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The Application of Led Lights (Light Emitting Diode) as Replacement of Kerosene Pressure Lamps at Stationary Lift Nets in Sungsang Estuary, South Sumatera

Fauziyah[1], Freddy Supriyadi[2], Khairul Saleh[3], Hadi[3] dan Yulianto Suteja[4]

[1]Marine Science Program Study Faculty of Mathematics & natural sciences-Sriwijaya University
E-mail: fauziyah@unsri.ac.id
[2] RIIF Mariana, Ministry of Marine and Fisheries
[3]Department of Physics Faculty of Mathematics and natural sciences - Sriwijaya University
[4]Marine Science Program Study Faculty of marine and fisheries- Udayana University, Bali

ABSTRACT

Kerosene pressure lamps used in stationary lift nets in Sungsang Estuary South Sumatra as a tool for catching anchovies. The high price of kerosene is the main considerations for conducting research to find a replacement of kerosene pressure lamps. The purpose of the study were 1) analyze the characteristics of catchment in stationary lift nets using kerosene pressure lamps and LED lights, and 2) analyze differences catches in stationary lift nets using kerosene pressure lamps and LED lights. The research was conducted on new moon (dark condition) in July 2013 by experimental method in stationary lift nets that using kerosene pressure lamps and LED lights. Both of them operated 4 times in each trip. The results of this study indicated that the use of kerosene pressure lamps and LED lights not statistically significantly different for the anchovy, squid, other fishes catches, and total catch. Thus technically, LED light can be used as a substitute for kerosene pressure lamps in stationary lift nets.

Keywords: *anchovy, kerosene pressure lamps, LED Lights, stationary lift nets*

INTRODUCTION

Research about anchovy fisheries in Sungsang estuary, South Sumatra has been done starting from the identification system anchovy fishery (Fauziyah *et al.* 2012[a]), response to the difference of kerosene pressure light intensity to the catchment (Fauziyah *et al.* 2012[b]), and the difference of hauling time to the catch (Fauziyah *et al.* 2013). However, these studies are still based on kerosene pressure light as a tool for catching anchovy fish in Sungsang Estuary, South Sumatera. Anchovy fisheries in the Sungsang estuary was conducted by local fishermen using kerosene pressure lamp with kerosene fuel. Kerosene pressure lamp serves as a light source that is expected to attract fish to congregate around the area which allows the fish caught by stationary lift nets when hauling. It means that, lighting from kerosene pressure lamp is one of the important factors for the success of the catching anchovies. But ironically, the current price of kerosene is very expensive so it is necessary to substitute an alternative solution for kerosene pressure lamp in catching fish.

One of the considerations in the search for a replacement solution kerosene pressure lamp is using LED lights which are almost similar to the colour of lighting kerosene pressure lamp, easily available in the market and has a light intensity that almost equal to the light intensity kerosene pressure lamp. It means that, this research does not begin with designing LED lamp for replacement kerosene pressure lamp but utilizing LED lighting products on the market.

The purpose of the study were 1) analyze the characteristics of catchment in stationary lift nets using kerosene pressure lamps and LED lights, and 2) analyze differences catches in stationary lift nets using kerosene pressure lamps and LED lights. The results of this study are expected to provide

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information to fishermen about the possibility of replacing kerosene pressure lamps with LED bulbs that already exists in the local market.

MATERIALS AND METHODS

Study Sites. This study was conducted in July 2013 in Sungsang Estuary Banyuasin District of South Sumatra Province. Location of the study lies in 20°15'6"- 20°15'18.8" S and 105°2'10.3" – 105°2'40.4" E. Experimental research was experimental fishing in catching fish on stationary lift nets. The treatment divided into two parts ie stationary lift nets with kerosene pressure lamps (control) and stationary lift nets with LED lights (treatment). Materials and tools used were 2 stationary lift nets, 1 kerosene pressure lamp (318 lux), 3 LED light (640 lux), scales, rulers, and stationery. The distance between stationary lift nets was about 100 meters. The first stationary lift nets used kerosene pressure lamp and the second stationary lift nets used LED lights. Both stationary lift nets were operated on the same day for 4 days by which time the operation of fishing gear, observation and measurement of data was conducted from 21:00 to 06:00. Every hauling, the catch of fish were identified and weighed, each fish species were obtained. 30 samples from each fish species has been taken to measured fish length (total length) and weight sample. Observed catches were anchovy, squid, other fish, and total catch. The amount of hauling during the operating time adjusted to the habits of the local fishermen. The operating time was used as replicates.

Data Analysis.

Analysis of the characteristics of the catch. The analysis of the catchment characteristics used analytical approach species composition and total weight of the catch.

Analysis of differences in the catch. Wilcoxon Signed Rank Test was used for this analysis, which aims to prove the statistically significant difference between stationary lift net using kerosene pressure lamp and LED lights. According to Walpole (1993) Wilcoxon Signed Rank Test can be used to compare the value of the middle 2 normal and abnormal populations.

The analysis was conducted on the catch anchovies, squid, other fish and total catch. The data was processed with software SPSS 17 for windows. This research used two hypotheses:

H_o : there was no difference effect between kerosene pressure lamp and LED lights to the catches
H_1 : there was difference effect between kerosene pressure lamp and LED lights to the catches

The decision results Wilcoxon Signed Rank Test were determined as follows:
Reject H_o : if significant value less than 0.05 means that there was difference effect between use of kerosene pressure lights and LED lights to the catches
Accept H_o : if significant value more than 0.05 means that there was no difference effect between use of kerosene pressure lights and LED lights to the catches

RESULTS

Characteristics of the catch. Figure 1 showed that the compositions of the catch in control (using kerosene pressure lamp) and treatment (using LED lights) was dominated (over 80%) by anchovies. Based on percentage, the catches of anchovies in control stationary lift nets greater than treatment, but

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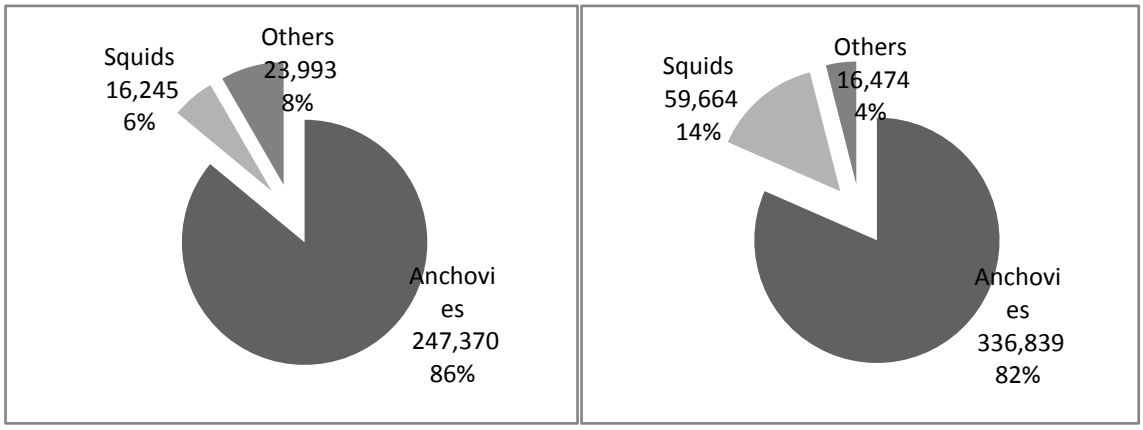
not based on total of catches (Kg). Conversely, if seen from squids and total catch, stationary lift nets control smaller than treatment both in number and percentage of treatment. In stationary lift nets treatment, the amount of other fish caught were smaller than control. For other fish catches, number and percentage stationary lift nets control greater than treatment. Stationary lift nets control had 7 types of fishes : 1) anchovies (*Stolephorus* sp.), 2) Squid (*Loligo* sp.), 3) Pony fish (*Leiognathus* sp.), 4) Trevally (*Selaroides* sp.), 5) Mullet (*Mugil* sp), 6) White Herring (*Ilisha elongata*) and 7) shrimp (*Metapenaeus ensis*). In stationary lift nets treatment in addition to the seven types of fishes except shrimp, also still obtain other types of fish such as Largehead hairtail (*Trichiurus* sp), Zabaleta ancohvy (*Clupeoides* sp) and Rainbow sardine (*Dussumieria acuta*). Total catch control was 287.61 kg and treatment was 412,98 kg.



(A) (B)

Figure 1. Catch Composition in stationary lift net that used kerosene pressure lamp (A) and LED light (B).

Characteristics catch compotition above showed that differences in the amount of the composition of catches of anchovies, squid, other fish and total fish catches. However, these differences need to be proven statistically.

Analysis of differences in the catch. The average of fish catches in each trip on the stationary lift nets bigger (84.2 kg / trip) compared with controls (61.8 kg / trip). Similarly, the average catches of squid, stationary lift nets treatment also bigger (14.9 kg / trip) compared with controls (4.1 kg / trip). This result were in contrast to the average catches category of other fishes where the catch of the stationary lift nets treatment (4.12 kg / trip) was smaller than the stationary lift nets control (5.99 kg / trip). While based on the average of the total catch, the catch of stationary lift nets treatment (103.24 kg / trip) bigger than the stationary lift nets control (71.9 kg / trip). It can be seen in Table 1 for more clearly. Furthermore, Table 1 also shows that the results of the Wilcoxon Signed Rank Test values obtained Asimp.

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Table 1. Summary result of Wilcoxon Signed Rank Test (kg)

Repetation		Anchovy		Squid		Other fish		Total catch	
		Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment
	1	39,000	43,495	4,415	3,124	1,829	4,413	**45,244**	**51,032**
	2	15,900	9,562	1,400	5,140	464	4,662	**17,764**	**19,364**
	3	23,270	33,710	6,430	21,900	21,552	5,223	**51,252**	**60,833**
	4	169,200	250,072	4,000	29,500	148	2,176	**173,348**	**281,748**
total		**247,370**	**336,839**	**16,245**	**59,664**	**23,993**	**16,474**	**287,608**	**412,977**
average		**61,843**	**84,210**	**4,061**	**14,916**	**5,998**	**4,119**	**71,902**	**103,244**
Statistic test									
• z		-1,095[a]		-1,826[a]		-1,826[a]		-1,826[a]	
• Asymp. Sig		0,273		0,068		0,068		0,068	

[a]: LED light (treatment) < kerosene pressure light (control)

Sig (2-tailed) for anchovy catches (0,274), squid (0,068), other fish (0,068) and total catch (0,068) is greater than the value of α = 0.05. it means that there was no difference in effect between the use of kerosene pressure lamp (318 lux) and LED light (640 lux) for catchment in the stationary lift nets to the category of the catch anchovies, squid, other fish and total catch.

DISCUSSIONS

The composition of the catchment showed that the predominant use of the kerosene pressure lamp and LED lights on the unit stationary lift nets in Sungsang Waters, South Sumatra was the anchovy. Although the obtained amount of anchovy catches were different but the value was not statistically significantly different. Similar results were also obtained in the category of squid, other fish and total catch.

The results were not statistically significantly different in the use of LED light bulbs and kerosene pressure lamp, strongly associated with factors light intensity and type of the resulting color of the second lamp. The differences in light intensity between kerosene pressure lamp (318 lux) and LED light (640 lux) account for about two-fold. The resulting color of kerosene pressure lamp was white slightly yellowish while the LED lights produce a white color. The fish has a different tolerance limits depending on the light (Puspito, 2008) and too strong light will make the fish move away until the appropriate tolerance limits (Natanubun and Patty, 2010). Although there were differences in the characteristics of light (intensity and color) which produced from kerosene pressure lamp and LED lights, but still within the tolerance limits of

fish (anchovies, squid and other small pelagic fish). The anchovy of those both types of the stationary lift nets had a similar opportunity to get close to the light source and get into area on the stationary lift nets. This conjecture was in line with Sudirman *et al.* (2004) where the fish tend to choose a higher light intensity, tend to be on the surface of the water, and quickly entered the area of the stationary lift nets, so it does not take a long time to make the perfect light adaptation process.

The anchovy tendency to schooling in one area, in addition to interest in the light source, also linked to the availability of plankton. Amirudin (2006) also explains that the catchable fish entered into the Rambo stationary lift nets area because of other factors than light but also because by dietary factors. In the body length <40 mm, anchovies generally eat phytoplankton and small zooplankton, whereas the body length> 40 mm, anchovy utilize larger zooplankton (copepods (Hutomo *et al.* Amirudin 1987 in 2006). The distance between both of the stationary lift nets about 100 meters so it assumed to have the same condition. In addition, this study assumes a net withdrawal rate at each stationary lift nets on the same stationary lift nets so that the possibility of escaping from the anchovies catchable chances are also the same area.

The effect of kerosene pressure lamp and LED lights showed that the catchment on the stationary lift nets was not statistically significantly different, and indicating that the LED lights can be used as a substitute for kerosene pressure lamp.

The composition of the catchment from both stationary lift nets with lights and LED light dominated by anchovy. The application both kerosene pressure lamp and LED lights on the stationary lift nets was not statistically significantly different to catch ancovy, squid, other fish, and total catch. Technically, the LED light can be used instead of the kerosene pressure lamp on the stationary lift nets unit

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