NaCl salt with dose 9 ppm (Dewi *et al.,* 2018) reported can kill egg *Argulus* sp. on the pond. Water quality during the research process Still in decent range For goldfish life .

CONCLUSION

The conclusion of this research is that the type of ectoparasite found in goldfish is *Argulus* sp and prevalence values of parasites *Argulus* sp. namely 67% with a degree of infection of 10.7 in each individual fish. Thep presence of the parasite *Argulus* sp. is caused by *Argulus* eggs that stick to equipment or around the pond and are carried by rainwater into the pond.

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REFERENCES

Afifah, B., Abdulgani, N., & Mahasri, G. (2014). Efektifitas Perendaman Benih Ikan Mas (*Cyprinus carpio* L.) dalam Larutan Perasan Daun Api-Api (*Avicennia marina*) terhadap Penurunan Jumlah *Trichodina* sp. *Jurnal Sains dan Seni POMITS., 3*(2), 58-62.

Alimuddin, Andi Yusuf, Nursidi, Mulyati. 2022. Identifikasi ektoparasit pada ikan nila (*Oreochromis niloticus*) di kolam pembesaran ikan air tawar Politani Pangkep. *Prosiding Semnas* Politani Pangkep Vol 3, 130-138

Ali, S. K., Koniyo, Y., & Mulis. (2013). Identifikasi ektoparasit pada ikan nila (Oreochromis niloticus) di Danau Limboto Provinsi Gorontalo. *Jurnal Ilmiah Perikanan Dan Kelautan, 19*, 31–36.

Dewi, R. R., Siallagan, W., & Suryanto, D. (2018). The Efficacy of Sodium Chloride Application in the Control of Fice Lice (Argulus sp sp) Infection on Tilapia (*Oreochromis niloticus*). *Acta Aquatica: Aquatic Sciences Journal, 5*(1), 4–7.

Erwin, N., Ridho, M.R., & Fitri, R. (2015). *Identifikasi dan Prevalensi Ektoparasit dan endoparasit Pada Ikan Nila (Oreochromus niloticus) di Kolam Budidaya Palembang, Sumatera Selatan*. Prosiding Semirata bidang MIPA BKS PTN Barat. pp. 12–29

Harrison, A.J., Gault, N.F.,& Dick, J.T. (2007). Variation in egg-laying by the freshwater fish louse Argulus sp foliaceus (*Crustacea: Branchiura*). *Dis Aquat Organ, 78*(2), 169–172. doi: 10.3354/dao01863

Inaya, A. F. N., Kimiyati, & Subekti, S. (2015). Pengaruh Perasan Biji Pepaya (*Carica papaya*) terhadap Kerusakan Telur *Argulus sp* sp. *Jurnal Ilmiah Perikanan Dan Kelautan, 7*(2)

Indahsari M., Kismiyati, & M.F. Ulkhaq. (2019). Prevalence and Intensity of Ectoparasites of Tilapia (*Oreochromis niloticus*) in Ponds with Low,Medium and High Stocking Density. *IOP Earth and Enviromental Science, 236*, 1–6.

Jasmanindar. Y. (2011) . Prevalensi Parasit dan Penyakit Ikan Air Tawar yang Dibudidayakan Di Kota/Kabupaten Kupang. *Jurnal Ilmu Hayati dan Fisik, 13*(1), 25–30.

Juniarsih, A., Mahasri, G., & Kismiyati, K. (2017). Infestasi Argulus sp pada Ikan Mas (*Cyprinus carpio*, L.) di Pasar Kolam Tanah dan Beton, Kecamatan Mutilan dan Mungkid, Kabupaten Magelang. *Journal of Aquaculture and Fish Health, 6*(2), 74.

Juwahir, A., Ya'la, Z.R., Mangitung, S.F., & Rusaini. (2016). Prevalensi dan Intensitas Ektoparasit pada Ikan Mas (Cyprinus carpio L.) di Kabupaten Sigi. *Jurnal Agrisains., 17*(2), 62–69.

Kabata, Z. (1985). *Parasits and Disease of Fish Cultured in the Tropics*. London: Taylor and Francis.

KKP. (2021). Produksi Perikanan. 18 September 2021. https://statistik.kkp.go.id/home.php?m=total&i=2#panel-footer.

Kumar, A., R.P. Raman, & K. Kumar. (2012). Antiparasitic Efficacy of Piperine Againts Argulus sp spp. On Carassius auratus (Linn. 1758): in Vitro and in Vivo Study. *Parasitol Res., 111*, 2071–2076.

Kurniawan, A. (2012). *Penyakit akuatik*. Pagkalpinang: UBB Press.

Linayat, L., & Madusari, B.D. (2019). Prevalence and Distribution of Anisakis sp Worms in Internal Organs of Tuna (*Euthynnus affinis*) at Fish Auction in Pekalongan City. *IOP Conf. Ser.: Earth Environ. Sci., 399*, 012109.

Linayati, L., Mardiana, T.Y., Ishadiyanto, & Yahya, M.Z. (2022). Prevalence Ectoparasites in Betta Fish (Betta splendens R) in Pekalongan City. *Jurnal Sains Akuakultur Tropis, 6*(2), 177-182

Linayati, L., Mardiana, T.Y., Ishadiyanto, Syakirin, M.B., & Soeprapto, H. (2021). Identifikasi Endoparasit Pada Ikan Cupang (Betta Splendens R) Di Kota Pekalongan. *PENA Akuatika, 20*(2)

Mahardika K., Mastuti I., dan Zafran Z. 2018. Intensitas Parsit Insang *Trematoda monogenea* : *Pseuodorhabdoynochus. sp* padaIikan Kerapu Hybrida Melalui Infeksi Buatan. *Jurnal Riset Auakuktur.* 13 (2) 169-177

Maulana, D.M., Muchlisin, Z.A., & Sugito, S. (2017). Intensitas dan Prevalensi Parasit Pada Ikan Betok (*Anabas testudineus*) dari Perairan Umum Daratan Aceh Bagian Utara. *Jurnal Ilmiah Mahasiswa Kelautan dan Perikanan Unsyiiah, 2*(1), 1–11.

Ode, I. (2012). Argulus sp Ektoparasit pada Ikan. *Bimafika: Jurnal MIPA, Kependidikan dan Terapan, 4*(1), 413-416.

Paremme, A. M., & Salosso, Y. (2018). Identifikasi Parasit *Anisakis* sp Pada Ikan Kakap Putih (*Lates calcarifer*), Kakap Merah (*Lutjanus sanguineus*), Dan Kerapu (*Epinephelus* sp) di Perairan Teluk Kupang. *Grouper: Jurnal Ilmiah Perikanan, 9*(2), 19–25.

Rohde, K. (1982). *Ecology of Marine Parasites*. St Lucia: University Queensland Press. 245.

Saha, M & P.K. Bandyopadhyay. (2015). First Report of Three Species of Argulus sp (Crustacea: Branchiura) Infesting on Redcan Oranda Gold Fish (*Carassius auratus*) in India. *Biolife Journa., 3*(4): 813-819.

Samsi, H., Mulyana, & M.A. Lusiastuti. (2016). Inventarisasi Ektoparasit pada Ikan Mas Koki (Carrasius auratus). *Jurnal Mina Sains, 2*(2), 71–79

Sari, N.D.K. (2014). *Pengendalian Telur Argulus sp sp. dengan Cara Pengeringan*. Surabaya: Universitas Airlangga.

SNI [Standar Nasional Indonesia]: 01-6131-1999. *Produksi Induk Ikan Mas (Cyprinus carpio Linneaus). Strain Majalaya Kelas Induk Pokok (Parent Stock)*. Jakarta: Badan Standarisasi Nasional Indonesia (BSN)

Steckler, N., & Yanong, R. P. E. (2012). *Argulus sp (Fish Louse) Infections in Fish.* Florida: University of Florida IFAS Extension, 1–5. http://edis.ifas.ufl.edu.

Suratno Suratno dan Dedi Faziansyah Putra. 2022. Pengendalian Ektoparasit Pada Ikan Lele Sangkuriang (*Clarias gariepinus*) Dengan Konsentrasi Oksigen Terlarut Sebagai Faktor Pembatas. JVIP, 2(2) : 32 - 36

Taylor, N. G. H., C. Sommerville & R. Wootten. (2005). *A Review of Argulus sp spp. Occuring in UK Freshwater*. Bristol: Environtment Agency.

Williams, E.H., & L.B. Williams. (1996). *Parasits Off shore big game fishes of Puerto Rico and the Western Atlantic*. Puerto Rico: Department of Natural Environmental Risourses and University of Puerto Rico

Zulkifli & Nurekawati, A.D. (2019). Infeksi Myxobolus sp. pada Ikan Koi (*Cyprinus carpio*) di Tahuna, Sulawesi Utara. *Samakia: Jurnal Ilmu Perikanan, 10*(2), 94-98.