

PAPER • OPEN ACCESS

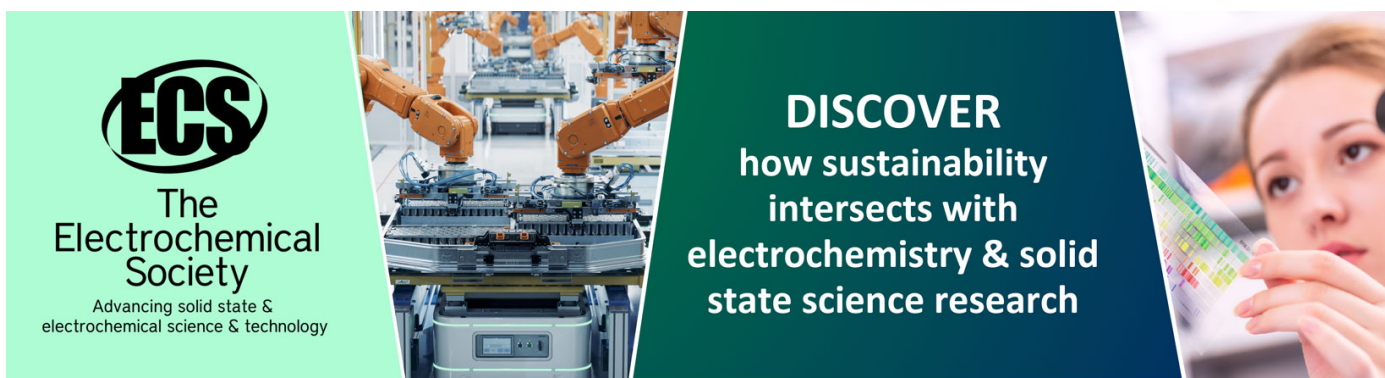
Inventory of ectoparasites in pacific white shrimp (*Litopenaeus vannamei*) that cultivated with high density

To cite this article: G D Pamenang *et al* 2020 *IOP Conf. Ser.: Earth Environ. Sci.* **441** 012077

View the [article online](#) for updates and enhancements.

You may also like

- [Identification of Ectoparasites that Infect Mangrove Crabs \(*Scylla Serrata*\) in Asahan District, Indonesia](#)
Rumondang, J P Batubara, K Laila et al.
- [Identification, prevalence and intensity of ectoparasite in sand lobster \(*Panulirus homarus*\) cultivated in floating cages \(floating net cage\) and bottom cage \(bottom cage\)](#)
G Septian, M F Ulkhaq and Kismiyati
- [Prevalence and intensity of ectoparasites in gabus fish \(*Channa striata*\) at Cangkringan Fishery Cultivation Technology Development Center, Sleman, Yogyakarta](#)
E N Fitriani, Rozi, M Arief et al.



ECS
The
Electrochemical
Society
Advancing solid state &
electrochemical science & technology

DISCOVER
how sustainability
intersects with
electrochemistry & solid
state science research

Inventory of ectoparasites in pacific white shrimp (*Litopenaeus vannamei*) that cultivated with high density

G D Pamenang¹, L Sulmartiwi², G Mahasri^{3,4}, N D Rahayu¹, and B Angwarmas¹

¹Magister Program Biotechnology of Fisheries and Marine, Faculty of Fisheries and Marine, Universitas Airlangga, Campus C Mulyorejo, Surabaya 60115, Indonesia

²Department of Marine, Faculty of Fisheries and Marine, Universitas Airlangga, Campus C Mulyorejo, Surabaya 60115, Indonesia

³Department of Fish Health Management and Aquaculture, Faculty of Fisheries and Marine, Universitas Airlangga, Campus C Mulyorejo, Surabaya 60115, Indonesia

Corresponding author: mahasritot@gmail.com

Abstract. Ectoparasites can attack on pacific white shrimp (*Litopenaeus vannamei*) which are kept in high density concrete ponds. The purpose of this study was to determine the type, prevalence, infestation and intensity degree of ectoparasites pacific white shrimp Postlarva (PL11 – PL15) stage and Postlarva (PL20 - PL30) stage in Bangil ponds that are cultivated with high density. The method used in this research is a survey method with random sampling. Data were analyzed using T test. The results of this study indicate that there are three genus of ectoparasites both in the pacific white shrimp PL11 - PL15 stage and PL20 - PL30 stage, namely *Zoothamnium* sp., *Vorticella* sp. and *Epistylis* sp. The prevalence of ectoparasites in pacific white shrimp is in the PL20 - PL30 stage at 100% while the prevalence of ectoparasites in the PL11 - PL15 stage is 75%. The level of ectoparasite intensity that attacks the pacific white shrimp (PL11 - PL15) includes a moderate category of 21.8 individuals / head, while the level of intensity of ectoparasites that attacks the pacific white shrimp (PL20 - PL30) includes a very severe category that is 814.05 individuals / head.

1. Introduction

Shrimp is the one of fisheries products that have high animal protein content and is favored by foreign and domestic communities. Indonesian shrimp production has increased, in 2017 pacific white shrimp production reached 1.1 million tons [1]. Pacific white shrimp comes from American waters and has spread throughout Indonesia and is developed by farmers and the government. Pacific white shrimp culture is chosen by farmers because this type of shrimp is more resistant to disease, has faster growth, is resistant to environmental changes, has shorter cultivation time (90-100 days per season), high stocking density, high survival rate and saves feed [2].

In line with these growths, the cultivation of pacific white shrimp in both hatcheries and ponds is not free from problems. The cultivation of pacific white shrimp in the hatchery can take place until the larvae reach the post larval stage (PL11-PL15) with densities reaching 300-400 tails in one square meter and in



the milling reaches up to PL20 - PL30 stage. The main problem that is often experienced by farmers is the disease and environmental conditions are decreasing. Poor environmental conditions in shrimp culture with intensive or super intensive patterns can be caused by high stocking densities (up to 200 - 300 tails per square meter or the rest of the feed) can increase the content of organic matter to accumulate at the bottom of the water and cause spoilage. Byproducts from disruption the process of decomposition of organic matter is the emergence of ammonia (NH₃) in water and the accumulation of waste in cultivated land, which causes shrimp to be poisoned [3]. The decreasing water condition will cause the shrimp to experience stress, which results in decreased endurance, making it vulnerable to infection pathogens that are in the waters [4].

One of the parasitic diseases that often attack pacific white shrimp is a disease caused by protozoan parasites from the Ciliate class. Protozoa that attack pacific white shrimp on ponds, namely *Zoothamnium* sp., *Vorticella* sp. and *Epistylis* sp. [5,6]. Diseases caused by these three species can cause mortality shrimp in aquaculture up to 100% in hatchery. Until now the prevalence and intensity in pasific white shrimp ponds is still high to reach 67% with zooid intensity per shrimp [7]. Furthermore, it is said that the entire surface of the body and gills of shrimp infested by these protozoa will be found in groups of the three species that are creamy white, which can cause shrimp to breathe hard, find it difficult to eat and cannot replace the skin (molting).

Based on the description, it is necessary to have an inventory of ectoparasites in pacific white shrimp that are maintained on ponds with an intensive pattern and in high-stocking hatcheries in Bangil District, Pasuruan Regency, East Java based on prevalence, intensity and degree of infestation, to make a reference in pacific white shrimp culture on the pond.

2. Research Methodology

2.1 Materials and tools

This research uses tweezers, scalpels, microscopes, glass objects, glass covers, petri dishes, pipettes, scales to measure the weight of the sample, and a ruler to measure the length of the sample. The material used in this study was the pacific white shrimp (*Litopenaeus vannamei*) measuring PL11 - PL15 originating from the hatchery and the size of PL20 - PL30 originating from the Bangil pond.

2.2 Sampling

Pacific white shrimp samples were taken from ponds and hatcheries located in ponds in Bangil. Samples were taken as many as 40 shrimp from the hatchery and from the pond. Pacific white shrimps are taken by proportional sampling at each collection site so that the data obtained represent the population in a representative manner and provide equal opportunities for all members of the population [8]. Pacific white shrimp samples are taken with closed transportation to be examined for infestation, intensity and degree of infestation at the Anatomy Laboratory of the Faculty of Fisheries and Marine, Universitas Airlangga.

2.3 Examination of ectoparasites

Ectoparasites examination by using native method, it were performed on all surfaces of the body of the gills, swimming legs, walking feet, and tails of pasific white shrimp (*Litopenaeus vannamei*). Examination is done by the method [9] natively without being done by staining. All parts of the shrimp body are placed on a glass object, dripped with water, covered with a glass cover and then observed using a microscope with a magnification of 40x and 100x. The parameters tested in this study are prevalence, infestation and infestation degree

2.4 Data analysis

Data of infestation, intensity and degree of infestation are presented in table (*Epistylis*, *Zoothamnium*, and *Vorticella*) which infects each individual Pacific white shrimp (*Litopenaeus vannamei*) were analyzed by using SPSS with T-Test [8].

3. Results and Discussion

Ectoparasite Examination Results in Pasific white Shrimp Ectoparasite examination results from pasific white shrimp (*Litopenaeus vannamei*) from 80 samples taken from ponds in Bangil showed that the parasites were found to belong to the genus *Zoothamnium*, *Vorticella*, and *Epistylis*. The observations can be seen in Table 1 and ectoparasites can be seen in Figure 1.

Table 1. Genus of ectoparasites found in pasific white shrimp

Sample	Sample Size	The number of positive shrimp infested with Ectoparasites	Type of parasite
PL11 – PL15	40	30	<i>Zoothamnium</i> sp. <i>Epistylis</i> sp. <i>Vorticella</i> sp.
PL20 – PL30	40	40	<i>Zoothamnium</i> sp. <i>Epistylis</i> sp. <i>Vorticella</i> sp.



Figure 1. Illustration of ectoparasite infestation in pacific white shrimp organs.
A: *Zoothamnium* B: *Vorticella* C: *Epistylis* (100x magnification)

The results of the calculation of the prevalence of ectoparasites in pasific white shrimp showed that PL11-PL15 positive stages were infested with 30 samples or 75% of the 40 samples examined. While the PL20-PL30 stage was ectoparasite infested by 40 or 100% of the 40 samples examined. The results of observations of the prevalence of ectoparasites in pasific white shrimp can be seen in the Table 2.

Table 2. Prevalence of ectoparasites in pasific white shrimp

Sample	Sample Size	The number of positive shrimp infested with ectoparasites	The number of negative shrimp infested with ectoparasites	Prevalence (%)
PL11 – PL15	40	30	10	75 %
PL20 – PL30	40	40	0	100 %

The results of observations of the level of infestation in pasific white shrimp showed PL11-PL15 stage included moderate infestation with an intensity of 21.8 individuals / head. Whereas the PL20-PL30 stage included in the category of very severe infection with an intensity of 814.05 individuals / head. The results of observations of the level of infestation in pasific white shrimp can be seen in the Table 3.

Table 3. Ectoparasites infestation rates on pasific white shrimp

Sample	Sampel Size	Ektoparasite	Intensity (Individual / head)	Intensity Category (William and Williams, 1996)
PL11 – PL15	40	<i>Zoothamnium</i> sp. <i>Epistylis</i> sp. <i>Vorticella</i> sp.	21,8	Moderate
PL20 – PL30	40	<i>Zoothamnium</i> sp. <i>Epistylis</i> sp. <i>Vorticella</i> sp.	814,05	Very Severe

Water quality data on the cultivation ponds of PL11-PL15 and PL20-PL30 vaname shrimp can be seen in Table 4.

Table 4. Water Quality of Pasific White Shrimp Cultivation Pond

No.	Parameter	Ponds		Water Quality in Shrimp Culture (Permen-Kep, 2016)
		PL11-PL15	PL20-PL30	
1.	Temperature(°C)	28	29	28-32
2.	DO (mg/L)	7.1	6.4	> 3
3.	pH	7	7	7,5-8,5
4.	Salinity (ppt)	15	15	10-35
5.	Ammonia (mg/L)	0.5-0.75	1	< 0.1
6.	Nitrite (mg/L)	1.25	1	< 1

Ectoparasites found in pasific white shrimp with different sizes, namely *Zoothamnium*, *Vorticella*, and *Epistylis*, all of which have the same morphological characteristics as previous studies [10,11]. *Zoothamnium*, *Epistylis* and *Vorticella* ectoparasites can develop optimally and quickly in pond waters that have many substrates, these ectoparasites require the substrate as a place to attach the cyste to their life cycle [7].

The results of ectoparasite examination showed that the prevalence of ectoparasites in pasific white shrimp with PL20-PL30 stage was higher than PL11-PL15 stage. Ectoparasites infested with PL20-PL30

pasific white shrimp were 40 out of 40 samples, while infestations on pasific white shrimp with PL11-PL15 stage were 30 out of 40 samples examined. The large number of ectoparasites in pasific white shrimp with PL20-PL30 stage is due to a wider body size than pasific white shrimp with PL11-PL15 stage, so that the number of ectoparasites infested more. This is consistent with the statement [12] that the larger the size or weight of the host, the higher the host is infected or infested with parasites.

The results of the calculation of the ectoparasite infestation rate that infested pacific white shrimp with different sizes, the value of ectoparasite infestation rate on the PL20-PL30 pasific white shrimp examined was higher, namely 814.05 individuals / head included in the very severe category, compared to the value of the ectoparasite infestation rate PL11-PL15 pasific white shrimp examined were 21.8 individuals / head included in the moderate category. This is presumably due to the use of ectoparasite infested shrimp seeds and ectoparasite attacks that occur in the aquaculture environment. According to [13] which states that parasites can enter the aquaculture environment because they are carried by water, microorganisms, aquatic plants and equipment used for aquaculture activities. Furthermore, stocking density used in cultivation also influences the distribution of ectoparasites where the density used in the PL20-PL30 stage is 200-300 per square meter. This is in accordance with [14] which states that high stocking densities in rearing cause shrimp to be more easily in direct contact with each other so that parasites will spread quickly. Cultivation on PL20-PL30 stages use concrete ponds where the remnants of feed, plankton and dead fish will cause high organic matter and cannot be absorbed into the soil so that it builds up in the pond. If oxygen is low, the decomposition process of organic matter is inhibited and causes decay and causes high ammonia in toxic waters. In accordance with the study [15] that the lack of sufficient oxygen in water causes high ammonia. In addition, it will cause a decrease in water quality which causes stress shrimp and decreased body defenses so that ectoparasites are easily infested. This is in accordance with the statement [16,17] decreased water quality causing the decreased in the pasific white shrimp immune system and the increase in parasites and *vibrio* sp. in cultivation. Furthermore according to [18] that the growth of parasites can increase rapidly due to poor water quality, stocking density that is too high and too much feeding so that it can cause increased organic material in the cultivation media.

4. Conclusions

Ectoparasites infestation in pacific white shrimp with PL20-PL30 stage is higher than PL11-PL15 with very severe degree of infestation.

5. References

- [1] Directorate general of aquaculture 2017 https://satudatakkpgoid/dashboard_produksi
- [2] Haliman R W dan S D Adijaya 2005 *Udang Vannamei* (Jakarta: Penebar Swadaya) p 75
- [3] Widanarni D, Wahjuningrum dan F Puspita 2012 *Jurnal Sains Terapan* **2** (1) : 32-49
- [4] Yanto H 2006 *Jurnal Penelitian Sains dan Teknologi* **1** (1): 17-32
- [5] Hafidloh U and P D W Sari 2019 *IOP Conf Ser: Earth Environ Sci* 236 (2019) 012091
- [6] Mahasri G, T Hidayat and Sudarno 2019 *IOP Conf Ser: Earth Environ Sci* 236 : 1-7
- [7] Mahasri G, K Rahayu, Kismiyati, Rozi dan H Gustrifandi 2018 *IOP Conf Ser: Earth Enviro* 37: 1-11
- [8] Barreiro P I and Albandoz J P 2001 *Management Mathematics for European Schools: Population and Sample* (Spain: MaMaEuSch, The University of Seville) pp 1-18
- [9] Johnson S K 1995 *Handbook of Shrimp Diseases* Texas Pp 30
- [10] Barreiro P I and Albandoz J P 2001 *Management Mathematics for European Schools: Population and Sample* (Spain: MaMaEuSch, The University of Seville) pp 1-18
- [11] Setiyaningsih L, Sarjito dan A H C Haditomo 2014 *Jurnal Manajemen Akuakultur dan Teknologi* **3** (3):8-16

- [12] Muchlisin Z A, A M Munazir, Z Fuady, W Winaruddin, S Sugianto, M Adlim, N Fadli, A Hendri 2014 *HVM Bioflux* **6** (3):148-152
- [13] Mahasri G dan Kismiyati 2015 *Textbook parasites and fish disease I (protozoan disease in fish and shrimp)* (Surabaya: Universitas Airlangga) p 88
- [14] Rustikawati I, Rostika R, Iriana D, Herlina E, 2004 *Jurnal Akuakultur Indonesia* **3** (3) : 33-39
- [15] D P Galang, A K Ashari, L Sulmatiwi, G Mahasri, Prayogo, and L A Sari 2019 *IOP Conf Ser: Earth Environ Sci* **236** : 1-7
- [16] Mahasri G, Sulmartiwi L, Sudarno, Prayogo, Pamenang G D, Harifa A I 2019 *Indian Vet J* **96** (5): 21–23
- [17] Mahasri G, Harifa A I, Sudarno 2019 *Indian Vet J* **96**(05): 37-39
- [18] Mahasri G 2007 *Zoothamnium Penaei immunogenic membrane protein as an ingredient of immunostimulant development in tiger shrimp (Penaeus monodon fabricus) against zoothamniosis* (Surabaya: Universitas Airlangga) p 284