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Prevalence and Intensity of Vaname Shrimp (Litopenaeus Vannamei) Ectoparasites in Shrimp Ponds in Nagari Tiku, Tanjung Mutiara District, Agam Regency

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Abstract – This study aims to determine the type, prevalence, intensity, and dominance of ectoparasites on vaname shrimp (Litopenaeus vannamei) in shrimp ponds Nagari Tiku, Tanjung Mutiara District, Agam Regency. This research used the observation method and to determine the sampling stations, the purposive sampling method was used by determining 3 research stations. The results showed that there are 3 types of ectoparasites that attack vanamei shrimp (Litopenaeus vannamei), namely Zoothamnium sp., Vorticella sp. and Epistylis sp. The results of water quality measurements at 3 stations in the shrimp pond Nagari Tiku, Tanjung Mutiara District, Agam Regency did not exceed the threshold except at station I on the measurement of pH, and station II on the measurement of salinity.

Keywords – Vannamei shrimp, ectoparasites, Prevalence, intensity, dominance, water quality

I. INTRODUCTION

Vannamei shrimp (*Litopenaeus vannamei*) is a shrimp that has economic value and is an alternative type of shrimp that can be cultivated in Indonesia, besides tiger shrimp (*Penaeus monodon*) and white shrimp (*Penaeus merguensis*). This is also what has made many shrimp farmers in Indonesia work on it in recent years. Shrimp farming activities in Indonesia have been carried out by many farming communities in the 1980s, from the application of simple technology to the application of intensive technology[1].

Parasites that usually attack vannamei shrimp farming are a class of protozoa, usually found in abundance in rearing media with high organic matter content. These poor environmental conditions can be caused by high stocking densities and feed residue which can increase water ammonia levels and accumulation of waste on cultivated land, making it easier for shrimp to get sick. The existence of parasites that exceed normal limits can affect the health of the host being invested. One of the types of ectoparasites that are often found attacking shrimp is the protozoa group. There are three types of ectoparasites in vannamei shrimp, namely: *Epistylis* sp., *Zoothamnium* sp., and *Vorticella* sp. which is often found investing in vannamei shrimp[2].

Efforts that can be made to overcome the occurrence of parasitic attacks include prevention. To be able to carry out preventive measures effectively and efficiently, it is necessary to have information about the causes or agents of the disease that attacks, in this case, the ectoparasites that attack vannamei shrimp, so further research is needed regarding the identification and prevalence of ectoparasitic attacks on vannamei shrimp. This study aims to analyze the type, prevalence, intensity, and dominance of ectoparasites in vannamei shrimp (*Litopenaeus vannamei*) in Nagari Tiku shrimp ponds, Tanjung Mutiara District, Agam Regency.

II. LITERATURE SURVEY

Parasites that usually attack vannamei shrimp farming are a class of protozoa, usually found in abundance in rearing media with high organic matter content. These poor environmental conditions can be caused by high stocking densities and feed residue

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which can increase water ammonia levels and accumulation of waste on cultivated land, making it In general, adult shrimp will mate in shallow areas to the open sea with a depth of up to 70 meters. the mating process begins with the release of the spermatophore by the male shrimp and the release of the egg by the female shrimp. Vaname shrimp fertilization occurs externally in water. Female vannamei shrimp can release 500 thousand–1 million eggs each time they lay eggs, and within 13–14 hours these eggs will hatch into larvae which are often called nauplius. Then, the larvae will undergo metamorphosis into zoea. In the nauplius stage, the larvae will eat the egg yolk stored in their bodies, while in the zoea stage, the shrimp larvae will eat algae in the waters. After a few days, the zoea will undergo metamorphosis back into mysis. At the mysis stage, organ formation is almost complete. This can be seen from its shape which resembles a small shrimp. After 3-4 days the mysis undergoes metamorphosis into postlarvae. At the postlarvae stage, the shrimp already has the same perfect body structure or organs as the adult shrimp[3].

The fish disease is anything that can cause physical or physiological disturbances in fish. This disturbance can be caused by other organisms, environmental conditions or human intervention. Following the nature of the disease can be classified into two namely infective diseases and non-infective diseases. An infective disease is a disease caused by pathogenic organisms such as parasites, fungi, bacteria, and viruses, while a non-infective disease is caused by non-pathogenic disorders such as nutrition (food), water quality, toxic materials, and genetics. Triggers for disease attacks include an imbalance between the carrying capacity of the environment and the quantity of production in one cultivation area (unbalanced infection between fish, pathogens, and the environment)[4].

In general, a parasite is an organism that lives on another organism that takes food from the organism's body, so that the organism it feeds on (host) will experience a loss. a parasite is an organism that lives in or on another organism that normally poses a danger to its host. Based on their habitat on the host, parasites can be divided into external parasites (ectoparasites) and internal parasites (endoparasites). Ectoparasites live on the surface of the host's body or in places that are frequently exposed, such as the mouth and gills. Endoparasites live within the host's body, namely internal organs and tissues. The group of parasitic organisms that are between the ectoparasites and endoparasites are known as mesoparasites. Parasitism is a relationship with one of the parasite species where the host acts as a habitat and is a place to obtain food or nutrition, the host's body is the main environment for the parasite, while the surrounding environment is the environment for both[5].

III. METHODOLOGY

This research was conducted in November-December 2022 at Nagari Tiku, Tanjung Mutiara District, Agam Regency. This study uses the observation method to determine the sampling station using the purposive sampling method by establishing 3 research stations, namely: CV. Fajar Mutiara is located facing the sea and on the side of the rear pond adjacent to a tributary that has mangrove vegetation and several other swamp plants, the Berkah pond is located facing the sea and coconut trees grow on the other side of the pond, the Torpedo Pond is located adjacent to the Torpedo Beach Park which has palm, Nypa palm, Beach almond, and some other swamp and beach vegetation.

Shrimp samples at each location were randomly taken as many as 4 from 10 shrimp caught at each station, the shrimp samples were put into a plastic bag containing, given oxygen, and brought to the laboratory for research. The vannamei shrimp samples were put into the container and samples were taken one by one for observation. The shrimp samples were weighed and their length was measured. The ectoparasites to be observed were the swimming legs, walking legs, tail, and the outside of the vaname shrimp body, and observed under a light microscope.

IV. RESULT AND DISCUSSION

Based on observations of 12 vaname shrimp (*Litopenaeus vannamei*) ectoparasites in the Nagari Tiku shrimp pond, Tanjung Mutiara District, Agam Regency, 3 types of ectoparasites were found. The types of ectoparasites found in this study were *Epistylis* sp., *Zoothamnium* sp., and *Vorticella* sp.

Table 1. Ectoparasites found in vannamei shrimp

Sampling Station	test	Cephalothorax	Abdomen	Pereopods	Pleopods	Uropod
Station I	a	9 V, 3 E	12 V	-	6 V	-
	b	2 V	-	10 V	18 Z, 9 V	-
	c	6 E	7 V	8 V	-	1 E
	d	-	26 Z	-	7 V, 5 E	8 V
Station II	a	-	-	-	-	-
	b	-	-	-	-	-
	c	-	-	-	-	-
	d	-	1 V	-	-	-
Station III	a	-	-	-	-	-
	b	3 E	2 V	5 V	6 V	-
	c	4 E	-	9 V	-	-
	d	1 V	-	-	5 V	7 V
Total		12 V,16 E	26 Z, 22 V	32 V	18 Z, 33 V, 5 E	15 V, 1 E

Information : Z (*Zoothamnium* sp.), V (*Vorticella* sp.), dan E (*Epistylis* sp.)

In this study, *Zoothamnium* sp. was found in pleopods organs (swimming legs) and abdomen (body), *Vorticella* sp. was found in the organs of Cephalothorax (head), Abdomen (body), pereopods (walking legs), pleopods (swimming legs), and Uropod (tail), and *Epistylis* sp. Found in the organs of the Cephalothorax (head), Pleopods (walking legs), and Uropod (tail).

Table 2. Prevalence of vannamei shrimp ectoparasites (*Litopenaeus vannamei*)

Sampling Station	Σ Vaname shrimp observed (tail)	Σ Infected vaname shrimp (tail)	Prevalence rate (%)	Prevalence category
Station 1	4	4	100	Always infection
Station 2	4	1	25	Frequent infections
Station 3	4	3	75	Common infection

The prevalence rate of ectoparasitic attack on vannamei shrimp (*Litopenaeus vannamei*) in the Nagari Tiku shrimp pond, Tanjung Mutiara District, Agam Regency, at station I of the CV. Fajar Mutiara prevalence rate reached 100% with the prevalence category of always infection, at station II of the Berkah shrimp ponds the prevalence rate reached 25% with the category of frequent infections, and at station III of the Torpedo shrimp ponds, the prevalence rate reached 75% with the usual infection category. The level of diseased shrimp at station I was higher than at stations II and III, this was because at the station I the vannamei shrimp had entered the age of 83 days, while station II had entered the age of 26 days and pond III had entered the age of 60 days. maintenance.

Based on the results of the study, it can be seen that the prevalence value of the shrimp is smaller. Prevalence values in shrimp tend to increase with increasing body size, this is because small shrimp have a smaller cross-sectional area than larger shrimp. In addition, the high and low levels of parasite prevalence are also caused by the parasite's adaptability to the host's body, so that it can live and develop based on the quality of the environment that supports it.

The identified ectoparasites were then counted for the number of individuals in each observed section. The number of

individual ectoparasites that have been counted will be used to calculate the intensity level of the parasite that attacks the vannamei shrimp[6].

Table 3. Vaname shrimp ectoparasites intensity

Sampling Station	Σ Infected vaname shrimp	Σ Infecting ectoparasites	intensity level	Prevalence category (Ilmiah, et al, 2022)
Station 1	4	137	34,25	Currently
Station 2	4	1	0,25	Very low
Station 3	4	42	10,5	Currently

The level of intensity of ectoparasitic attack on vannamei shrimp (*Litopenaeus vannamei*) in the Nagari Tiku shrimp pond, Tanjung Mutiara District, Agam Regency. At the station, I shrimp pond CV. Fajar Mutiara and station III of Torpedo ponds have a moderate level of ectoparasites, and at station II of Berkah ponds, the level of intensity of ectoparasites is very low.

The level of attack by ectoparasites at stations I and III are in the medium category, this is due to the age of shrimp rearing which is entering the age of 60 days and 83 days of maintenance where the shrimp that are reared have a weight size of 90-55 heads/Kg where the shrimp has a cross-sectional size for broad ectoparasites. whereas at station II the attack of ectoparasites was classified in the very low category, this was because the shrimp had just entered 26 days of rearing with a weight size of 900-500 individuals/Kg where the cross-sectional size for ectoparasites was not too large.

Table 4. Vannamei shrimp ectoparasites domination

Types of Ectoparasites	Σ Ectoparasites	Ectoparasite level (%)
Zoothamnium sp.	44	24,44
Vorticella sp.	114	63,33
Epistylis sp.	22	12,22
Total	180	

The level of ectoparasitic dominance in vannamei shrimp (*Litopenaeus vannamei*) can be seen by *Vorticella* sp. has a dominance level of 63.33% higher than *Zoothamnium* sp. 24.44% and *Epistylis* sp. 12.22%, which explains the existence of the ectoparasites *Vorticella* sp. which was found in many vannamei shrimp samples, namely 63.33%, this was made possible because the growing environment was suitable for its growth. *Vorticella* sp. can survive in fresh and marine and brackish waters. So that growth in brackish waters as a shrimp culture medium affects the growth rate of parasites in vannamei shrimp. This parasite can still live if it finds a suitable substrate to survive and reproduce.

Table 5. Observation results of water quality at each station

Analysis parameters	Unit	Sampling station			Quality standards
		Station I	Station II	Station III	
temperature	^{0}C	27	28	28	26-30
pH		6,5	7,6	7,4	7-9
Salinity	‰	20	10	22	15-35
DO	Mg/L	5,20	5,79	5,85	4-8
BOD	Mg/L	2,92	2,12	2,05	<25
COD	Mg/L	27,10	19,34	20,10	<40
Ammonia	Mg/L	0,008	0,004	0,016	<0,1

The results of observations of water quality at each sampling station, the station I the results of observations of water quality showed optimum values for temperature, salinity, DO, BOD, COD, and ammonia, while at pH it showed values below the quality standard where the pH value of water at Station I leads to a more acidity value of the water where the neutral pH of the water shows a value of 7. At station II the water quality observations showed optimum values at temperature, pH, DO, BOD, COD, and ammonia, while at salinity it showed values below the quality standard where the water salinity value at station II led to low salt levels in the water, this was due to The high rainfall causes the level of salt levels to decrease. At station III the water quality observations showed the optimum value for the water quality observed, the water quality at station III did not exceed the threshold standard.

Good water quality parameters will affect harvest productivity and minimal spread of disease infections in pond waters. Vaname shrimp (Litopenaeus vannamei) is a type of shrimp that is very sensitive to fluctuations in changes in its living environment, so water as a living medium for shrimp cultivation must meet the appropriate criteria both chemically, physically, and biologically.

V. CONCLUSION

research conducted on 3 shrimp ponds in Nagari Tiku, Tanjung Mutiara District, Agam Regency, it can be concluded that: 3 types of ectoparasites attack vannamei shrimp (Litopenaeus vannamei), namely Zoothamnium sp. found in the abdominal organs (body) and pleopods (swimming legs), Vorticella sp. found in the organs of the cephalothorax (head), abdomen (body), pereiopods (walking legs), pleopods (swimming legs), and uropods (tail), and Epistylis sp. which are found in the organs of the cephalothorax (head), pleopods (swimming legs), and uropods (tail). The prevalence rate of ectoparasitic attack on vannamei shrimp (Litopenaeus vannamei) at 3 different sampling stations. A station I shrimp pond CV. Fajar Mutiara had a 100% prevalence rate of ectoparasites with the prevalence category of always infection, at station II of the Berkah shrimp ponds the prevalence rate of ectoparasites was 25% with the prevalence category of frequent infections, and station III of the Torpedo shrimp ponds the prevalence rate of ectoparasites was 75% with the prevalence category of ordinary infections. The level of intensity of ectoparasitic attacks on vannamei shrimp (Litopenaeus vannamei) at three stations, namely station I at CV. Fajar Mutiara is 34.25 individual/head and station III of the Torpedo shrimp pond is 10.5 individual/head including the moderate intensity category, and at station II the Berkah shrimp pond is 0.25 individual/head including the very low-intensity category. The predominance level of ectoparasitic attack on vannamei shrimp (Litopenaeus vannamei) is the ectoparasite Vorticella sp. which has a higher dominance level of 63.33% than Zoothamnium sp. with a dominance rate of 24.44% and Epistylis sp. 12.22%.

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