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Jurnal Biodjati 4(1):58-67, May 2019
e-ISSN : 2541-4208
p-ISSN : 2548-1606

JURNAL BIODJATI

http://journal.uinsgd.ac.id/index.php/biodjati

PREVALENCE AND INTENSITY OF ECTOPARASITES ON *Clarias gariepinus* FROM AQUACULTURE POND IN ACEH BESAR DISTRICT, INDONESIA

Fitria Nelda Fautama[1], Ilham Zulfahmi[1,2*], Muliari[3], Adian Aristia Anas[4]

Received : March 08, 2019
Accepted : April 05, 2019

DOI: 10.15575/biodjati.v4i1.4328

[1]Center for Aquatic Research and Conservation, Universitas Islam Negeri Ar-Raniry Banda Aceh 23111

[2]Department of Biology, Faculty of Science and Technology, Universitas Islam Negeri Ar-Raniry Banda Aceh 23111

[3]Department of Aquaculture, Faculty of Agriculture, Universitas Almuslim, Bireuen 24261

[4]Department of Environmental Engineering, Faculty of Science and Technology, Universitas Islam Negeri Ar-Raniry, Banda Aceh 23111

e-mail:
[1]neldafautama@gmail.com
[*1,2]ilhamgravel@yahoo.com
[3]muliari86@gmail.com
[4]adian1087@gmail.com

*****Corresponding author*

Abstract. *Information related to the prevalence and intensity of parasites in an aquatic environment is crucial as preventive and responsive efforts to manage aquatic resources, especially for fish farming purposes. Up to now, information related to the prevalence and intensity of ectoparasites on catfish (Clarias gariepinus) from aquaculture ponds in Aceh Besar District is rare. This study aims to investigate the prevalence, intensity, and dominance of ectoparasites on catfish from aquaculture ponds in Aceh Besar district. The total of 200 catfish from four research stations at Sibreh, Kareung, Lambaro, and Limpok was observed in this study. The ectoparasites observation was focused on the skin, fins, and gill of the catfish. The observation parameter consists of prevalence, intensity, domination, length-weight relationship, and condition factor. Identification result showed that there were four types of ectoparasites infect the catfish in the aquaculture ponds in Aceh Besar District i.e Trichodina sp., Gyrodactylus sp., Dactylogyrus sp. and Ichthyopthyrius multifiliis. Station 3 (Lambaro) had the highest prevalence and intensity, which were 64% and 5.87 ectoparasites/fish, respectively. Infected catfish tended to have a lower weight growth than healthy catfish.*

Keywords: *condition factor, dominance, intensity, length-weight relationship, prevalence*

Citation
Fautama, F. N., Zulfahmi, I., Muliari & Anas, A. A. (2019). Prevalence and Intesity of Ectoparasites on *Clarias gariepinus* from Aquaqulture Pond in Aceh Besar District, Indonesia. *Jurnal Biodjati*, 4(1), 58-67

INTRODUCTION

Catfish (*Clarias gariepinus*) is one of the important consumption fish for the people of Indonesia (Aidil et al., 2016). In addition to its high economic value (reach to Rp. 16,200/kg), catfish also contains essential nutrition for the human body (Jaja et al., 2013; Suwandi et al., 2011). Apriyana (2014) reported that catfish contain 78.5 g moisture, 90 g calories, 18.7 g Protein, 1.1 g lipid, 15 g calcium (Ca), 260 g phosphor (P), 2 g zinc (Fe), 150 g natrium, 0.10 g thiamin, 0.05 g riboflavin and 2.0 g per 100 g niacin.

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Catfish production in Indonesia, especially for Aceh province is continually increasing. The Department of Marine and Fisheries (hereinafter will be referred as DKP) of Aceh province (2018) states that in 2016 production of catfish in Aceh increases by 6,793 tons compared to the 2014 production which was only 5,917 tons. Main location of catfish farming in Aceh province spread in several districts such as Aceh Selatan District, Aceh Barat District, Aceh Tengah District, Aceh Utara District and Aceh Besar District. Aceh Besar district is one of the strategic locations for catfish production in Aceh province. In addition to having suitable land and water resources, this district is also strategically located by bordering with the provincial capital, therefore the distribution and marketing process becomes efficient. Catfish production in Aceh Besar district in 2012 was 11.40 tons and increased to 26.01 tons in 2016 (DKP Aceh, 2018).

The increase of people population and activity accompanied by land expansion for provincial capital development has linked to water quality decreased including in Aceh Besar District (Wardhana et al., 2017; Hidayat, 2013; Fadli et al., 2012). This is also worsened by the lack of catfish farmers' knowledge on proper catfish farming, has made the catfish farming vulnerable to ectoparasites infection. Ectoparasites are a common parasite that often infects the aquatic animals cultivated in aquaculture ponds or aquaria (MacMillan, 1991). Several types of ectoparasites are such as ciliata, several flagellata, monogenea, copepoda, isopoda, branchiuran and annelida (Anshary, 2008).

According to Mulia (2010), ectoparasites infection can cause acute death without any symptoms. In addition, ectoparasites infection is also one predisposing factor for the existence of other more lethal organisms. Non-lethal infection of ectoparasites causes irritation on the external organs like gill and skin (Mood et al., 2011). The destruction on fish gill due to ectoparasites infection has caused a disturbance on respiration and osmoregulation processes in fish, while ectoparasites infection on the skin has decreased the fish immunity and led the intrusion of other dangerous organisms. If this condition continues, it will impact the lower growth rate until the death of fish.

Information related to the prevalence and intensity of parasites in an aquatic environment is needed as part of preventive and responsive efforts for water resource management, especially on fish farming. Galli et al. (2011) states that the increase in the intensity of parasites was linked to the decreasing water quality parameter in an aquatic environment. Although similar studied on ectoparasites on catfish have been reported in several locations in Indonesia such as in Bogor (Hadiroseyani, 2006), Makasar (Anshari, 2008) and Semarang (Pujiastuti & Setiati, 2015), currently, there are no information on the prevalence and intensity of ectoparasites on catfish from the aquaculture pond in Aceh Besar district. Thus, the objective of the present study was to investigate the prevalence, intensity and dominance of ectoparasites on catfish from the aquaculture pond in Aceh Besar District.

MATERIALS AND METHODS.

Considering to cultivation age of catfish which had a period from two to three months where ectoparasites frequent to infect, therefore this study was conducted from July to August 2018. The research stages were including sampling, identification of ectoparasites and data analysis. The samples of catfish were taken from four of aquaculture pond (four research stations) in Aceh Besar District (Figure

1). Research stations were determined based on the ecological characteristics and human activities around the locations. Description of each research station was presented in Table 1.

A total of 50 samples of catfish were sampled from each research station by using a fishing net and stored in a labeled container filled with ice. The samples were then transported into the laboratory for further identification. The collected catfish samples had a range of length from 10 – 20 cm and weight from 100 – 200 g. The total length of and weight of the fish were measured using a ruler (standard error = 0.1 cm) and a digital scale (standard error = 0.01 g). During the catfish sampling, physico-chemical parameters of water in cultivation pond were also measured, consists of temperature, dissolved oxygen, pH, and ammonia. The temperature was measured using a digital thermometer, dissolved oxygen was measured using DO meter, and pH was measured using pH meter, whereas, ammonia was measured using a spectrophotometer.

Observation of ectoparasite was carried out in the skin/mucus, fins, and gill of fish samples. The fish was sacrificed by pinning with a needle at backpart of the head. The mucus from the lateral body of the fish were taken by using scrapping method. Ectoparasites in the fins were observed by placing a slice of the fish fin (dorsal, caudal, ventral and pectoral fin) into an object glass with a drop of aquadest, while the observation of ectoparasites in the gill was carried out after separating the gill filament and operculum.

Ectoparasites were observed under a light microscope with 40x and 100x magnification. Identification of founded ectoparasite was done by comparing the similarity of ectoparasite morphology with several references such as Kabata (1985), Noble & Noble (1989) and Nurcahyo (2014). The preparation and identification stage of the ectoparasites were done in the Parasites Laboratory of Fish Quarantine and Inspection Agency of Aceh Province.

The main parameters in this study were prevalence, intensity, and dominance of ectoparasites observed from each research station. Ectoparasites prevalence was calculated using the formula as follow (Kabata, 1985):

$$\text{Prevalence (\%)} = \frac{\text{total number of infected fish}}{\text{total number of examined fish}} \times 100$$

Ectoparasites intensity was calculated using the formula as follow (Kabata, 1985):

$$\text{Intensity (ectoparasite/fish)} = \frac{\text{total number of ectoparasite found}}{\text{total number of infected fish}}$$

While the dominance of ectoparasites was calculated using the following formula (Kabata,1985):

$$\text{Dominance (\%)} = \frac{\text{total number of each ectoparasite species}}{\text{total number of ectoparasite found}} \times 100$$

Parasites infection level in each station was determine based on Williams & Williams (1996). The effort to evaluate the health condition between healthy fish and infected fish was done by measuring the length weight relationship and condition factor of fish. Length weight relationship was calculated with the Linear Allometric Model (LAM) as follow:

$$W = aL^b$$

W is the weight of fish (g), L is the total length of fish (cm), a is constant and b is an exponential expressing relation between length and weight. The condition factor (K) was measured based on the length and the weight of the fish using the following formula:

$$K = \frac{W}{aL^b}$$

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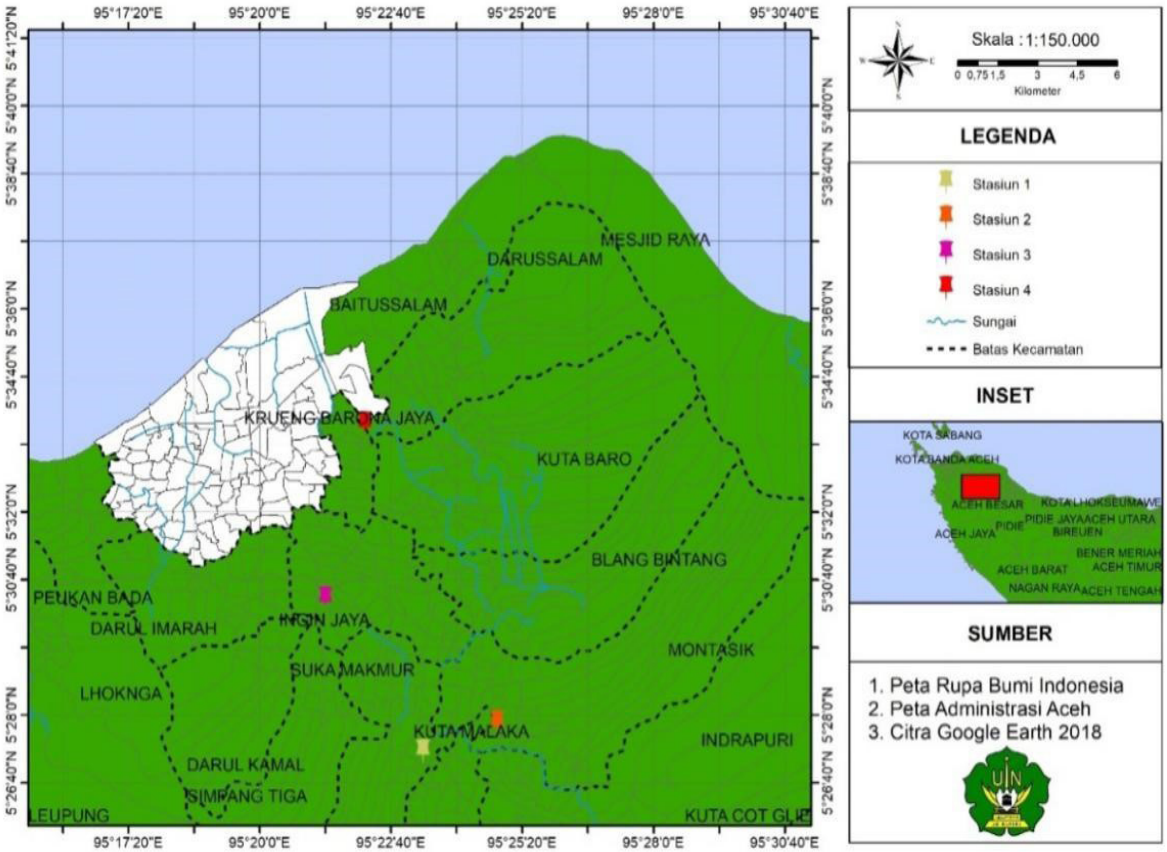

Figure 1. The Map of Sampling Station.

Table 1. Location, Geographic Coordinates and Description of the Station

Station	Place	Geographic Coordinates	Description of the Station
1	Sibreh	05°27'18.45" N 95°23'19.20" S	Tarpaulin ponds above the soil. Location was near to agriculture fields. Located was far from residential and market areas.
2	Kareung	05°27'53.71" N 95°24'49.11" S	Natural soil ponds, using filter straps as harvesting aids. The location was close to agriculture fields and the villages.
3	Lambaro	05°30'18.03" N 95°21'21.251" S	Natural soil ponds, around the settlement. The location was next to the main road, near to the market and residential areas.
4	Limpok	05°33'45.66" N 95°23'19.20" S	Cement tarpaulin ponds, located around residential areas, close to the main road.

RESULTS AND DISCUSSION

There were four types of ectoparasites that infected the catfish in the aquaculture pond in Aceh Besar District i.e: *Trichodina* sp., *Gyrodactylus* sp., *Dactylogyrus* sp. and *Ichthyopthyrius multifiliis* (Figure 2). Several previous studies have reported that these ectoparasites also infect catfish in many places in Indonesia, for instance Semarang

(Hasyimia et al., 2016), Bogor (Hadiroseyani et al., 2006) and Makassar (Anshary, 2008). Besides infecting catfish, these ectoparasites also have been reported to infect several species of fish such as goldfish (*Carriasus auratus*) (Anshary, 2008), carps (*Cyprinus carpio*) (Irwandi et al., 2005), tilapia (*Oreochromis niloticus*) (Mulia, 2010), panga (*Pangasius hypophthalmus*) (Islami, 2017) and milkfish (*Chanos chanos*) (Riko et al., 2012).

The prevalence value of ectoparasites in catfish in this location ranges between 46 – 64% (Table 2). Station 3 had the highest prevalence value, which was 64%, while station 1 had the lowest prevalence value of ectoparasites, which was only 46%. The intensity of ectoparasites on catfish ranged from 1.21 – 5.87 ectoparasites/fish. The highest intensity of ectoparasites was found in station 3, while the lowest ectoparasites intensity was found in station 4. Although stations 1 and 2 had a similar prevalence value of ectoparasites, station 2 had a higher intensity of ectoparasites compared to station 1. Based on criteria of parasites infection level referring to Williams & Williams (1996), the prevalence of ectoparasites in catfish farming area in Aceh Besar was within commonly to frequently. Nevertheless, based on the intensity criteria, the ectoparasites infection in Aceh Besar was still within a low category (Williams & Williams, 1996). The prevalence and intensity value of ectoparasites value in Aceh Besar District were higher compared to several other farming areas in Indonesia, such as in Gresik (Lestari, 2011) and Deli Serdang (Daulae et al., 2018).

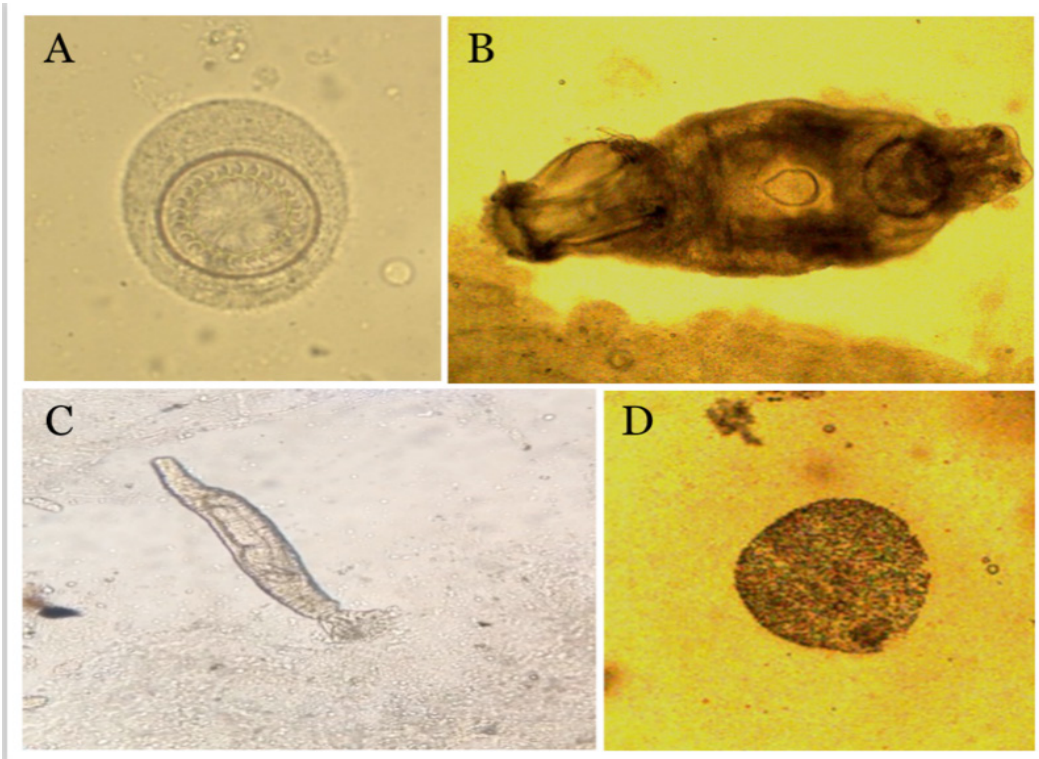

Figure 2. Ectoparasites that Infect Catfish. (A) *Trichodina* sp., (B) *Gyrodactylus* sp., (C) *Dactylogyrus* sp., (D) *Ichthyopthyrius multifiliis*.

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Table 2. Prevalence and Intensity of Ectoparasites that Infect Catfish at Each Station

Station	Infected fish (ind)	Examined fish (ind)	Number of parasite (Ind)	Prevalence (%)	Intensity (Σ ectoparasite/fish)
1	28	50	114	56	4.07
2	28	50	131	56	4.67
3	32	50	188	64	5.87
4	23	50	28	46	1.21

Number and types of ectoparasites that infect catfish in Aceh Besar aquaculture ponds were similar to the number and types of ectoparasites that infect catfish in Deli Serdang farming areas (Daulae et al., 2018), however, the number and types were less than those found to infect catfish in Bogor (10 types) (Hadiroseyani et al., 2006). This thought influenced by the water condition of the cultivation pond, which was relatively unpolluted and the lacking of anthropogenic activities around the farming areas. Based on the physicochemical parameters' measurement in the cultivation pond, it was found that the water quality parameter in station 1, 2 and 4 was within the optimum range for catfish farming activity (Table 6). As a comparison, the temperature of catfish cultivation pond at each station in this study was closer to ideal than the temperature of catfish cultivation pond in Bogor, which was 24.5°C (Hadisoeryani et al, 2006). In fact, a different result was presented in station 3, where the pH and ammonia value have passed the optimum range (Standar Nasional Indonesia, 2002). We assumed high values of pH and ammonia to be the cause for high prevalence and intensity of ectoparasites in this station. According to Riko et al. (2012), the decline of water quality in an area has positive correlation toward the increase of ectoparasites infection. Further, Ashari et al. (2014) described that the decline of water quality has caused the fish to stress, hence, they are vulnerable to ectoparasites infection.

There was no station infected by four types of ectoparasites at the same time. Stations 3 and 4 were infected by three types of ectoparasites, whereas stations 1 and 2 were only infected by two types of ectoparasites (Table 3). *Gyrodactylus* sp. was the only parasite founded in all research station and had the highest dominance level in station 4. *Tricodina* sp. was the type of ectoparasites with the highest dominance value in stations 1, 2 and 3. According to Kabata (1985), *Trichodina* sp. including the type of universal ectoparasites who have active movement, and with fast growth, hence, it tends to be widely distributed in various water bodies. Based on the predilection site, this ectoparasite tends to infect every organ of the fish's body with the gill as the main target. Afrianto & Liviawaty (2015) stated that fish infected with *Trichodina* sp. characterized by the skin irritation, excessive mucus production, pale gill, and decreased appetite, broken tail fin, and the reddish color of the tail fin due to the broken capillary blood arteries.

Based on its predilection *Trichodina* sp., *Gyrodactylus* sp. and *Dactylogyrus* sp. were ectoparasites found in three areas of observation, skin, fins and gills, while, *Ichthyopthyrius multifiliis* only infect the skin fish. *Trichodina* sp. mostly infects the gill part, and *Gyrodactylus* sp. tends to mostly infect the skin of the catfish (Table 4). *Gyrodactylus* sp. and *Ichthyopthyrius multifiliis* were the most dominant types of ectoparasites that infect the

skin. Morphologically, *Gyrodactylus* sp. had an elongated body with 16 hooks and 1 pair of the anchor which connect to each other in the posterior, while *Ichthyopthyrius multifiliis* was characterized as a dark color, and amoeboid characteristic, accompanied by the presence of large macronucleus shaped like horseshoes (Klinger & Floyd, 2013). Catfish were vulnerable to ectoparasites infection. This is due to the inexistence of a hard scale, which can serve as a body protector from the ectoparasites (Noga, 2000). The characteristics of fish infected with *Gyrodactylus* sp. was the increase of mucus in the epidermis layer, paler skin, increase the frequency of breathing followed by a decline of appetite, while, the characteristics of fish infected by *Ichthyopthyrius multifiliis* ectoparasites was the appearance of white spots in the infected part of the body (Kabata, 1985).

Besides being able to cause death, ectoparasites infection was also reported to disturb the physiological performance of the fish, which impacted a lower growth of fish (Irwandi et al., 2017). According to Sudaryatma & Eriawati (2012), ectoparasites infection can cause gill lamellar bleeding, which led to necrosis in the epithelial cells of lamellar. This caused a decrease in oxygen consumption, which had an implication on the decline of fish growth. (Hossain et al., 2007). This study confirmed that infected catfish tend to have lower average body weight. Based on the observation of the biometric condition and length weight relationship, it was known that healthy catfish had a higher average weight compared to infected catfish which were 148.5 g and 139 g, respectively. A similar result was also shown by the coefficient value of b and the value of condition factor, where the healthy catfish had the higher coefficient b value and condition factor value than the infected catfish (Table 5 and Figure 3).

The conclusions of this research showed that from 4 stations observed, station 3 (Lambaro) has the highest prevalence and intensity of ectoparasites which have been identified as *Trichodina* sp., *Gyrodactylus* sp., *Dactylogyrus* sp. and *Ichthyopthyrius multifiliis*. *Trichodina* sp. was the most dominating ectoparasite with gills as the major infected organ. Infected catfish tend to had lower weight growth and condition factor than healthy catfish.

Table 3. Dominance of Ectoparasites that Infect Catfish at each Station

Station	Dominance of Ectoparasites (%)			
	Trichodina sp.	*Gyrodactylus* sp.	*Dactylogyrus* sp.	*Ichthyopthyrius multifiliis*
1	70	30	-	-
2	56	44	-	-
3	91	4	-	5
4	-	68	21	11

Table 4. Ectoparasite Predilection that Infects Catfish

Predilection	Number of Ectoparasites that Infect (ind)			
	Trichodina sp.	*Gyrodactylus* sp.	*Dactylogyrus* sp.	*Ichthyopthyrius multifiliis*
Skin	52	51	2	13
Fins	35	25	2	0
Gill	238	41	2	0

Table 5. Ectoparasite Predilection that Infects Catfish

Fish Condition	N (ind)	Weight Range (g)	Average Weight (g)	Length Range (cm)	Average length (cm)	a	b
Healthy Catfish	89	102 - 195	148.5	22.5 - 29.5	26	0.74	1.60
Infected Catfish	111	102 - 176	139	23 - 29	26	1.34	1.40

Table 6. Physico-chemical Parameter of Catfish Cultivation Media at Each Station

No	Parameter	Unit	Sampling Station				Optimum Range*
			1	2	3	4	
1	Temperature	°C	28.7	28.9	31.5	30.4	25 - 30
2	pH	-	7.58	7.83	8.29	8.01	7 - 8
3	Dissolved Oxygen	mg/L	10.1	9.3	9.9	9	> 3
4	Amonia	mg/L	0.18	0.73	2.07	0.34	1

*(SNI: 01-6484.4, 2000)

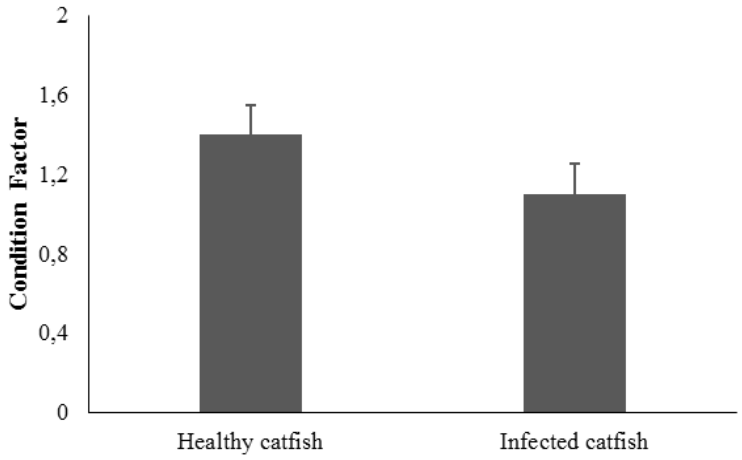

Figure 3. Factor Condition of Healthy Catfish and Infected Catfish.

ACKNOWLEDGMENTS

Authors thank the Fish Quarantine and Inspection Agency of Aceh Province, which has facilitated the laboratories for ectoparasites identifying purposes.

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