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IDENTIFICATION OF TYPE, INTENSITY AND PREVALENCE OF VANAME SHRIMP (*Litopenaeus vannamei*) ECTOPARASITES IN TRADITIONAL POND CULTURE

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ABSTRACT

The production of vannamei shrimp (*Litopenaeus vannamei*) continues to decline due to parasitic attacks on ponds in North Gorontalo Regency. Ectoparasites are one of the factors that can cause failure in the cultivation of vannamei shrimp (*Litopenaeus vannamei*). This study aims to determine the type of ectoparasites, intensity, and prevalence of vannamei shrimp cultured in traditional ponds in the North Gorontalo Regency. A sampling of the research was carried out at five research stations. This research was selected randomly in 5 plots of ponds, and the total number of shrimp was as many as 150 tails. At each station, samples were taken of 30 vannamei shrimp (*Litopenaeus vannamei*). Sampling using fishing gear in the form of nets. The observed models were 8-10 cm in size alive. Observations of ectoparasites were carried out microscopically using a Zeis Binocular microscope with 10x magnification. Data analysis used descriptive analysis of ectoparasites, intensity, and prevalence of ectoparasites found. The study's results found four types of ectoparasites found in vannamei shrimp: *Zoothanium* sp, *Epistylis* sp, *Carchesium* sp, and *Vorticella* sp. The intensity of ectoparasite attack on shrimp was categorized as low to moderate infection, namely 4-7 individuals/head. The prevalence rate is 80-100%, with moderate to very severe disease.

INTRODUCTION

Vannamei Shrimp (*Litopenaeus vannamei*) is an introduced species cultivated in Indonesia. Vannamei shrimp come from Central American waters. Countries in Central and South America, such as Ecuador, Venezuela, Panama, Brazil, and Mexico, have long cultivated a type of shrimp known as Pacific white shrimp (Hafidloh and Sari 2019). Vannamei shrimp was officially introduced to the farming community in 2001 after the decline in production of tiger shrimp (*Penaeus monodon*) due to various problems encountered in the production process, both technical and non-technical problems (Subyakto et al. 2009). This species is relatively easy to breed and cultivate, so vannamei shrimp is one of the mainstay species in

shrimp culture in several countries worldwide.

The potential for fisheries in the North Gorontalo district includes the capture fisheries sub-sector, aquaculture, which includes ponds, floating nets, and fishery processing. Fishery potential in North Gorontalo Regency is expanding, along with production achievements that have increased significantly yearly. The district's fishery production achievement from 2007-2014 has increased from 9,317 tons in 2007 to 51,631 tons in 2014. Aquaculture production from 2,160 tons in 2007 to 28,443 tons in 2014, and capture fisheries production from 7,157 tons in 2007 to 23,178 tons in 2014 (Department of Fisheries and Marine Affairs, North Gorontalo Regency, 2015).

Utilization of aquaculture potential in 2011 reached 5,724 Ha with details for marine cultivation covering an area of 9.4 million m2, pond cultivation covering an area of 4,535 Ha, pond cultivation covering an area of 201 Ha, cage cultivation covering an area of 28,525 m2, floating net cultivation covering an area of 283,718 m2 and cultivation in rice fields covering an area of 16 Ha (Statistical data on aquaculture, 2011). Shrimp production in 2015 reached 67.80 tons (Central Bureau of Statistics North Gorontalo Regency, 2016).

These data indicate that the potential development of vannamei shrimp culture is not optimal. This is because vannamei shrimp farmers often experience production failure due to high shrimp mortality. The results of the observations showed that the problem faced by the vannamei shrimp farming community in the traditional ponds of the village of mootinelo is the presence of parasites that can inhibit the growth of shrimp it can result in crop failure. Parasite attack can be one of the predisposing factors for infection with more dangerous pathogenic organisms such as viruses and bacteria. Losses caused by ectoparasite attacks can be in the form of damage to external organs, namely the skin and gills, and can even lead to mass death. Therefore, it is necessary to take action to overcome the existing problems. Knowledge of the identification of ectoparasites in shrimp is fundamental and essential because the types of parasites that are often encountered have the potential to become obstacles in the cultivation unit.

METHODOLOGY

This research activity was carried out from August 2021 – January 2022. There are two locations for this research, namely the location for sampling vannamei shrimp (*Litopenaeus vannamei*) in Mootinelo Village, Kwandang District, North Gorontalo Regency, and for examination of vannamei shrimp (*Litopenaeus vannamei*) samples at Laboratory of Aquaculture, Feed and Disease, Faculty of Fisheries and Marine Sciences, State University of Gorontalo.

Vannamei shrimp sampling locations are located at five stations (ponds) in Mootinelo Village. The station I is located at the coordinates 0o48'19.11''N 122 o52'34.70''E. Station I is located near a resident's plantation and adjacent to a pond that is no longer in use. The station I area is ±7000 square meters with a stocking density of 30,000 individuals. Station II is located at the coordinates 0o48'20.94''N 122 o52'28.27''E. near people's plantations and far from seawater estuaries. The area of the pond at station II is ± 1 ha with a stocking density of 50,000 fish. The color of the water at station II is brownish. Station III is located at the coordinates 0o48'25.31''N 122 o52'30.96''E adjacent to station II and IV. Station III pond area is ±2 ha with a stocking density of 25,000. Seawater sources are far from this station. Station IV is located at the coordinates 0o48'27.44''N 122 o52'26.42''E. This pond is adjacent to station III in this pond, where there are mangrove trees that have been cut down. The area of the pond at this

station is ±1 ha, with a stocking density of 35,000 individuals. Station V is located at the coordinates of 0o48'59.22''N 122 o52'29.54''E. This station is located near the mangrove area and Maura seawater compared to other ponds. The area of the pond at Station V is ±2 ha with a stocking density of 25,000 individuals. The research location in detail is presented in Figure 1.

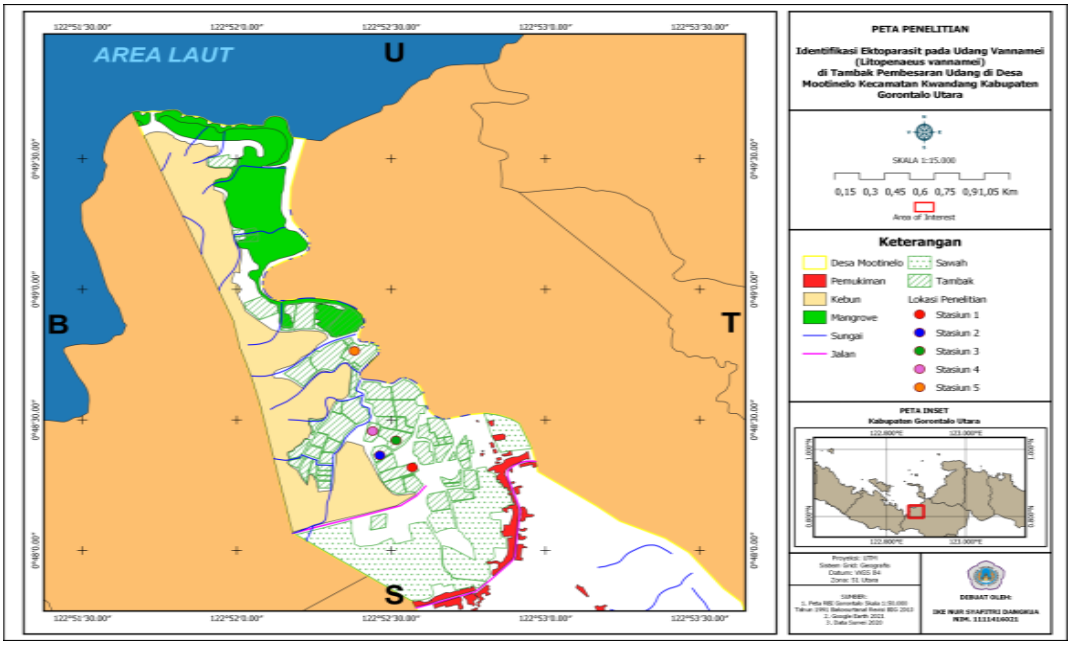

Figure 1. Research Sampling Locations

Sampling in this study was taken randomly at 5 stations and the total number of shrimp was 150. At each station, 30 vannamei shrimp (*Litopenaeus vannamei*) were taken. Sampling using fishing gear in the form of nets and shrimp were sampled alive.

The identification of ectoparasites in vannamei shrimp refers to the research of Hafidloh and Sari (2019). The stages of identification of ectoparasites were carried out during the research, namely (1) Preparing the tools and materials to be used, (2) Taking the shrimp from the storage container, (3) Weighing and measuring the length of the shrimp, (4) Cleaning the cutting board as a place for shrimp that has been cleaned. cut, (5) kills the shrimp by cutting the head of the shrimp and then cutting the parts that you want to observe, namely the tail, swimming legs, carapace and gills, (6) Putting the observation sample on a glass slide, (7) Taking the water from the live medium of the shrimp. using a pipette then dripping on the observation sample, (8) Observing ectoparasites under a Zeis Binocular Microscope with a magnification of 10x10, (9) Recording the results and taking documentation on a microscope (10) Calculating the prevalence and intensity of vannamei shrimp (Litopenaeus vannamei).

The prevalence and intensity of ectoparasites in shrimp were calculated as follows (Idrus, Mahasri, and Subekti 2016). The type, number and organ where the ectoparasites were found were recorded and the prevalence and intensity values were calculated using the following formula:

$$\text{Prevalence} = \frac{\sum \text{infected shrimp}}{\sum \text{shrimp examined}} \times 100\%$$

$$\text{Intensity} = \frac{\sum \text{infected shrimp}}{\sum \text{shrimp examined}}$$

RESULT

Types of Ectoparasites found in Vannamei Shrimp

Figure 2. Zoothamnium sp (10x Magnification)
(Documentation, 2021)

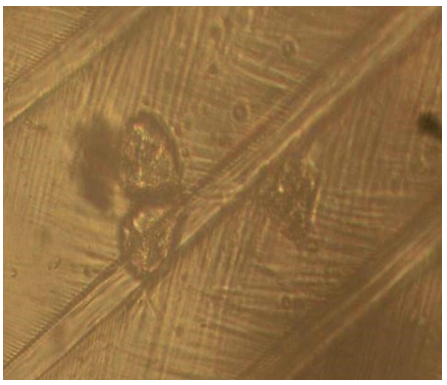

Figure 3. Epistylis sp (40x magnification)
(Source: Documentation, 2021)

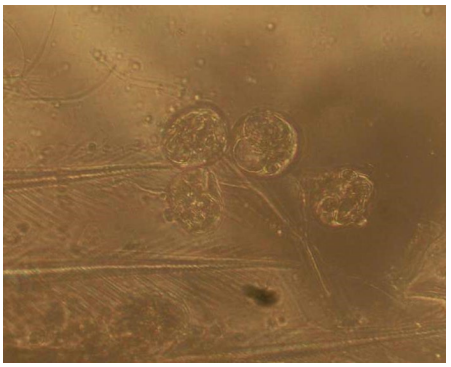

Figure 4. Carchesium sp (magnification 40x)
(Source: Documentation, 2021)

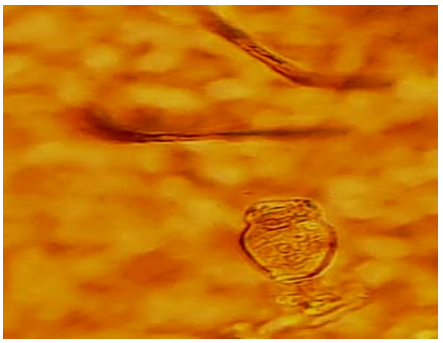

Figure 5. Vorticella sp (10x magnification)
(Source: Documentation, 2021)

Vannamei Shrimp Prevalence and Intensity

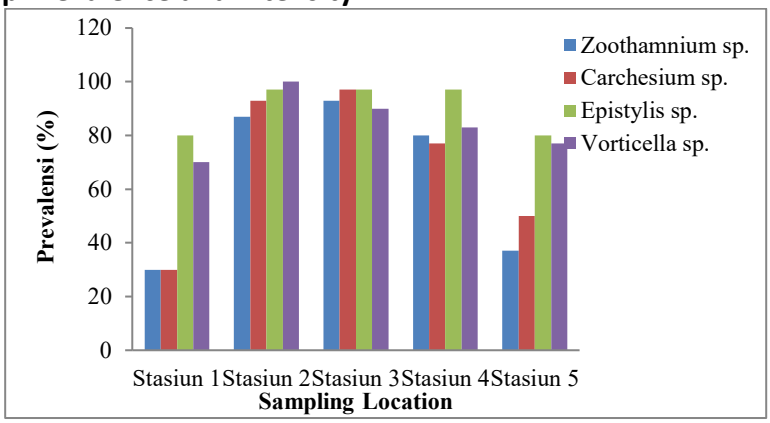

Figure 6. Graph of parasite attack prevalence on vannamei shrimp at each station

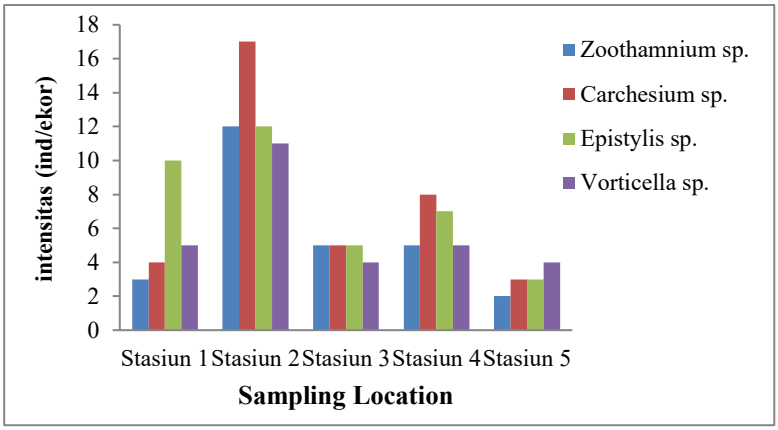

Figure 7. Graph of parasite intensity on vannamei shrimp at each station

Table 7. Prevalence and Intensity of Vannamei Shrimp Based on Organs Attacked

Organs observed	Prevalence (%)	Intensity (ind/tail)
Tail	92,00	12,31
Swimming Feet	78,67	10,06
Carapace	36,00	5,31
Gills	16,67	2,72

DISCUSSION

The results of the research on the identification of ectoparasites in vannamei shrimp, with a total sample of 150 individuals obtained from five traditional shrimp pond stations in Mootinelo Village, Kwandang District, North Gorontalo Regency, found types of ectoparasites belonging to the protozoa phylum, namely *Zoothamnium* sp, *Carchesium* sp, *Epistylis* sp., and *Vorticella* sp. The ectoparasites that often attack vannamei shrimp seeds are *Vorticella* sp., *Zoothamnium* sp., and *Epistylis* sp. The highest attack rate comes from *Zoothamnium* sp. with a prevalence value of 53% and an intensity of 38 individuals/head. This study aims to describe the types of Ciliophora and their attack level, as well as clinical symptoms of vannamei shrimp infected with Ciliophora ectoparasites on land with many polyculture ponds in Sidoarjo Regency. (Firdaus and Ambarwati, 2019; Nurlaila, Dewiyanti, and Wijaya, 2016).

Zoothamnium sp was shaped like a bell, with the cilia on the periosteum living in colonies having contractile stalks that branched and moved simultaneously and were transparent (Irvansyah, Abdulgani, and Mahasri, 2012; Handayani and Rozikin 2019). *Zoothamnium* sp. ectoparasites. has a body shape like an inverted bell, is contractile, lives in colonies with many branches on each stalk, and is transparent in color. *Zoothamnium* sp is a parasite that often attacks cultured shrimp. *Zoothamnium* sp can be seen in Figure 2.

Shrimp that are attacked by the *Zoothamnium* sp parasite are characterized by their bodies covered with a white membrane and brown infected gills, and shrimp usually swim to the surface of the water. This is in accordance with Zulkarnain (2011) which states that the body of shrimp infected with *Zoothamnium* sp is covered with a kind of white or brown membrane and the shrimp has difficulty breathing because the host is covered in parasites.

Epistylis sp. identified in this study has a bell-like shape but is slightly slender. Epistylis sp has branches and lives in the form of stemmed colonies that are not contractile (not moving), and have cilia (vibrating hairs) on the periostome, while the stalks and branches of this ectoparasite colony cannot move (Pamenang et al., 2020; Haslan, 2017).

Shrimp infected with the *Epistylis* sp parasite moves slowly, the appearance of the shrimp becomes unattractive, the body looks brown, and the gills of the shrimp are brown (Mahasri, Hidayat, and Sudarno 2019). Kakoolaki, Sepahdari, and Mehrabi (2017) stated that *Epistylis* sp that attacks the shrimp body would experience a change in body color such as mossy with a brownish color caused by the attachment of this parasite. This parasite also attacks the gills so that the gills are black, and the movement becomes slow.

The type of parasite *Carchesium* sp. was found to have the same shape and characteristics as Epistylis sp., but what distinguishes the stalk of Carchesium sp. is that it is contractile (moving). This parasite most commonly attacks the shrimp's tail, reaching 519 species of *Carchesium* sp. At the same time, the least attacked were on the gill organs, namely 36 individuals. A movement in one branch of *Carchesium* sp. can trigger other branches of the central stalk to move along. K, MA confirms this, and D (2018) that *Carchesium* sp. are ectoparasites that can live in colonies and are contractile.

Vorticella sp. The identified color is yellowish, has vibrating feathers, has a bell-like shape with a long stalk, is not branched, does not colonize, and is contractile. The shape of this ectoparasite almost resembles *Epistylis* sp. and *Carchesium* sp., but *Epistylis* sp. and *Carchesium* sp. live in colonies while *Vorticella* sp. solitary. Widiani and Ambarwati (2018) stated that *Vorticella* sp. has a zooid shape like a bell, and in the peristome, there are cilia. On the other hand, *Vorticella* sp. transparent in color found solitary life with a flat, cylindrical contractile stalk and unbranched.

The type of ectoparasite *Vorticella* sp was found in all shrimp organs taken as

observation samples. The most abundant shrimp organs found in Vorticella sp ectoparasites were 379 individuals on the tail, then 287 individuals on the swimming legs, 65 individual carapace and 18 individuals on the tail. Nurlaila, Dewiyanti, and Wijaya (2016), stated that Vorticella sp is a parasite that attacks the carapace, swimming legs, gills and tail of Vannamei shrimp.

Based on the results of the calculation of the prevalence and intensity of vannamei shrimp from five different ponds (stations) with a total sample of 150 individuals showing different results. The prevalence value was obtained from the number of shrimp infected with the parasite divided by the number of samples obtained in times of one hundred percent. While the intensity value is obtained from the number of parasites found divided by the number of shrimp that are infected with the parasite.

The results of the analysis of the prevalence and intensity of parasites that attack vannamei shrimp in traditional ponds in Mootinelo Village, Kwandang District, North Gorontalo Regency are presented in Figures 6 and 7. The results of the study of 150 vannamei shrimp obtained from five different stations, were found at station 1 shrimp infected with protozoan parasites (*Zoothanium* sp 9, *Carchesium* sp 9, *Epistylis* sp 24 and *Vorticella* sp 21). Station 2 *Zoothanium* sp 26, *Carchesium* sp 28, *Epistylis* sp 29 and *Vorticell*a sp 30. Station 3 *Zoothanium* sp 28, *Carchesium* sp 29, *Epistylis* sp 29 and *Vorticella* sp 27. Station 4 *Zoothanium* sp 24, Carchesium sp 23, Epistylis sp 29 and Vorticella sp 25. Station 5 Zoothanium sp 11 individuals, *Carchesium* sp 15, *Epistylis* sp 24 and *Vorticella* sp 23. (attachment 6)

For the number of parasites found in pond I, the number of parasites was 410 individuals which were divided into several types of parasites including Zoothanium sp 28 individuals, Carchesium sp 36 individuals Epistylis sp 240 individuals and Vorticella sp 106 individuals. Tambak II found the total number of parasites of 1467 individuals, including Zoothanium sp 316 individuals, Carchesium sp 471 individuals Epistylis sp 342 individuals and Vorticella sp 338 individuals. In pond III the total number of parasites found was 509, including Zoothanium sp 131 individuals, Carchesium sp 141 individuals Epistylis sp 135 individuals and Vorticella sp 102 individuals. In pond IV the number of parasites found was 629 individuals which were divided into several types of parasites, Zoothanium sp 123 individuals, Carchesium sp 185 individuals, Epistylis sp 199 individuals and *Vorticella* sp 122 individuals. And in pond V the number of parasites found was 226 individuals, each with *Zoothanium* sp 21 individuals, *Carchesium* sp 47 individuals, *Epistylis* sp 77 individuals and *Vorticella* sp 81 individuals.

The highest prevalence percentage in vannamei shrimp organs observed was found in the tail organ with a prevalence percentage of 92% then the second highest was in the swimming legs with a prevalence percentage of 78.67%, followed by the carapace and gills, respectively, the prevalence percentages were 36% and 16.67%. So that the tail and swimming legs are classified as almost always and usually, which means that the tail has a severe infection and the swimming leg is moderately infected. Meanwhile, the highest intensity was found in the tail organ, which was 12.31 ind/head (medium category) while the lowest was found in the gill organ, 2.72 ind/tail (low category).

The high parasite attack on the tail and swimming legs is thought to be because these two organs are organs that often touch the substrate when moving. The results of Nurcahyo's research (2018), found the highest prevalence and intensity were found in the tail fin organ of Vannamei shrimp where the value reached 56.6% and the highest intensity was 17.5 ind/tail, the highest was found at the foot of the road. The high prevalence and intensity values are thought to be because walking legs are always used to perform slow movements, this can trigger parasitic organisms in the waters to easily attach to the organs so that parasites spread

quickly and the intensity level gets higher, especially if the water quality is maintained. If the water is not good and the organic matter content in the water is high, the parasite will stick to the shrimp organs (Setyaningsih, Sarjito, and Haditomo 2017).

The relationship between parasite intensity and age of shrimp was grouped according to three patterns, namely independent of shrimp age, decreasing with increasing age of shrimp and with increasing age of shrimp. It is important to know the intensity value to predict the health condition of the shrimp. Due to disturbance in the host due to parasitic infection in general due to the high density of parasites. Parasite intensity was lower and tended to decrease with changes in shrimp length increasing (Rahmayanti and Marlian 2018).

The attack of ectoparasites in large numbers will cause the death of shrimp. This is due to the weak condition of the shrimp, difficulty in breathing, decreased appetite, the molting process is hampered due to being filled with adherent organisms. Wahyudi (2003) states that shrimp that are attacked by this type of parasite experience disturbances such as decreased shrimp appetite and passive or weak body. (Mahasri, Hidayat, and Sudarno, 2019; Haslan, 2017), stated that shrimp infected with ectoparasites will experience disturbances during the molting process, weakness and difficulty breathing and decreased appetite for shrimp.

The results of the measurement of water quality parameters at each station ranged between 30 – 31oC, dissolved oxygen ranged from 2,3 – 3 mg/l, pH value 6.5 – 7.3, salinity 29 -30 ppt and COD > 1500 mg/l If referring to the Regulation of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number 75/Permen-Kp/2016 concerning General Guidelines for Enlargement of Windu Shrimp (Penaeus Monodon) and Vaname Shrimp (Litopenaeus Vannamei) the water temperature in rearing vannamei shrimp is 28 - 32 oC, dissolved oxygen >3 mg/l, pH 7.5 – 8.5, salinity 5 – 40 ppt and COD <40 mg/l. This indicates that the values of dissolved oxygen, pH and COD are in the bad category for the maintenance of vannamei shrimp.

Ectoparasites that attack cultured organisms including Vanname shrimp are thought to be related to environmental conditions suitable for the life of several types of ectoparasites, such as Zoothamnium sp, Epistylis sp, Carchesium sp, and Vorticella sp (Samsundari and Wirawan 2013). The content of dissolved oxygen and COD (Chemical Oxygen Demand) has a relationship with the occurrence of pollution in the pond water environment where if the oxygen content decreases then COD increases. This increase in COD is thought to be due to the high organic matter in these waters, the lower the dissolved oxygen value, the higher the level of pollution of an aquatic ecosystem (Sun et al., 2006; Tamyiz, 2015)

CONCLUSION

The types of ectoparasites that attack vannamei shrimp in traditional ponds in Mootinelo Village, Kwandang District, North Gorontalo Regency are from protozoa, namely Zoothamnium sp, Epistylis sp, Carchesium sp, and Vorticella sp. The highest prevalence of parasitic attack was found at each station of the Epistylis sp, Carchesium sp, and Vorticella sp parasites. with a prevalence value of 80-100% in the category of moderate to very severe infection. Meanwhile, the highest parasitic attack intensity was Zoothamnium sp, Epistylis sp, Carchesium sp, and Vorticella sp. ranged from 4 to 17 ind/head with a low to moderate infection category.

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