

Keragaman dan kelimpahan ektoparasit pada Udang Pisang (*Penaeus merguensis*) hasil tangkapan di Pelabuhan Perikanan Sleko, Cilacap, Jawa Tengah

Diversity and abundance of ectoparasite in banana prawn (*Penaeus merguensis*) as caught in Sleko fish landing, Cilacap, Central Java

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Manuskrip diterima: 25 Maret 2023. Revisi disetujui: 20 April 2023.

Abstrak. Rokhmani, Setyowati EA, Budianto BH. 2023. Keragaman dan kelimpahan ektoparasit pada Udang Pisang (*Penaeus merguensis*) hasil tangkapan di Pelabuhan Perikanan Sleko, Cilacap, Jawa Tengah. *Pros Sem Nas Masy Biodiv Indon 9: 15-21*. Udang pisang (*Penaeus merguensis* de Man, 1888) merupakan jenis udang yang termasuk dalam kelas Craustacea ordo Decapoda dan Famili Penaeidae. Udang pisang dalam siklus hidupnya memanfaatkan muara hutan mangrove sebagai daerah hidupnya memanfaatkan muara hutan mangrove sebagai daerah pembibitan dan laut lepas pantai sebagai daerah pemijahan. Udang pisang di Sleko Cilacap memiliki peran ekonomi yang penting bagi masyarakat sekitar dengan dengan produksi mencapai 13% dari total produksi udang. Penelitian ini bertujuan untuk mengetahui kelimpahan dan keanekaragaman ektoparasit yang terdapat pada Udang Pisang (*P. merguensis*) hasil tangkapan di Sleko Cilacap. Metode penelitian yang digunakan ialah metode survei dengan menggunakan teknik random sampling. Hasil penelitian menunjukkan prevalensi ektoparasit pada udang Pisang (*P. merguensis*) yang tertangkap di Sleko Cilacap sebesar 54%. Ektoparasit pada udang galah yang ditemukan terdiri dari tiga spesies *Apiosoma* sp. *Oodinium* sp. dan *Vorticella* sp. Kelimpahan ektoparasit Udang Pisang (*P. merguensis*) yang tertangkap di Sleko Cilacap adalah *Apiosoma* sp. 0,15 ind/udang, *Oodinium* sp. 0,52 ind/udang dan *Vorticella* sp, 0,04 ind/udang. Selain itu, Indeks Keragaman = 0.7185 dan Kemerataan = 0.654, yang berarti penyebaran individu dalam komunitas.

Kata kunci: Ektopatasit, kelimpahan, keragaman, *Penaeus merguensis*

Abstract. Rokhmani, Setyowati EA, Budianto BH. 2023. Diversity and abundance of ectoparasite in banana prawn (*Penaeus merguensis*) as caught in Sleko fish landing, Cilacap, Central Java. *Pros Sem Nas Masy Biodiv Indon 9: 15-21*. Banana shrimp (*Penaeus merguensis* de Man, 1888) is a type of shrimp belonging to the class Crustacea of the Decapoda order and the Penaeidae family. In their life cycle, Banana shrimp utilizes mangrove forest estuaries as their living area utilizing mangrove forest estuaries as nurseries and offshore seas as spawning areas. Banana shrimp in Sleko Cilacap have an important economic role for the surrounding community, reaching 13% of the total shrimp production. This study aims to determine the abundance and diversity of ectoparasites in banana shrimp (*P. merguensis*) in Sleko Cilacap. The study uses a survey method using a random sampling technique. The study found that the prevalence of ectoparasites in Banana shrimp (*P. merguensis*) caught in Sleko Cilacap was 54%. The ectoparasites found in Banana Shrimp comprise three species, *Apiosoma* sp., *Oodinium* sp., and *Vorticella* sp. The ectoparasite abundance of the Banana Shrimp (*P. merguensis*) caught in Sleko Cilacap shows that *Apiosoma* sp. 0.15 ind/shrimp, *Oodinium* sp. 0.52 ind/shrimp, and *Vorticella* sp, 0.04 ind/shrimp. In addition, Index Diversity = 0.7185 and Evenness = 0.654, which means individual spread within communities.

Keywords: Abundance, ectoparasites, *Penaeus merguensis*, prevalence

INTRODUCTION

Banana prawn (*Penaeus merguensis* de Man, 1888) is a type of prawn belonging to the class Craustacea, order Decapoda and Family Penaeidae. In general, penaeid prawn have one or more serrations under the rostrum that are not found in some other prawn species (King 1995). Banana prawn is an important commodity because it has high demand and economic value. Banana prawn (*P.*

merguensis) is a tropical organism that inhabits turbid waters rich in organic matter with a muddy sandy bottom (Carpenter and Niem 1998). In their life cycle, Banana prawn use mangrove forest estuaries as a nursery area and off-shore sea as spawning areas (Gilanders 2003). In Indonesia, the catching area for Banana prawn spreads to almost to all coastal waters, especially in shallow waters around estuaries and mangrove areas (Gillanders 2003). Banana prawn is one of the dominant catches caught in mini trawl in Central Java waters (Ernawati 2010). Banana

prawns in the Segara Anakan estuary have an important economic role for the surrounding community with production reaching 13% of the total prawn production. The fishing of Banana prawn in the Segara Anakan estuary has been going on for a long time intensively using floating nets (Pangesti et al. 2015).

Parasites are one of the problems that often arise in aquatic ecology, both in marine and freshwater (Rohde 1982). Parasites are organisms whose life depends on other organisms to get food, shelter, protection and opportunities to reproduce in their host bodies (Prasadi 2015). Based on the location of the parasite infection on the host, parasites can be divided into two types, endoparasites and ectoparasites. Endoparasites are parasites that live and infect internal organs, while ectoparasites are parasites that live on the surface of the host's body (Kabata 1985). Protozoa, worms (Trematoda, Cestoda and Nematoda) and Crustaceae (Branchiura, Copepoda, Isopoda) are a class of parasites that are often found in marine organisms such as fish, crab and prawn (Anshary 2008).

Cilacap District are a shipping route for the cement industry and the petroleum processing industry and are widely used for various activities such as activities in ship workshops, ports, settlements and agriculture. The existence of these activities leads to the entry of toxic and dangerous pollutants into the waters, resulting in a decrease in water quality (Hidayati et al. 2014). Host relationships with ectoparasites are influenced by environmental conditions such as temperature, geographic location, water depth and other anthropogenic disturbances (Sheath et al. 2016).

Based on the background that has been conveyed, the following problems can be formulated: how is the prevalence of ectoparasites in Banana prawn (*Penaeus merguensis*) caught by Estuaria Segara Anakan, Cilacap District. And how is the abundance of ectoparasite in

Banana prawn (*P. merguensis*) caught by Sleko Cilacap Harbor.

Based on the research problem above, the objectives of this study are to determine the prevalence of ectoparasites in Banana prawn (*P. merguensis*) caught by Estuaria Segara Anakan, Cilacap District. And determine the abundance of ectoparasites in Banana prawn (*P. merguensis*) caught by Estuaria Segara Anakan, Cilacap District.

The results of this study are expected to provide scientific information regarding the prevalence and abundance of Banana prawn (*P. merguensis*) in the area of the Cilacap sea which is used as a data source so that strategic steps can be taken in controlling environmental conditions and can be taken and anticipatory steps for prevention and control, when the prawn proved to be infected by ectoparasites.

MATERIALS AND METHODS

Materials, location, and time of research

Materials

The tools used in this study were styrofoam measuring 25x20x30 cm, plastic bucket, surgical scissors, tweezers, basin, microscope, object glass, mask and pipette. The materials that used were banana prawn (*P. merguensis*) caught by trawling from Estuaria Segara Anakan Cilacap District, glove, tissue, ice cubes and distilled water.

Location, and time of research

The research was carried out at Sleko, Cilacap District, Central Java Province, Indonesia (Figure 1) in March 2021. Microscopic observations were carried out at the Laboratory of Parasitology and Entomology, Faculty of Biology, Jenderal Soedirman University, Banyumas, Indonesia.

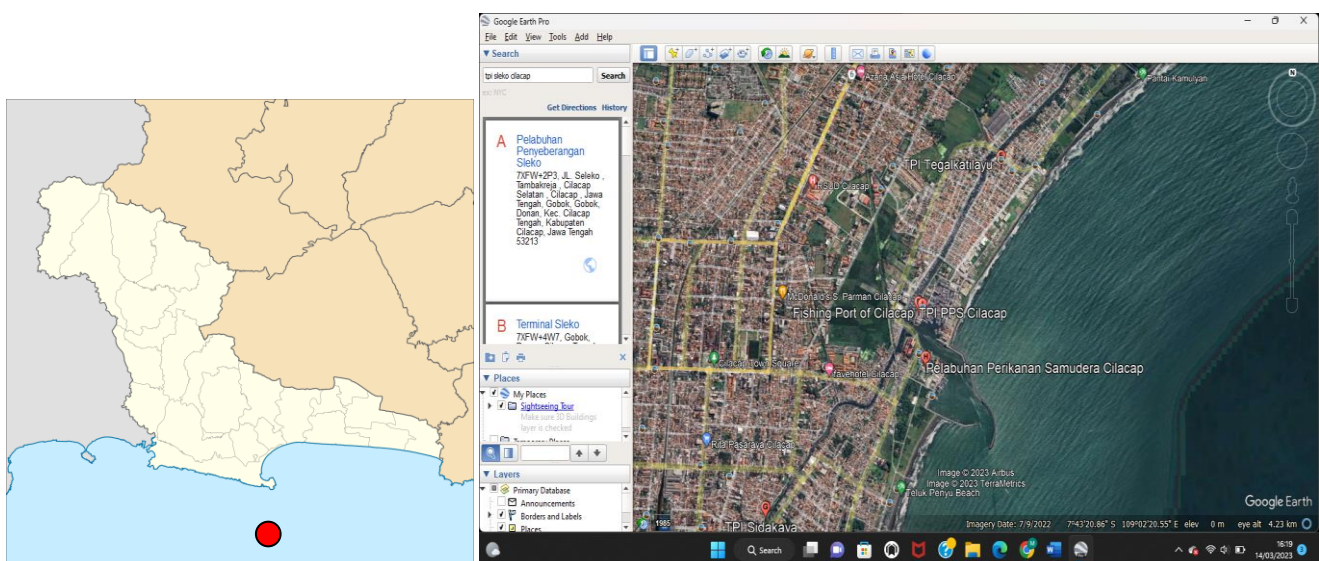


Figure 1. Map of sampling locations for banana shrimp (*Penaeus merguensis*) caught in Sleko Cilacap, Central Java, Indonesia

Design of research

Sampling method

This research was conducted using a survey method, with a random sampling technique. Samples of banana prawn (*P. merguensis*) were taken by trawling from Segara Anakan and taken directly from fishermen. The method used is random, sample was taken 4 times with time intervals of 1 week. 100 samples of banana prawn were taken.

Research variables and parameters

The research variables observed were prevalence and abundance. The parameters observed were the type and number of ectoparasites found in banana prawn.

Research procedures

Calculation of the sample number. This study uses the modified Slovin formula in sample calculations with an error rate of 5%, following the Slovin formula proposed by Husein Umar (2013):

$$n = \frac{4pq}{d^2} \quad n = \frac{4pq}{d^2}$$

Description:

n = Sample size

p = proportion of population (if unknown, 0.5)

q = 1-p

d = error tolerance limit

The number of samples required are:

$$n = \frac{4pq}{d^2}$$

$$= \frac{4 \times 0.5 \times 0.5}{0.05^2}$$

$$= \frac{4 \times 0.25}{0.0025}$$

$$= \frac{4 \times 0.25}{0.01}$$

$$= \frac{4 \times 0.25}{0.01}$$

$$= 100$$

Handling of shrimp samples. (i) We prepared a Styrofoam box measuring 25 x 20 x 30 cm and a lid. (ii) Banana prawns were obtained by trawling. (iii) Banana prawns that have just been landed from the ship were immediately taken and then put into Styrofoam boxes filled with ice cubes. (iv) The styrofoam box containing Banana prawn was closed using a Styrofoam cap. Then the Banana prawn were taken to the Laboratory of Entomology and Parasitology, Faculty of Biology, Jenderal Soedirman University for ectoparasite examination.

Parasite inspection method. (i) The banana prawn that have been taken from fishermen were carried using styrofoam and transferred to basins. (ii) The banana prawn's body surface was visually observed to see the initial examination of ectoparasite attacks. (iii) Prawn body parts such as antennae, carapace, periopod, pleopod, uropod, and abdominal skin were cut using surgical scissors. (iv) The parts of the prawn body that have been cut were placed on a glass object then dripped with distilled water. (v) The preparations were observed using a microscope with a magnification of 4x10. (vi) The number of ectoparasites infecting banana prawn was counted on the

antenna, carapace, periopod, pleopod, uropod, and abdominal skin.

Data analysis

Calculation of the prevalence of infected mullet ectoparasitic as follows:

$$\text{Prevalence (\%)} = \frac{\sum \text{Number of banana prawns infected by ectoparasite}}{\sum \text{Total Banana Prawns observed}} \times 100\%$$

While the calculation of the abundance of mullet ectoparasites uses the formula, as follows:

$$\text{Abundance (\%)} = \frac{\sum \text{The number of individual parasites found}}{\sum \text{Total Banana Prawns observed}}$$

Furthermore, to find out the prevalence level, then grouped by category, as follows (Table 1):

Furthermore, to find out the level of abundance with the category of abundance according to Martin and Stuart 2000, as follow (Table 2):

Calculation of the diversity of infected mullet ectoparasitic as follows (Magurran 1988) :

$$H' = -\sum p_i \ln p_i$$

Furthermore, to find out the diversity level, then grouped by category, as follows:

$H > 3.0$: High diversity

$1 < H < 3$: Moderate diversity

$H < 1$: Low diversity

Table 1. Ectoparasite infection prevalence category

Prevalence	Category	Description
100-99%	All times	Very severe infection
98-99%	Almost all time	Severe infection
89-70%	Mostly	Mostly infection
69-50%	Very frequent	Infections are very frequent
49-30%	General	Common infection
29-10%	Often	Frequent infections
9-1%	Sometimes	Infection sometimes
< 1-0.1%	Rarely	Infection is rare
< 0.1-0.01%	Very rarely	Infection is very rare
< 0.01%	Almost never	No infection

Table 2. Ectoparasite abundance category

Value	Category
< 0.1	Almost never
0.1- 2.0	Very rarely
2.1-10.0	Rarely
10.1- 40.0	High infection
> 40.0	Overflow infection

RESULTS AND DISCUSSION

Based on the results of the research conducted, it showed that not all of the 100 banana prawn samples examined were infected with ectoparasites. The results of the examination were only 54 samples of infected banana prawns. There are three species of ectoparasites that infect tiger prawns. The three ectoparasites are *Oodinium* sp., *Apiosoma* sp., and *Vorticella* sp. The intensity of ectoparasites infection can be influenced by the movement of shrimp that often move on the bottom of the water with a mud substrate. Parasites found on the bottom of the water can easily attach to the leg organs and spread quickly until the intensity increases (Novita et al. 2016).

In the research of Novita et al. (2016), which examined the intensity and prevalence of ectoparasites in banana prawn (*Penaeus* sp.) originating from aquaculture ponds on the west coast of Aceh. There were 140 samples of shrimp from four cultivation locations and it was found that 85 of them were positively infected with ectoparasites. In particular, when the examination was carried out, it was found that the ectoparasites that infect banana shrimp came from the phylum protozoa, consisting of three different species, *Zoothamnium* sp., *Vorticella* sp., and *Epistylis* sp.

According to Nurlaila et al. (2016), the high prevalence of ectoparasite development can be caused by the environmental factors of shrimp that strongly support the growth of ectoparasites. Research on ectoparasites on banana prawn in public waters, especially in Segara Anak Estuary Cilacap is still rare so this research can provide an additional data on ectoparasites that infects banana prawn.

Based on Table 3, the most common ectoparasites found were *Oodinium* sp. this ectoparasite was found as many as 31 individuals, while found *Apiosoma* sp. as many as 15 individuals, and the most rare is *Vorticella* sp., it's only 4 individuals was found. According to Sarjito et al. (2013), the emergence of parasitic diseases in shrimp is a dynamic process and a complex interaction between three components in the ecosystem, a weak host due to various stressors, virulent pathogens and suboptimal environmental quality.

Calculation of the number of ectoparasites that attack each organ in banana prawn was also carried out to find out which part of the organ was the most ectoparasites found. The results of the calculation of the number of ectoparasites showed that the organ parts of tiger shrimp that were most affected by ectoparasites were found in the periopod and pleopod (Table 3). The number of ectoparasites that attack periopods and pleopods is 19. Periopods and pleopods are the most actively moving organs. Banana prawn habitat on the seabed also allows direct contact of the periopod and pleopod parts of one shrimp with another shrimp so that the distribution of ectoparasites can increase in the periopod and pleopod parts.

Ectoparasites are more commonly found in organs that are actively moving due to the high oxygen content, as is the case in the operculum and pectoral fins of fish. Novita et al. (2016), found that the highest ectoparasite attack rate was found in Periopod. The high attack on periopod and pleopod is thought to be because the two organs often touch the substrate when moving. Wulandari (2014), also stated that the high level of ectoparasite attack on the

periopod and pleopods was caused by the fact that the shrimp often moved on the bottom of the water with a muddy substrate. These factors can trigger parasitic organisms on the bottom of the water to easily attach to the organ and spread quickly to a higher level of intensity.

Apiosoma sp.

Apiosoma sp. (Figure 2), 15 individuals were found, 7 individuals in the carapace, 3 individuals in the abdomen, 3 individuals in the pereopod and 2 individuals in the pleopod section. *Apiosoma* sp. has an oval cell shape, there are cilia on the posterior and live-in colonies between 2-5 individuals. This is in accordance with the statement of Nurhalimah (2017), that *Apiosoma* sp. has the characteristics of an elongated cylindrical shape like a pear, also has a conical or spherical macronucleus. According to Li et al. (2008), with the discovery of *Apiosoma* sp. can affect the fish to be slow movement, lose balance and often come to the surface of the water. This parasite can escape from the group and find new hosts by free swimming. This parasite is generally categorized as a fish parasite, but this parasite finds a new host or is attached to a host in the form of banana prawn (*P. merguensis*).

Oodinium sp.

Oodinium sp. (Figure 3), 52 individuals were found, 11 individuals in the carapace, 12 individuals in the abdomen, 13 individuals in periopod and 16 individuals in the pleopod. *Oodinium* sp. observed to have an oval shape, some are fusiform and have cytoplasmic projections. This is in accordance with the statement of Salam and Hidayati (2017), *Oodinium* sp. has an oval shape with a length of 101.5 m. Found in 2 phases, the trophont phase which is characterized by the presence of cytoplasmic projections, and the mitotic phase which is characterized by the presence of cell segmentation. According to Kabata (1985), *Oodinium* sp. caused by penetration of rhizoids into host epithelial cells, causing necrosis, bleeding and secondary infection by bacteria and fungi.

Vorticella sp.

Vorticella sp. (Figure 4) are the few species found in this study. *Vorticella* sp. 2 individuals were found in periopod and 1 individual in pleopod. According to Nurlaila et al. (2016), characteristics of *Vorticella* sp. It has a contractile, solitary stalk that is yellowish in color. Almost the same thing was stated by Setyaningsih et al. (2014) stated that the body shape of *Vorticella* sp. is a bell, has an unbranched stalk, and lives solitary.

Table 3. Ectoparasites found in banana prawn organs

Organ observed	Ectoparasite			ΣTotal
	<i>Apiosoma</i> sp.	<i>Oodinium</i> sp.	<i>Vorticella</i> sp.	
Carapace	7	11	-	18
Abdomen	3	12	-	15
Periopod	3	13	3	19
Pleopod	2	16	1	19
ΣTotal	15	52	4	71



Figure 2. Morphology of *Apiosoma* sp. that infects banana (40x magnification)

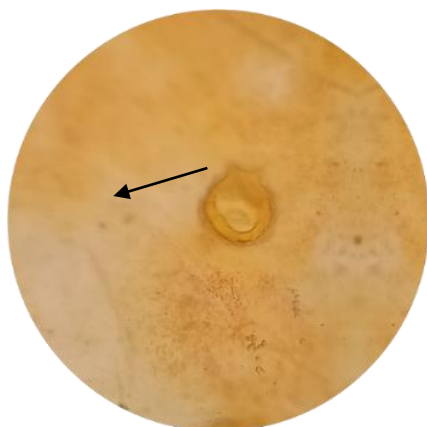


Figure 3. Morphology of *Oodinium* sp. that infects banana prawn (40x magnification)

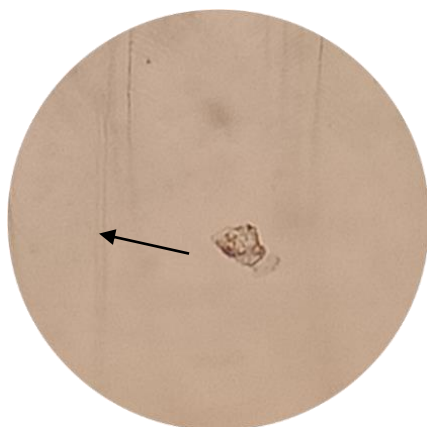


Figure 4. Morphology of *Vorticella* sp. that infects banana (40x magnification)

Vorticella sp. which is found to have a bell-like shape upside down but not forming a colony, has a yellowish color and the stem can move. This is supported by the results of research conducted by Setiyaningsih et al. (2014) *Vorticella* sp. shaped like a bell or bell, yellowish in color,

has a contracted cell, macronucleus, adoral membrane, long, non-colonizing stalk. The movement of the curled and retractable stalks allows these ectoparasites to move around. Aziz et al. (2012) stated, the stalk on *Vorticella* sp. can retract and curl when moving. *Vorticella* sp. often found on the pleopod.

Ectoparasite prevalence in banana prawn (*P. merguensis*)

The prevalence of banana prawn infected with ectoparasites was determined by calculating the number of infected banana prawns divided by the number of banana prawns observed. Data from the calculation of prevalence can be seen in Table 4.

The results showed that the prevalence of ectoparasites infecting shrimp had a value of 54%. Based on the number of samples used as many as 100 samples of shrimp and 54 of them were infected with ectoparasites. Based on Table 5, the criteria for the prevalence of parasitic infection (Williams and Williams 1996) the results fall into the category of very frequent. The intensity of ectoparasite attack can be influenced by the movement of shrimp that often move on the bottom of the water with a mud substrate. Parasites found on the bottom of the water can easily attach to the leg organs and spread quickly until the intensity increases (Novita et al. 2016).

According to Nurlaila et al. (2016) the high prevalence of ectoparasite development can be caused by environmental factors that strongly support the growth of ectoparasites. The decline in the physiological function of the prawn's body can also cause the prawn to be easily infected with ectoparasites. Prawn sampling locations in open waters located in industrial areas can result in a decrease in the physical condition of the waters themselves. This is supported by the statement of Herowati (2014), if prawns live in a bad aquatic environment, it can cause the prawn's body defense are decrease so that ectoparasites can easily infect.

Ectoparasite abundance in banana prawn (*P. merguensis*)

The abundance of ectoparasites on banana prawns can be determined by counting the number of individual parasites found divided by the number of banana prawn observed. The data from the abundance calculation can be seen in Table 6. The results obtained were the abundance values of *Apiosoma* sp. of 0.15 ind/prawn, *Oodinium* sp. 0.52 ind/prawn and *Vorticella* sp, 0.04 ind/prawn. Based on Table 6 categories of abundance of ectoparasites according to Martin and Stuart (2000), the abundance of *Apiosoma* sp. and *Oodinium* sp. included in the category of very rare infection, while the abundance of *Vorticella* sp. included in the category of infection almost never. $\sum Ba$

Ectoparasite diversity in banana prawn (*P. merguensis*)

The diversity of ectoparasites on banana prawns can be determined by counting the number of individual parasites found divided by the number of banana prawn observed. The data from the abundance calculation can be seen in Table 6.

Table 4. Prevalence of ectoparasites infected banana prawn in Segara Anakan Estuary

Sampling	Σ Infected banana prawn (individual)	Σ banana prawn sample (individual)	Prevalence (%)
I	7	25	28
II	12	25	48
III	18	25	72
IV	17	25	68
Average	13.5	25	54

Table 5. Prevalence of Ectoparasites infected banana prawn in Segara Anakan Estuary

Ectoparasite species	Σ Ektoparasite	Σ Banana prawn infected	Abundance (ind/prawn)
<i>Apiosoma</i> sp.	15	6	0.15
<i>Oodinium</i> sp.	52	44	0.52
<i>Vorticella</i> sp.	4	4	0.04

Table 6. Diversity of Ectoparasites infected banana prawn in Segara Anakan Estuary

Ectoparasite species	Σ	pi lnpi	Pi.lnpi
<i>Apiosoma</i> sp.	0.15	-0.2115	-0.3285
<i>Oodinium</i> sp.	0.52	-0.3114	-0.2281
<i>Vorticella</i> sp.	0.04	-2.8771	-0.1619

Note: diversity index: 0.7185, Evenness: 0.654. individu spread mean in community

The results obtained were the diversity values of *Apiosoma* sp. of 0.15 ind/prawn, *Oodinium* sp. 0.52 ind/prawn and *Vorticella* sp. 0.04 ind/prawn. Based on Table 6 categories of abundance of ectoparasites according to Martin and Stuart (2000), the abundance of *Apiosoma* sp. and *Oodinium* sp. included in the category of very rare infection, while the abundance of *Vorticella* sp. included in the category of infection almost never.

In conclusion, the prevalence of ectoparasite in banana prawn (*P. merguensis*) caught in the Segara Anakan Estuary Cilacap was 54%, these results were included in the very frequent category and the types of ectoparasites in banana prawn were found to consist of three species *Apiosoma* sp. *Oodinium* sp. and *Vorticella* sp. Abundan ektoparasit pada banana prawn (*P. merguensis*) caught in the Segara Anakan Estuary Cilacap was *Apiosoma* sp. 0.15 ind/prawn, *Oodinium* sp. 0.52 ind/prawn and *Vorticella* sp. 0.04 ind/prawn. the abundance of *Apiosoma* sp. and *Oodinium* sp. included in the category of very rare infection, while the abundance of *Vorticella* sp. included in the category of infection almost never: -0.7185. indeks diversity: 0.7185, evenness: 0.654 individu spread mean in community. Based on this research, information was obtained that shrimp that grow in nature can be infected with ectoparasites which can disrupt the growth of banana prawn. Suggestions for future research are to study more

deeply about prawn ectoparasites in different beaches and different species in order to get a comparison.

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