

Utilization of Light Emitting Diode (LED) lamp with difference color

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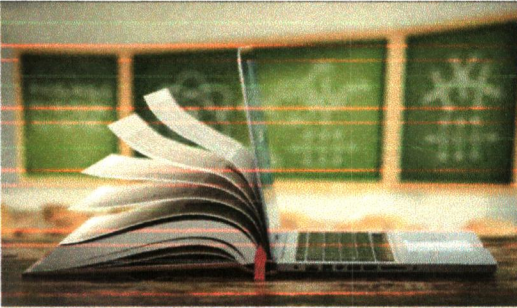
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Utilization of Light Emitting Diode (LED) lamp with difference color as attractor for fixed lift net as small scale fisheries in Makassar Strait, Indonesia

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Abstract. Use of light for the some types of fisheries has been one of the most advance and successful methods to control fish to capture process. Several fishing technology operated in Indonesia waters, used of light as attractor for catching of the small pelagic fish. A lot of typed of lamps used by the fisherman, like incandescent lamp, florescent lamp, mercury lamp and metal haline lamp. In the development of technology, now the some company was introduce new lamp typed with environmentally friendly technology called Light Emitting Diode (LED) lamp. Research about utilization of Light Emitting Diode (LED) lamp with different color and color combination of fixed lift net was conducted in Makassar Strait during the May- November 2018 and March - September 2019. The research aimed was to determine the best effectively color of LED can use as attractor for pelagic fish in fixed lift net in Makassar Strait. Experimental fishing was conducted in one unit commercial fixed lift net with bamboo platform size 15 m x 15m in Pangkep regency Makassar Strait. Data were obtained at every fishing operation by examining the catch species, total catch, by catch and discard species every hauling time. In 2018 there are three color LED namely white, yellow and blue color. Experimental fishing for 30 hauling time for each color of LED in 2018 and 35 time for each LED in 2019 with color combination. Data were collected two time a week during. Fixed lift net did not operated during the full month (one week a month). Total lighting power of 374 W, with 16 total unit LED lamps was setting under the lift net flatform. The result showed that Light Emitting Diode (LED) is effective as attractor in fixed lift net fisheries to utilization of small pelagic species in coastal area. There are 25 species captured of the fixed lift net during the experimental fishing in Makassar. There are five dominant and commercial species, there called main species are Anchovies (*Stolephorus sp.*), Sardine (*Sardinella sp.*), Pony fish (*Equulites sp.*), squids (*Loligo sp.*), and Big eye scad (*Selaroides sp.*). White color and combination of white-blue - yellow color is preference color for small pelagic species.

1. Introduction

Use of light for the some types of fisheries has been one of the most advance and successful methods to control fish to capture process [1-3]. Artificial light would be effective to attract fish and to catch them. Electric lamp is easily used, effective and efficient because it can be set on surface and underwater [4]. Fixed lift net is type of lift net with bamboo platform stuck an the seabed of 7-15 m water depth used by Indonesia fisherman, operated in coastal area for catching small pelagic fish.



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species.

In advancements in light and lighting technology, light fishing operations have become one of the highly effective fishing categories. These studies used various types of electric lamp, namely halogen lamps, mercury lamps, incandescent lamps, and light emitting diodes (LED) have been conducted of some researches [2-3, 5-7]. Was to investigate the effect of using LED lights of different colours (wavelengths) to attract fish in a natural (nearshore, coastal) environment.

In the last decade, sustainable development including sustainable fisheries is very important issue, to minimize of using energy consumption during the capture process and fishing operation. The light emitting diodes (LED) is typed of lamp with low energy consumption and high light power energy output. Some research was conducted of light emitting diodes (LED) in to the lift net like [3, 8] to prove the LED (light emitting diode) lamp efficiency in lift net fishing and to find out the optimum time for lift net fishing operation. Publications related to LED lamp on fixed lift nets especially using various color is still lack. Several studies was conducted in Makassar Strait in South Sulawesi Indonesia will be discussed. This research aimed to display information on catch of the fixed lift net with various color.

2. Material and Method

This research was conducted in Pangkeje Kepulauan waters in Makassar Strait Indonesia (Fig 1) using a small scale commercial fishing unit with bamboo platform size 15 m x 15 m. Data collected from June-November 2018 and March-August 2019. Data were obtained at every fishing operation by examining the catch species, total catch, by-catch and discard species every hauling time. In 2018 there are three color LED namely white, yellow and blue color. Experimental fishing for 30 hauling time for each color of LED in 2018 and 35 time for each LED in 2019. Data were collected two time a week during. Fixed lift net did not operated during the full month (one week a month). Total lighting power of 374 W, with 16 total unit LED lamps was setting under the flatfom.

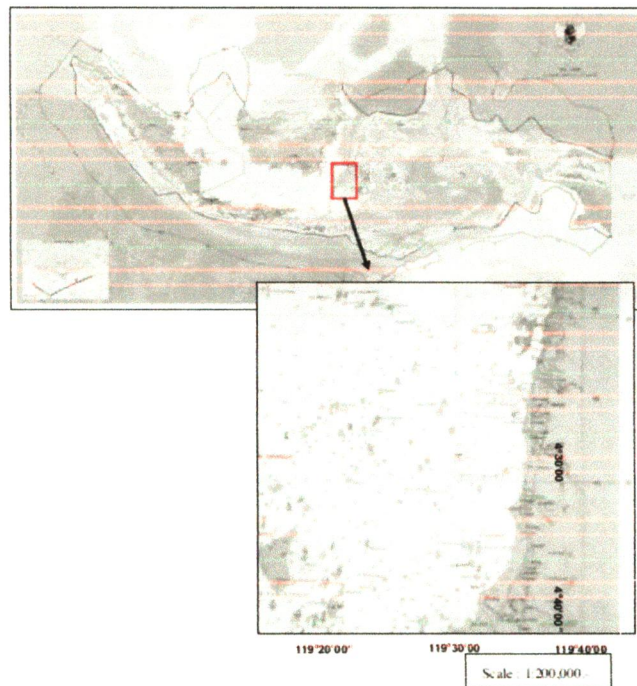


Figure 1. Map of Makassar Strait were experimental site and data collection.

Data were obtained at every fishing operation for examining the total catch, catch species, by-catch and discard species and size of the dominant species every hauling time.

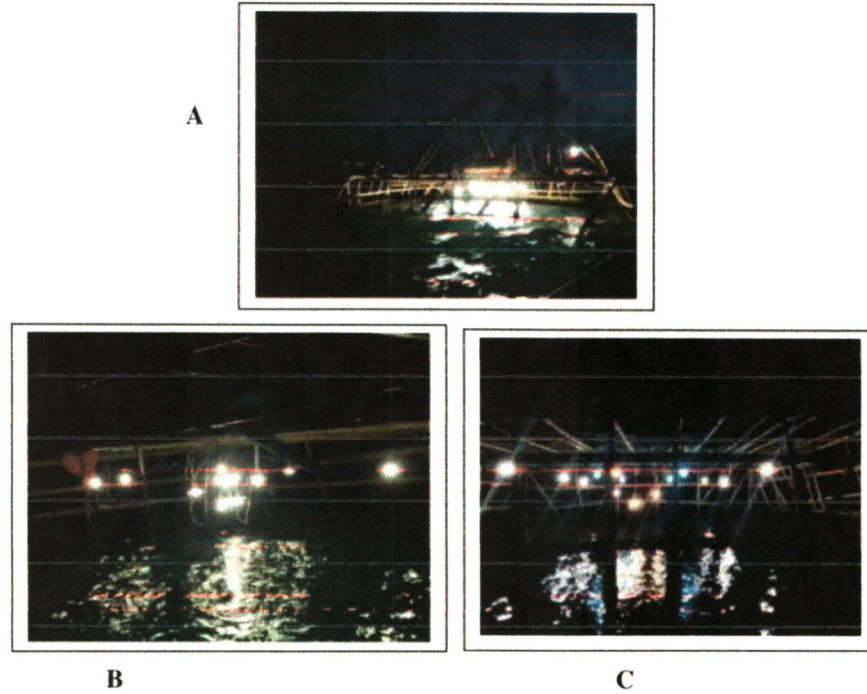


Figure 2. Fishing operation of fixed lift net during the night time using LED lamps: A. Fixed lift net front of view; B. Using white color and C. Using combination color of LED lamps

Setting of combination color of LED lamps showing in Fig 3. Data were taken in every 3 time a weeks, except during the full month, where artificial lamps ineffective.

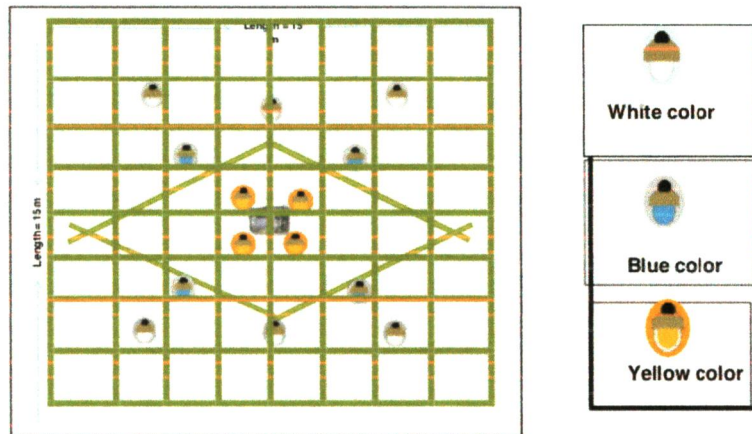


Figure 3. Example setting of color Combination of LED in the fixed lift net (view from above) with white-blue and yellow color

3. Result and Discussion

There are 25 species captured of the fixed lift net during the experimental fishing in Makassar Strait. There are five dominant and commercial species, there called main species are Anchovies (*Stolephorus sp.*), Sardine (*Sardinella sp.*), Pony fish (*Equulites sp.*), squids (*Loligo sp.*), and Big eye scad (*Selaroides sp.*). The others species was also captured by the fixed lift net are Jack mackerel (*Carangoides sp.*), Giant seapike (*Sphyraena sp.*), Wolf herring (*Chirocentrus sp.*). The other species is by catch species like are Hardyhead (*Atherinomorus sp.*), Goatfishes (*Upeneus sp.*), Grunters (*Pomadasy sp.*). Same species also caught by fixed lif net is discarded species. Generally discarded species is fishes from puffers fish namely *Lagocephalus sp.*, *Paramonacanthus sp.*, *Torquigener*.

3.1. Catch Comparison

Catch comparison fixed lift net with using different color (white, yellow and blue) during 30 hauling net, showing in Fig 4. Total catch of fixed lift net with using white color was 692.7 Kg, blue color 649.7 kg and yellow color were 578.0 Kg.

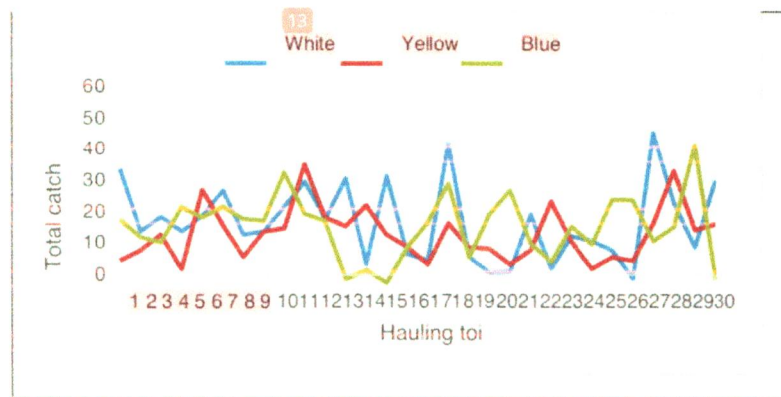


Figure 4. Comparison of total catch of the fixed lift net with three different color for 30 Hauling

Every hauling the net is white color higher than blue and yellow color. Total catch during 30 hauling the net, showing in Fig 4. It means that white color lamp is more effective as attractor for lift net fisheries compare with blue and yellow color. The average catch of the lift net for using different each color showing in the Fig 5

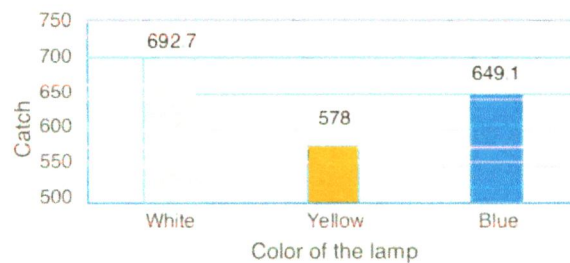


Figure 5. Comparison of total catch of the fixed lift net with three different color during the experimental fishing.

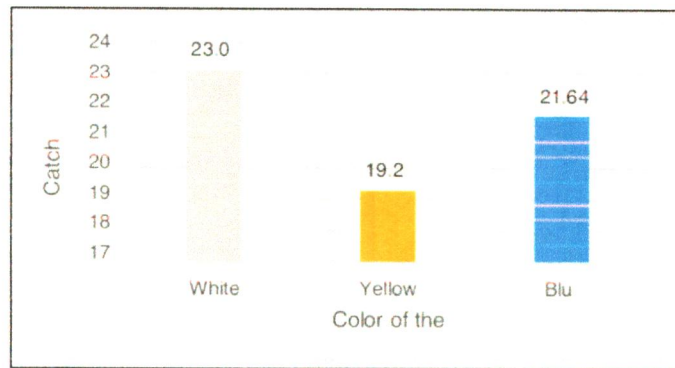


Figure 6. Average catch of the lift net with different color during the 30 hauling

3.2 Catch Comparison of color combination

Experimental fishing was conducted in 2019, showing in Fig 6-8. During the 35 hauling time indicated that combination white-blue yellow color is better than combination blue-white- yellow and blue-white-red color. The total catch of the lift net for each color combination 722.5 Kg, 699.4 Kg and 552.2 Kg (Fig 7)

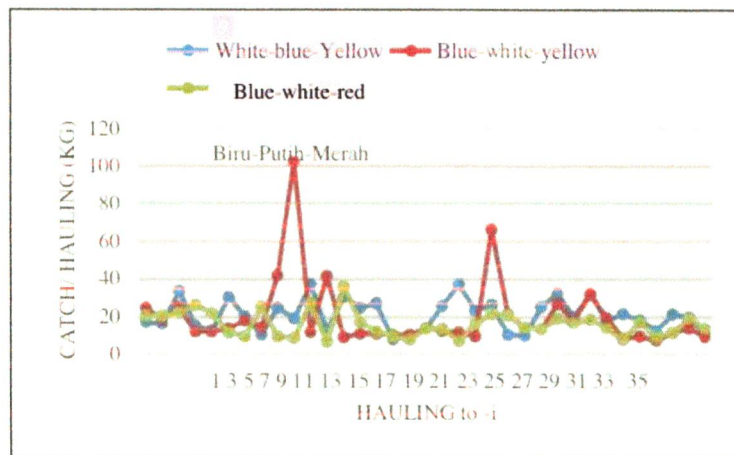


Figure 7 Comparison of total catch of the fixed liftnet base one combination color used during the experiment

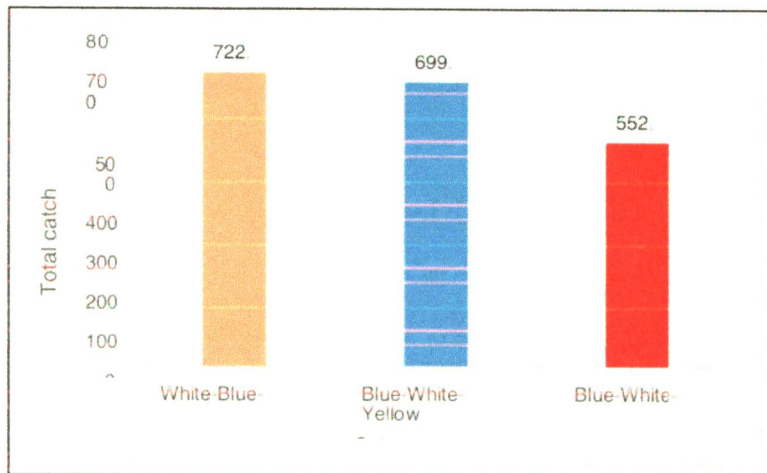


Figure 8. Total catch (Kg) of fixed lift net base on color of LED used during the experiment (35 hauling)

Average catch of the lift net in 2019 during the 35 hauling time indicated that combination of the white-blue-yellow and blue-white-yellow (Fig 8.9). In this research recommended that utilize to applicable lift net, in coastal area in South Sulawesi.

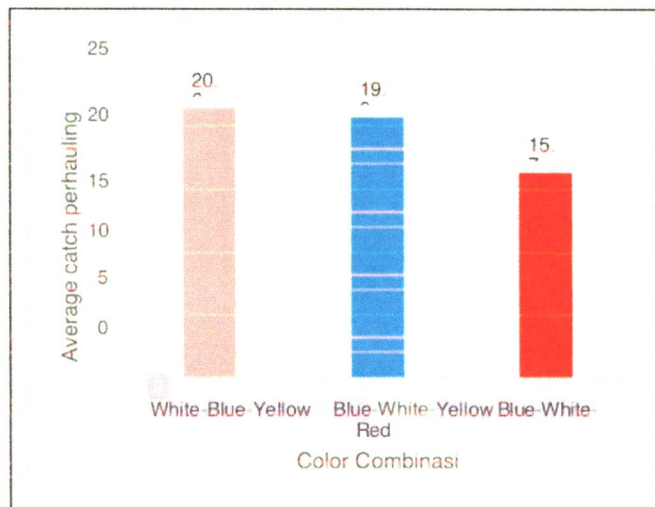


Figure 9. Average catch (Kg) every hauling of fixed lift net base on color of LED used during the experiment (35 hauling)

Research was conducted by [8] under direct observations in field found that number of organisms concentrated under LED lamp was higher compared to those under fluorescent lamp. This indicates that LED lamp is preferred by plankton feeder against fluorescent lamp [8]. make conclude that the use of the LED lamp on lift net resulted in catch of 7 types of organisms weighing 159 kg which is higher compared to the fluorescent lamp method (5 organisms weighing 131 kg). [9] said that LED lamps can be used to replace the kerosene and saving energy lamps. This research also have been

calculating of the main catch, bycatch and discard catch. Percentage of main catch, bycatch and discarded showing in the Fig 10-12.

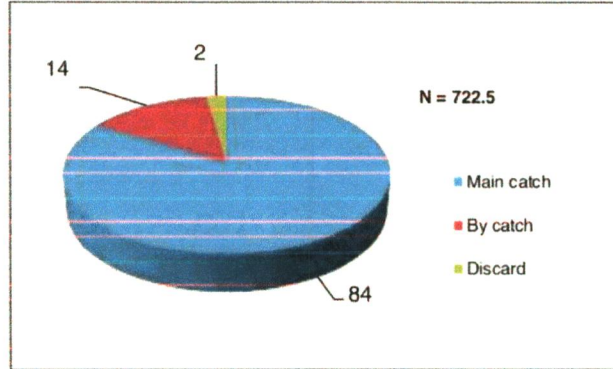


Figure 10. Percentage of main catch, by catch and discard catch of the lift net using LED white-blue-yellow color

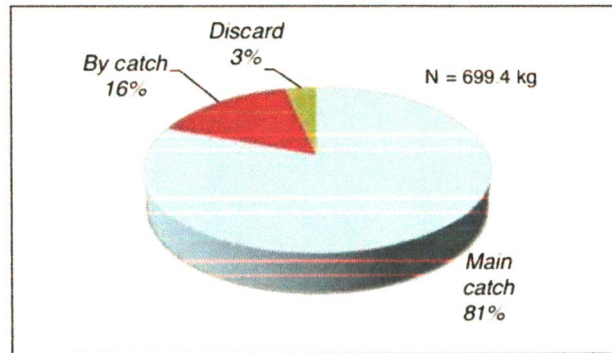


Figure 11. Percentage of main catch, by catch and discard catch of the lift net using LED blue-white-yellow color

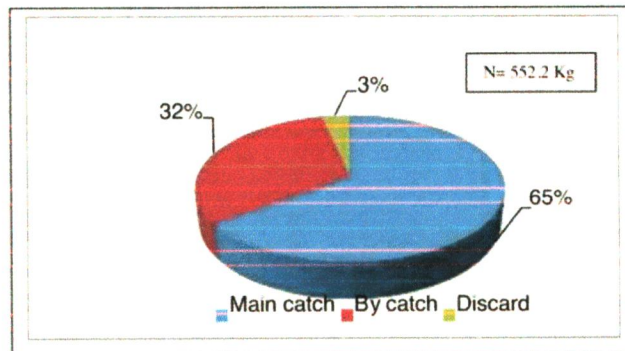


Figure 12. Percentage of main catch, by catch and discard catch of the lift net using LED Blue-white-red color

Relation to the bycatch in the light fishing [7] was investigated the effect of using LED light of different colours (wavelength) to attract fish in a natural environment. The result indicated the relationship between the wavelength and number of fish was inversely proportional to one another.

4. Conclusion

The conclusion of this research are:

1. Light Emitting Diode (LED) is effective as attractor in fixed lift net fisheries to utilization of small pelagic species in coastal area.
2. White color and combination of white-blue – yellow color of LED lamp is preference color for small pelagic species.

Acknowledgments

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