Study of AUTO-LION (Automatic Lighting Rumpon) on Fisheries of Stationary Lift Net in Semarang, Central Java

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Abstract. Fish Aggregation Device (FAD) is a fishing tool that serves to collect fish at a place to facilitate fishermen in the process of fishing. The use of light is also proven to help the process of fishing at night. AUTO-LION (Automatic Lighting Rumpon) is a FADs innovation equipped with fish-eating sound and solar-powered lights that can be activated automatically when it is dark or nighttime. The purpose of this study was to determine the effect of AUTO-LION use on fishermen catch. The research method used is experimental fishing. The research was conducted on May 2017 on the stationary lift net in Semarang Waters. The results showed the catch as much as 10.55 kg without the use of AUTO-LION, 15.05 kg on the use of FADs, 19.08 kg on the use of FADs with sound, 27.04 kg on the use of FADs with light, and 40.01 kg on the use of AUTO-LION. Based on these results it can be seen that the use of AUTO-LION can increase the catch of fishermen, especially when the light is activated.

Keywords: Fish Aggregation Device, lift net, rumpon

1. Introduction
Semarang City is located on the north coast of Central Java, at position 06005'07 "LS - 110035'28" East Longitude, with total area reaches 37,366,838 ha or 373,7 km2. Seeing the existence of fishermen who live and fish in coastal Semarang, at this time they are looking fish far to the north to Karimunjawa islands, because the potential of fisheries in the coast and sea of Semarang City is much reduced. The results obtained are also not balanced with expenditures for fuel oil and for other operations.

Charts are one of a kind of rectangular fishing gear and are generally operated in the waters near the coast. The principle of the chart capture tool is to concentrate and collect fish in the center of the chart, then catch it. According to Sukandar dan Fuad (2015)[1], the step chart is a passive catch tool, where the tool is a building in the middle of the sea with a net under it, the net will be lifted after many fish gathered in the middle of the chart. Based on the way the operation of the chart is grouped in lift net, but because it uses light to collect the fish it is also called light fishing (Subani and Barus, 1989 in Fuad et al., 2016) [2]. Chart type can be divided into 3 that is step tancap, floating chart and boat chart. The timepiece is fixed while the floating and boat charts can move.
FADs is one of the collecting fish tool that serves as a shelter for fish from predators. According to Suwarsih (2012) [3], FADs is one of the fishing aids to increase the catch where it has a plant-like construction that placed in the sea waters and serves as a shelter, to eat, spawn, and gather fish. According to Regulation of the Minister of Marine and Fisheries No. 26 / PERMEN-KP / 2014 [4], FADs is a fish collecting tool that uses various forms and types of attractors from solid objects, it’s serves to attracting fish to gather, which is utilized to improve the efficiency and effectiveness of fishing operations. FADs can be located in any place depending on the direction of current or wind, or a combination of both (Mandagi et al., 2015 [5]; Nurani et al., 2014[6]; Simbolon et al., 2013[7]. Traditional FADs is generally made of coconut leaves that are hooked on a main rope. FADs can be placed on the surface, middle or bottom of the water. According to Yusfiandayani et al. (2012) [8], the traditional FADs attractor is generally made of coconut leaf or wrecked rickshaw.

The use of solar cells as a solar light tower is a technology that has just been developed as a renewable energy. The use of solar cells can save fossil fuels that until now become a decreased resource. The working principle of this tool is the absorption of sunlight by solar panels during the day. Then the energy will be stored in the battery to be used for the fishing operations of the sound and the light attractor. According to Yandri (2012) [9], solar energy is the energy gained by converting solar thermal energy (sun) through certain equipment into other form resources. According to Widayana (2012) [10], solar energy is one of the energies currently being developed by the Indonesian government because as a tropical country, Indonesia has considerable potential solar energy. Solar energy is extraordinary because it is not pollutant, cannot run out, can be trusted and does not buy. There are many ways to use the energy from the sun. The term "solar power" means converting sunlight directly into heat or electrical energy for our utility [11].

The use of rumpon has been widely applied by fishermen before, but there is no the use of rumpon which is equipped with the fish eating sound attractor and automatic flame lights. AUTO-LION is a rumpon innovation, which is a tool that works to help in catching the fish by collecting the fish in a place. When the fishes are concentrated in a point, the fishing operation can be more easily done and the catches will increase. The sound attractor which used is the recording of the sound of the fish while eating. Some fishes produce a sound as an acoustic cue when doing activities, such as communicating with other individuals, searching for a partner, prey detection, stress, and eating (Fitri et al., 2010 [12]; Enger et al., 1993[13]. So when the sound is played in the water, then the fish will come and gather around the rumpon because of the sound trick( Myrberg, 2001[14]; Sabet et al., 2016[15], while the light attractor which used is white LED lights (Amorim et al., 2015[16]; Taufiq et al., 2015[17]; Yoshizawa and Sadao, 2008[18]. The light attractor is made waterproof so that the lamp is not easily damaged when it is inserted into the water. White color is used because this color is indicated as the best color to collect the fish. This is confirmed by Urbasa et al. (2015)[19], fish is more interested in white and green color than blue and red color. The most preferred color is white. According to Sukandar and Fuad (2015) [1], the light function in catching the fish is to collect the fish up to a certain catchable area, then the catch is done by means of net and fishing line.

The purpose of this study is to examine the effect of AUTO-LION usage on the catch of tancap charts in Semarang Waters.

2. Research Methods

The research method which used was experimental method with several treatments i.e. without AUTO-LION; the use of rumpon; the combination of rumpon and sound attractor; and the combination of rumpon and light attractor. The first step was to solve and process the absorption of solar light with solar panels at 09.00 - 15.00. Solar panels and batteries were placed on the top of the chart and allowed to stand for 6 hours. The second stage was the test of fishing without aid at 09.00-11.00. The third stage was an AUTO-LION raiding test at 12:00 to 14:00. At this stage, the rumpon was placed in the center of the tread. Rumpon was inserted into the water after the chart net was inserted into the water in order not to collide and damage the net. The fourth stage was the test with the combination of rumpon and sound attractor at 15.00 - 17.00. At this stage the work step was similar as before, but the the sound attractor
turned on. And then the test of the combination of rumpon with light attractors at 19.00 - 21.00. And the last treatment is with AUTO-LION at 22.00 – 24.00. This test was performed during the night for a positive phototactic fish could approach the light attractor when the situation around it was dark. Treatment for 2 hours is based on the time of fishing habits when conducting fishing operations with the tancap chart.

This research was conducted on May 2017 at TambakLorok, Semarang with the coordinate position of 6° 56'19" LS and 110° 25'57" BT. The analysis which used is the IBM SPSS Statistics 20 License Authorization Wizard. The hypothesis which used is the estimation of the influence of fish catch by using various capture treatments.

Ho : There is no influence between the catch fish and the capture treatment.

Ha : There is an influence between the catch fish and the capture treatment.

The decision making was done by doing a comparison to the sign value = 0.05. If the sign value <0.05 then Ho is rejected whereas the sign value> 0.05 then Ho is accepted. The observation was made on the stationary lift net 8x8m with a depth of 4m. The tools which used were AUTO-LION, stopwatch and fish finder as a tool to observe the existence of the fish. AUTO-LION is composed of triangular wood-shaped skeletons with a size of 1x0.5x0.5m, coconut leaves, 6 white LED lights 10 watts(Taufiq et al., 2015) [17], speaker and MP3 player 800 Hz with the sound of recording fish, 4 pieces of concrete weights, Polyethylene ropes, 1 piece solar cell, solar controller cell, and 10 accu (Purnomo, 2010)[20]. The construction of AUTO-LION and the position of AUTO-LION on the chart can be seen in Figure 1.
3. Results and Discussion

The results showed that the comparison of each treatment was in the following graph:

![Graph Comparison of Each Treatment]

Based on the observations on the fishing tool which was tested showed the significant results. The catch in each treatment had a difference that was when the fisherman used the fishing chart tool without using rumpon had a catch of 10.55 kg. The fishing tool that was added by the rumpon tool had a catch...
of 15.05 kg. The *rumpon* tool then was assigned a sound attractor and produced a catch of 19.08 kg, in contrast with when it given a light attractor of 27.04 kg. A *rumpon* tool that was given light and sound attractor at the same time produced the highest catch of 40.01 kg. Calculation result (sign 0.05) so that there is influence between catch with the treatment.

FADs added with light and sound attractors (AUTO-LION) are a combination of attractors who have 3 more power to collect fish. The resulting catch is subject to considerably higher changes than capture without using FADs. This fish aggregating device is suitable for as a catching tool performed on passive and static fishing equipment (Haruna, 2010[21]; Sudirman and Mallawa, 2004[22]. Fish aggregating device using one of the light and lower-light attractors in collecting fish compared to the two when combined. One strength of the attractor will affect the attractiveness of the fish. Light attractor will produce more catches than sound attractor because of the nature of the propagation light attractors can enter the vine into the water faster than the sound attractor so the fish will be more sensitive to light attractor. Fish will approach a catchy sound and make fish feel secure because of its acoustactic properties (Enger et al., 1993[13]; Fitri et al., 2010[12]). The indication is that the fish has a positive phototaxis of light, and the fish sound attractor will indicate its acoustax [14].

Fish has an organ that can be used to select the object that attracts it. One is the eye organ, the fish will be attracted by the things that stand out. Fish associated with the use of his eyes is a fish that has phototaxis properties. Phototaxis is the nature of fish that can be attracted to or away when there is a light. Fish attracted to lamu because it has positive phototaxis properties, if the fish away from the light, it means the fish has negative phototaxis properties. Nicol (1963) in Gustaman et al. (2014) [23] stated that the majority of the sea fish eye is very high in sensitivity to light. Light is the most important thing on the net fishery lift. It is attractant of plankton feeders around the light source [24].

At this time has grown a lot of FADs that uses lights but constrained that the lamp requires electrical energy. Usually the fishermen use electrical energy that stored in battery. The use of solar cells is a new stage that began to ogled the makers of fish collection equipment, which does not require home electricity but uses solar energy stored in solar cells. Solar cells will be used to turn on lights automatically. So the use of solar energy supports energy efficient capture. Solar energy becomes one source of power plants other than water, steam, wind, biogas, coal, and petroleum.

Fish that have positive phototaxis properties are fish that are usually in adult size. One of them is anchovy, according to Sudirman and Natsir (2011) in Fuad et al. (2016)[2], anchovies are thought to have very high positive phototaxis properties, while other species in addition to the nature of phototaxis also because of the impulse to find food. Visible axis is serve to identify fish habits in food or other objects. The axis of vision is obtained after the value of the cone cell density of each part of the retina of the eye is known by drawing a straight line from the retina that has the highest concentration of conic cell to the center of the eyepiece. Fish have the ability to adapt to the incoming light in the retina of their eyes. Such capabilities include the ability to distinguish colors or wavelengths received.

The catches caught at the time of the study were fish cured (Plotusus canius), kwiper (Scatophagus argus), mullet (Mugil sp.), Sriding (Ambasius marianus), sumedar, shrimp (penaeus monodon), anchovy (stolephorus sp.). The main catch in this study is the anchovy which is the target fish in the fishing gear chart. Anchovy will approach the light source and survive to linger in the lighting area. In addition to being attracted by light, according to Baskoro (2007) in Gustaman et al. (2014) [23] occurrence of anchovy is also caused by the presence of food that usually gathered under the lights of petromaks ie plankton, shrimp and smaller fish.

Fish have hearing power with the organ of hearing that is owned, usually the fish is possessed lineal lateralis, or line in the middle of the body. Fish that possess the lateral line will respond to the sound source. Examples of fish that have lineal lateralis are gulamah, mullets, milkfish, sriding, and others.

### 4. Conclusion

The conclusion that can be obtained from the study of AUTO-LION study in the tap fishing gear is the highest catch obtained after the installation of AUTO-LION that is equal to 38.83% of the catch without using the aid of fish collecting equipment. The fish-raiser apparatus added by the voice enhancer...
increased the catch by 18.45%, while the added with the light attachment increased the catch by 26.21% and with AUTO-LION was more effective. AUTO-LION needs to be re-developed to become a fish-gatherer tool that meets the expected capabilities.

References

[1] Sukandar dan Fuad 2015 *J. Innovation and Applied Tech.* 2 pp 101-105
[2] Fuad, Sukandar, A Jauhari 2016 *J. Kelautan.* 9(2016)1 pp 7-11
[3] Suwarsih 2012 *Prospektus* pp 181-191
[4] Regulation of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia Number 26 Year 2014 about *Rumpon*
[5] Mandagi, Channia, Patrice N I Kalangi, Alfret Luasunaung 2016 *J. Ilmu dan Teknologi Perikanan Tangkap.* 2(2016)3 pp 105-108
[6] Nurani, T W, S H Wisudo, P I Wahyuningrum, dan R E Arhatin 2014 *J. Ilmu Pertanian Indonesia.* 19(2014)1 pp 57-65
[7] Simbolon, D, B Jeujanan, E S Wiyono 2013 Effectiveness of *Rumpon* Utilization in Fishing Operation in Southeast Maluku Waters
[8] Yusfianani, R, I Jaya, dan A Baswantara 2014 *J. Fisheries and Marine Technology.* 5(2014)1 pp 75-82
[9] Yandri, V R 2012 *J. ILMU FISIKA (JIF).* 1 pp 14-19
[10] Widayana, G 2012 *J. PTK, UNDIKSHA.* 9 pp 37-46
[11] Asy’ari, H, A. Rozaq., dan F. S. Putra 2010 *J. Emitor.* 14(2010)1 pp 33-40
[12] Fitri, A D P, Asryanto, H Sutanto, and Widatini 2010 *J. Coastal Development.* 13 (2010) pp 205-214
[13] Enger, P. S., H. E. Karlsten., F. R. Knudsen and O. Sand 1993 *ICES mar. Sci. Symp.*. 196 pp 108-112
[14] Myrberg, A. A. 2001. *Enviromental Biology of Fishe.* 60 pp 31-45
[15] Sabet. S S, K Wesdrop, J Campbell, P Snelderwaard, and H Slabbekoom 2016 Science Direct 116 pp 1-11
[16] Amorim, M C P R O, Vasconcelos, and P J Fonseca 2015 ISPA. Instituto Universitário, Rua Jardim Do Tabaco 34, 1149-041 Lisbon, Portugal
[17] Taufiq, W Mawardi, M S Baskoro, dan Zulkarnain 2015 *J. Teknologi Perikanan dan Kelautan.* 6(1) pp 51-67
[18] Yoshizawa, K and S Nogami 2008 Science Direct. 85(2008)1 pp 128-130
[19] Urbasa, F, F E Kaparang dan H J Kumajas 2015 *J. Science and Technology of Capture Fisheries* 2 pp 39-43
[20] Pernomo, W 2010 Electrical engineering major, FTI, Universitas Gunadarma. Margonda Raya.
[21] Haruna 2010 *J. Amanisal PSP FPIK Unpatti-Ambon* 1 pp 22 – 29
[22] Sudirman dan Achmar Mallawa 2004 Fishing Technique. Rineka Cipta, Jakarta.
[23] Gustaman, G, Fauziyah, dan Isnaini 2014 *J. Maspari,* 4(2004)1 pp 92-102
[24] Puspito, G, S Ahmad, and M Sururi 2017 Egyptian *J. Aquatic Research.* 43 pp 155-160