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Levels of prevalence and intensity of ectoparasites that are contained on grouper fish (*Ephinephelus fuscoguttatus-lanceolatus*) in floating net cage Pangandaran district

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Abstract
The purpose of this research was to determine the value of prevalence, intensity, and identification of Kerapu *Epinephelus fuscoguttatus-lanceolatus* fishes. This research has been held in April until May 2018 on the east coast of Pangandaran. The methods used in this research are survey methods, sampling and laboratory tests. The parameters observed were the prevalence and intensity values of ectoparasites that infect the fishes. Ectoparasites data that have been found were analyzed with prevalence and intensity analysis, analyzed descriptively. This research of ectoparasite analysis are divided based on the place of sampling. First sample taken at floating cage (FLOATING CAGE) *quatec* has a prevalence value of *Diplectanum* 66,6%, *Tricodina* 50%, *Alitropus* 11,1%. Intensity value of *Diplectanum* 2,9, *Tricodina* 3,7, *Alitropus* 2. For sample taken at FLOATING CAGE Traditional has a prevalence value of *Diplectanum* 44,4%, *Tricodina* 38,8%, *Alitropus* 33,3%. Intensity value of *Diplectanum* 2, *Tricodina* 1,6, *Myxosporea* 1,7.

Keywords: ectoparasites, grouper *Epinephelus fuscoguttatus-lanceolatus* fishes, intensity, prevalence

1. Introduction
Industrial development contributes to pollution increase. River water pollution in Java ranges about 25-30% of total pollutions (Sugiharto, 1987) [10]. Therefore, rules are necessary for realization of eco-development. Eco-development bears the meaning that development must be in harmony with the environment in order not to disturb its ecological functions. Therefore, such development will be able to reduce pollution and non-toxic to human and other living beings supporting human's life (Soemarwoto, 2001) [9]. Alertness against diseases in fish farming needs to be the center of attention. Diseases on fish may be caused by infectious agents like parasites, bacteria and viruses and non-infectious agents like lack of supporting environmental condition for fish's life. An incident of disease is the result of unharmonious interaction between fish, environmental condition and disease inducing organism or agent (Afriyanto and Liviawaty, 1992) [1]. This inappropriate interaction causes fish to be stressed and weakens its defense mechanism, and disease agents will easily enter its body and cause disease. The existence of parasite may inhibit host's growth rate and even kill the host.
Grouper (*Epinephelus sp*) is one of sea fishes widely farmed because of its relatively high market demand and acquisition of its farming technology, of its relatively high tolerance to environmental change and resistance to limited space and it may be grown in Floating Net Cage (*Keramba Jaring Apung* - floating cage). Its highly economic value derived from farming makes grouper a marketing commodity exported alive (BBPBL 2010) [2]. Some types of Grouper successfully farmed and exported to various countries include *grouper Epinephelus fuscoguttatus-lanceolatus* (*Epinephelus fuscoguttatus-lanceolatus*), *grouper tikus* (*Cromileptes* sp.) and *grouper cantik* (*Epinephelus* sp.). In Pangandaran, one Regency in Indonesia, groupers are farmed in floating cages off its Coast.

2. Materials and Method
The materials used in this research are 18 heads of grouper *Epinephelus fuscoguttatus-lanceolatus* from *Aquatic* floating cage and 18 heads from Traditional floating cage, with samples of 10-20cm in length. 300ml distilled water and physiological sodium chloride (NaCl) are used for observational process.
This research employs a survey method, direct sampling and laboratory test for parasite identification. 18 fishes are randomly collected from each floating cage. Fishes with parasite infection will have their skin wounded, have their fin damaged, have their appetite reduced, be less active, and swim sideways.

2.1 Procedure
After field survey, the sampling activity is performed on floating net cages in Pantai Timur, Pangandaran. This sampling process is performed in two phases, first, water sampling and, second, fish sampling, to be taken to laboratory for water quality test and ectoparasites identification on the tested fishes.
Ectoparasites are taken from fish skin, fin and gill. The ectoparasites sampling from skin is performed by scrapping skin mucosa from pectoral towards tail using object glass, dripping them with distilled water and closed with cover glass. The ectoparasites sampling from dorsal fin, caudal fin, and gill is performed by cutting them using preparation scissors, dripping them with distilled water and closed with cover glass (Grabda 1991) [4].

After identification of any ectoparasites found on the grouper *Epinephelus fuscoguttatus-lanceolatus*, they are recorded and counted for intensity and prevalence values (Grabda 1991, Justine & Lim 2007) [4, 6].

a. The formula for calculating prevalence is as follows :

$$P = \frac{N}{n} x\ 100\%$$

Note:
P : Prevalence
N : Number of infected sample
n : Number of observed sample

b. The formula for calculating intensity is as follows :

$$I = \frac{P}{N}$$

Dimana :
I : Intensity
P : Number of infection of ectoparasites
N : Number of Infected Sample

2.2 Data Analysis
The types of ectoparasite found and their intensity and prevalence on grouper *Epinephelus fuscoguttatus-lanceolatus* are descriptively analyzed.

3. Results and Discussion
3.1 Number of Ectoparasites Found
The grouper *Epinephelus fuscoguttatus-lanceolatus* collected from the two floating net cages in Pantai Timur, Pangandaran shows that there are ectoparasites attacks by *Diplectanum*, *Trichodina* and *Alitropus* sp. on the *Aquatic* floating cage, while on local farmer's Traditional floating cage, the fishes are infected by parasites *Diplectanum, Tricodina* sp., and kista *Myxosporea*, as presented in Tables 8 and 9.
The symptoms that the grouper *Epinephelus fuscoguttatus-lanceolatus* (*Epinephelus fuscoguttatus-lanceolatus*) is infected a parasite are marked with excessive mucus and damaged tail fin. The excessive mucus is caused by fish's response to parasite infection to its body, in which the fish's mucus attempts to protect it.

3.2 Ectoparasite on FPIK *Aquatic* Floating Net Cage
The grouper collected from the *Aquatic* floating cage in Pantai Timur, Pangandaran shows disease attacks caused by parasites *Diplectanum*, *Trichodina* and *Alitropus* sp. (Table 1).

Table 1

Sampling order -	Number of Sample	Existence Of ecto-parasites	Parasites Ind/fish
1	3	-	-
2	3	-	-
3	3	17	5,6
4	3	12	4
5	3	13	4,3
6	3	12	4
Total	18	54	

Based on Table 1, the existence of ecto-paracites on *Aquatic* in Pantai Timur, Pangandaran is found starting with 17 heads from the third sampling, 12 heads are found on the fourth sampling, 13 heads are found on the fifth sampling and 12 heads are found on the sixth sampling.

3.3 Parasites on Traditional Floating Net Cage
The grouper *Epinephelus fuscoguttatus-lanceolatus* collected from the Traditional in Pantai Timur, Pangandaran shows disease attacks caused by parasites *Diplectanum*, *Trichodina* and *Myxosporea* cyst (Table 2).

Table 2: Number of *Epinephelus fuscoguttatus-lanceolatus* observed and number of ectoparasites found on Traditional floating cage

Sampling order -	Number of Sample (Fish)	Existence of ecto-parasites	Parasites Ind/fish
1	3	-	-
2	3	6	2
3	3	11	3,6
4	3	4	1,3
5	3	13	4,3
6	3	3	1
Total	18	37	

Based on the results of Table 2, the existence of parasites on Traditional floating cage in Pantai Timur, Pangandaran is found starting with 6 heads from the second sampling, 11 heads are found on the third sampling, 4 heads are found on the fourth sampling, 13 heads are found on the fifth sampling and 3 heads are found on the sixth sampling.
From the description above, it is found that the highest number of ectoparasites is found on grouper *Epinephelus fuscoguttatus-lanceolatus* from the *Aquatic* floating cage totally 54 heads out of 18 samples of tested fishes, classified into low category. Meanwhile, on the Traditional floating cage, there are 37 heads out of 18 fishes, classified into low category.

3.4 Parasite's Prevalence and Intensity Value
The Prevalence and Intensity calculation method is employed aiming at examining how many fishes are infected by parasites and how many parasites attack the grouper *Epinephelus fuscoguttatus-lanceolatus*.

3.4.1 Prevalence and Intensity on FPIK *Aquatic* floating cage
After the sampling and identification processes, the ectoparasites collected are calculated for their respective prevalence and intensity values (Table 4), thus the values of each ectoparasite are known. (Table 3).

Table 3: Type, Number, and Distribution Area of Infection to grouper *Epinephelus fuscoguttatus-lanceolatus* at FPIK *Aquatic* floating cage.

No.	Parasites	Observed organ				Total
		Scale	Fin	Gill	Eye	
1	*Diplectanum*	-	-	23	-	23
2	*Trichodina*	13	-	14	-	27
3	*Alitropus* sp.	-	-	4	-	4
Total						54

Table 4: Number of types of parasites and their ecological infection at Traditional FLOATING CAGE

No	Parasites	Infected Fish Sample	Number of Parasites	Prevalence (%)	Intesity
1	*Diplectanum*	12	23	66,6%	1,9
2	*Tricodina*	9	27	50%	3
3	*Alitropus* sp.	2	4	11,1%	2

Based on Table 3, the distribution area of parasite

Diplectanum on the body of 23 heads of grouper *Epinephelus fuscoguttatus-lanceolatus* of first sampling from FPIK *Aquatic* floating cage is found on gill. Meanwhile, 27 heads of ectoparasite *Trichodina* are found on the scale of 13 fishes and on the scale of 14 fishes. *Alitropus* sp. are found only on the gill of 4 fishes.

From the total 54 heads of parasite found on *Aquatic* floating cage (Table 10), *Trichodina* is the highest number with 27 heads. The prevalence calculation results state that *Diplectanum* is 66.6%, *Trichodina* is 50% and *Alitropus* is 11.1%. The intensity value is 1.9 for *Diplectanum*, 3 for *Trichodina* and 2 for *Alitropus.*

Based on the prevalence category scale, *Diplectanum*, *Trichodina* and *Myxosporea* are classified into 'common' category of infection since they fall within ratio of 30% - 49%. The three ectoparasites' intensity category is classified into low scale since they fall within range 1-5 ind/head.

Tricodhina sp. has high mobility and may survive for 2 days without host. These two concerns are likely to be the factor to cause this organism to be able to infect most of individuals in an organism (Mulia, 2006) [8], particularly that the *Epinephelus fuscoguttatus-lanceolatus* samples are within the same area to make it easier for the parasite to attack most of the fishes.

Tricodinasis infection occurs through water and direct contact between infected and healthy fishes. Factors which support the parasite *Tricodina* sp. to develop are decreasing oxygen content in water, water fluctuating temperature, and high organic matters in water (Hassan, 1999) [5].

One factor to cause *Trichodina*'s high intensity is that there are denticle ring to serve to be a sticking device and cilia around its body, which makes it easier to stick to grouper's body and gill. This may be observed from the number of ectoparasites found on the grouper *Epinephelus fuscoguttatus-lanceolatus* samples on *Aquatic* floating cage that there are 13 heads on fish's scale and 14 heads on fish's gill.

Another factor suspected to be the cause of high number of *Trichodina* is high organic materials in the water around the cages, both *Aquatic* and Traditional FLOATING CAGEs. A high amount of non-decomposed feed leftover causes feed deposit at the bottom of water, which triggers the emergence of *Trichodina.*

Diplectanum is found on fish's skin, in which it is likely to be thrown away from fish's gill and eventually sticks to its skin, since basically, *Diplectanum* is frequently found on fish's gill. A grouper infected by *Diplectanum* will looks to breathe more rapidly with gill cover kept open. The reason of this is that there is blood flow in the gill, containing nutrients serving to be a source of ectoparasite's food, especially *Diplectanum*. An infected gill is commonly pale colored with excessive mucus production (Chong & Chao, 1986) [3].

Gill is a part most vulnerable to parasite infection, and it is an organ mostly preferred by ectoparasites. Gill contains many nutrients obtained through filtering food in the form of feed particles and binding oxygen, thus it is the most vulnerable part where parasites prefer to live. This is why ectoparasites are commonly found on gill, both in *Aquatic* and Traditional floating cages.

The clinical symptoms induced include reduced appetite, abnormal swimming behavior on water surface and body color turning to pale. Parasite *Diplectanum* is, commonly attacking gill, not found on any of the samples. A severe attack of this parasite may damage gill filaments and occasionally cause death because of respiratory disorder. Besides, such respiratory disorder is caused by excessive production of mucus, causing the gill to be covered by mucus. The color of infected grouper's gill will look pale (Zafran *et al*., 1998; Koesharyani *et al*., 2001) [11, 7].

3.4.2 Prevalence and Intensity on Traditional floating cage

On the samples collected from the Traditional floating cage, a different result is found on parasite *Myxosporea* on fish's gill, as presented in Table 12.

Table 5: Type, Number, and Distribution Area of Infection to grouper *Epinephelus fuscoguttatus-lanceolatus* at Traditional floating cage.

No.	Parasites	Observed Organ				Total
		Scale	Fin	Gill	Eyes	
1	*Diplectanum*	-	-	16	-	16
2	*Tricodina*	-	-	11	-	11
3	*Myxosporea*	-	-	10	-	10
Total		-	-	37	-	37

Table 6: Number of types of parasites and their ecological infection at Traditional floating cage

No	Parasites	Infected Fish Sample	Parasites	Prevalence (%)	Intensity
1	*Diplectanum*	8	16	44,4%	2
2	*Tricodina*	7	11	38,8%	1,6
3	*Myxosporea*	6	10	33,3%	1,7

Based on Table 5, the distribution area of parasite *Diplectanum* on the body of 16 heads of grouper *Epinephelus fuscoguttatus-lanceolatus* of the first sampling from Traditional floating cage is on the gill, with 11 heads of parasite. Meanwhile, there are 11 heads of parasite *Tricodina*, and 10 heads of *Myxospora* located on gill.

Based on the prevalence category scale, *Diplectanum* and *Trichodina* are classified into highly frequent infection category, since they fall within the ratio of 50% - 69%, while *Alitropus* are classified into frequent category with a ratio of 10% - 29%. For the intensity category, the three ectoparasites fall within low scale since they are within a range of 1-5 ind/head.

Differently from parasites found on farmer's Traditional floating cage, the parasites found are fewer, totally of 37 heads of parasites. *Diplectanum* and *Tricodina* are still found on the sampling from this Traditional floating cage, that the 2 parasites are frequently found on grouper. The prevalence calculation results are 44.4% for *Diplectanum*, 38.8% for *Tricodina* and 33.3% for *Myxosporea*. Their intensity values are respectively 2 for *Diplectanum*, 1.6 for *Tricodina* and 1.7 for *Myxosporea*.

Based on the water quality of *Aquatic* floating cage and Traditional floating cage, there is no significant difference influencing the different number of ectoparasites found. However, according to the identification results, the number of ectoparasites existing at the *Aqautec* floating cage is higher than that at the Traditional floating cage. One factor to cause this is that the replacement net used on *Aquatic* floating cage has been previously used for fresh water culture, in which much feed leftover is attached to the net, leading to decomposition of feed leftover and ammonia formation.

4. Conclusion

The grouper *Epinephelus fuscoguttatus-lanceolatus* farmed at the two floating cage locations in Pantai Timur, Pangandaran, which are *Aquatic* floating cage and farmer's Traditional floating cage, is attacked by ectoparasites at different prevalence and intensity levels. The parasites found on the *Aquatic* floating cage are *Diplectanum*, *Trichodina*, and *Alitropus* sp., while the parasites found on the farmer's Traditional floating cage are *Diplectanum*, *Tricodina* and *Myxosporea* Cyst.

The highest prevalence of ectoparasite infecting grouper *Epinephelus fuscoguttatus-lanceolatus* at the *Aquatic* floating cage is 66.6% (*Diplectanum*) with intensity value of 2.9 (3.0). The highest prevalence value of ectoparasite infecting grouper *Epinephelus fuscoguttatus-lanceolatus* at the Traditional floating cage is 44.4% (*Diplectanum*) with intensity value of 2.

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