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The Effect of Light Color of Lamp on Bagan Tancap Catching Equipment on Catches in the Waters of Sadai Village South Bangka Regency

Pengaruh Cahaya Warna Lampu pada Alat Tangkap Bagan Tancap Terhadap Hasil Tangkapan di Perairan Desa Sadai Kabupaten Bangka Selatan

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Abstract

Fishermen in the waters of Sadai Village mostly use the Bagan tancap by catching using different colors of lights. The study aimed to determine the effect of light colors (white, red, yellow, green, and blue) on the Bagan tancap fishing gear on catches in the waters of Sadai Village, South Bangka Regency. This research was conducted on April 28 - May 28 2022 in the waters of Sadai Village, South Bangka Regency. The method used is an experimental method using a randomized block design (RBD) and Duncan's further test. The data collected includes the type of catch, the total weight of the catch, the number of catches, and environmental parameters. The results showed that the treatment of different light colors affected the number (fish) and weight (kg) of the catches on the Bagan tancap. The composition of the catch on the Bagan tancap for the species caught is squid (*Loligo* sp) and Curvespine cuttlefish (*Sepia recurvirostra*) which are the main catch (HTU) while Starry triggerfish (*Abalistes stellaris*), mackerel (*Rastrelliger brachysoma*), Yellowtail scad (*Atule mate*), and Doublewhip threadfin bream (*Nemipterus nematophorus*) are by-catch. Based on the results, it can be concluded that blue light is a good color for catches in the form of number (fish) and weight (kg) on the Bagan tancap fishing gear.

Keywords: Catch, Light Fishing, Light Color, Sadai Village

Abstrak

Nelayan di Perairan Desa Sadai sebagian besar menggunakan alat tangkap bagan tancap dengan melakukan penangkapan menggunakan warna lampu yang berbeda. Tujuan penelitian adalah untuk mengetahui pengaruh cahaya warna lampu (putih, merah, kuning, hijau dan biru) pada alat tangkap bagan tancap terhadap hasil tangkapan di perairan Desa Sadai Kabupaten Bangka Selatan. Penelitian ini dilaksanakan pada tanggal 28 April – 28 Mei 2022 di Perairan Desa Sadai Kabupaten Bangka Selatan. Metode yang digunakan adalah metode eksperimen dengan menggunakan Rancangan Acak Kelompok (RAK) dan uji lanjut Duncan. Data yang dihimpun meliputi jenis hasil tangkapan, bobot total hasil tangkapan, jumlah hasil tangkapan serta parameter lingkungan. Hasil penelitian menunjukkan bahwa perlakuan warna lampu yang berbeda memberikan pengaruh terhadap jumlah (ekor) dan berat (kg) hasil tangkapan bagan tancap. Komposisi hasil tangkapan bagan tancap spesies yang tertangkap adalah cumi-cumi (*Loligo Sp*) dan Sotong (*Sepia recurvirostra*) merupakan hasil tangkapan utama (HTU) sedangkan ikan Ayam-ayam (*Abalistes Stellaris*), kembung (*Rastrelliger brachysoma*), selar (*Atule mate*), dan kurisi (*Nemipterus nematophorus*)

merupakan hasil tangkapan sampingan. Berdasarkan hasil dapat disimpulkan bahwa lampu warna biru merupakan warna yang baik terhadap hasil tangkapan berupa jumlah (ekor) maupun berat (kg) pada alat tangkap bagan tancap.

Kata Kunci : Hasil Tangkapan, Bagan Tancap, Warna Lampu, Desa Sadai

1. Introduction

The Bangka Belitung Islands Province has an area of 65,301 km^2 (80%) and a coastline of 1,200 km. Under these conditions, this province certainly has a quite diverse and large number of fishery potentials. Geographically, the Bangka Belitung Islands Province is one of the provinces with an interest in managing capture fisheries in the Fisheries Management Area (WPP) 711 (Mario, 2018). The Bangka Belitung Islands Province consists of several regencies, one of which is South Bangka. South Bangka's six sub-districts have become fishing bases, namely Pongok Islands, Lepar Pongok, Tukak Sadai, Toboali, Pulau Besar, and Simpang Rimba.

The waters of Sadai Village have a total of 435 fishermen using Gillnet fishing gear 93 fishermen, Payang fishing gear 56 fishermen, Bubu fishing gear 87, Squid fishing gear 64 fishermen, Bagan Apung fishing gear 30 fishermen, longline fishing gear 47 fishermen, 58 fishermen from Pukat pantai fishing gear, and 30 fishermen from Bagan Tancap fishing gear. The catches on the Bagan tancap fishing gear are various species, namely squid (*Loligo* sp), Curvespine cuttlefish (*Sepia recurvirostra*), mackerel (*Rastrelliger brachysoma*), Yellowtail scad (*Atule mate*), and Doublewhip threadfin bream (*Nemipterus nematophorus*).

According to Sudirman & Palo (2013), Bagan is a type of fishing gear that belongs to lift nets as an aid in catching. The operation of the lift net fishing gear cannot be separated from fishing aids that use lights to attract fish and other species that are positively phototactic. Each Bagan tancap fisherman in each region certainly has differences in the use of the color of the lights used. Bagan tancap fishermen in Sadai village use white Phillips lamps. In the study of Isnaini (2012) white light has a striking comparison with other light treatments (blue, yellow, green, and red). However, based on the results of research conducted by Hilman (2021), shows the effect of the color of the lights on light fishing activities, the best catches are blue, compared to green, red, white, and yellow. So in this way, the authors conducted research in the waters of Sadai Village, South Bangka Regency with the title the effect of the light color lamp on the fishing gear of the Bagan tancap on Catches in the Waters of Sadai Village, South Bangka Regency. The purpose of this study was to determine the effect of the color of the light on the Bagan tancap fishing gear on catches in the waters of Sadai Village, South Bangka Regency.

2. Material and Method

2.1. Time and Place of Research

This research was conducted in the waters of Sadai Village from April 28 to May 28, 2022, which is located in Sadai Village, Tukak Sadai District, South Bangka Regency. The research location can be seen in Figure 1.

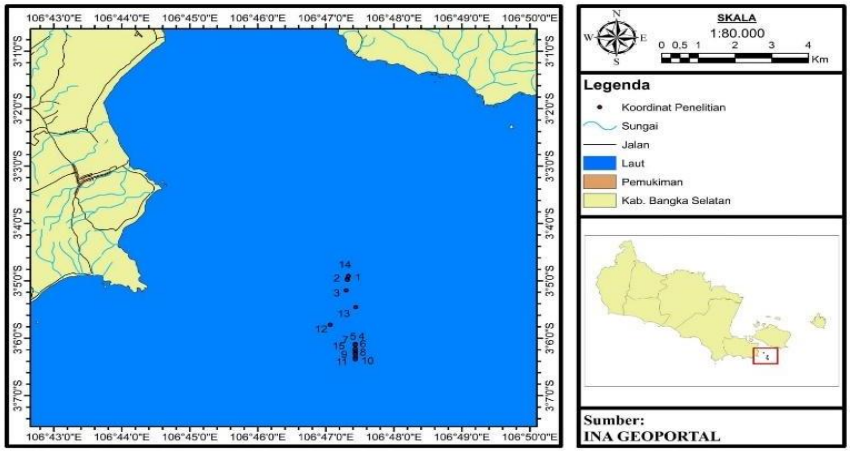

Figure 1. Map of Research Locations

2.2. Research Materials

The materials used in this study were the catches of Bagan tancap in the form of fish with high economic value (HTU) and fish with moderate or low economic value (HTS). The equipment used in this study included 15 units of step-by-line fishing gear. 3 Philips light bulbs, with white, yellow, blue, red, and green lights (50

watts each), fishing boat, thermometer, pH meter, measuring current speed (stopwatch, 1-meter rope, and Styrofoam foam), cameras, laptops, stationery, and scales.

2.3. Research Methods

The method used in this research is an experimental fishing method. According to Srigandono (1981), the experimental fishing method is a method that is planned to obtain new facts or strengthen or refute existing facts. The data taken in this study were obtained directly through field research. The method used to determine fishermen in sampling is purposive random sampling. Where the number of Bagan tancap fishermen is 30 fishermen (15 Bagan tancap hooks) which is the total Bagan tancap fishing gear that is still actively operating. So a total of 15 Bagan tancap were carried out for 7 repetitions using 5 treatments

This study used 15 Bagan with a net size of 20 x 20 m, a mesh size of 3/4 inches, and a distance between nets of ± 50 m. Each lamp on the net is placed in the center of the Bagan, totaling 3 light bulbs of 50 watts each, and the lights are coated with plastic with different colors, namely white (P), yellow (K), blue (B), red (M), and green (H). Each Bagan gets 5 colors of light treatment and is repeated 7 times. The treatment of changing the color of the lights in the Bagan tancap can be seen in the following Table 1.

Table 1. Randomization of light colors

Treatment	Repetitions						
	1	2	3	4	5	6	7
White	Bagan (1,6,11)	Bagan (5,10,15)	bagan (4,9,14)	Bagan (3,8,13)	Bagan (2,7,12)	Bagan (1,6,11)	Bagan (5,10,15)
Red	Bagan (2,7,12)	Bagan (1,6,11)	Bagan (5,10,15)	bagan (4,9,14)	Bagan (3,8,13)	Bagan (2,7,12)	Bagan (1,6,11)
Yellow	Bagan (3,8,13)	Bagan (2,7,12)	Bagan (1,6,11)	Bagan (5,10,15)	bagan (4,9,14)	Bagan (3,8,13)	Bagan (2,7,12)
Green	bagan (4,9,14)	Bagan (3,8,13)	Bagan (2,7,12)	Bagan (1,6,11)	Bagan (5,10,15)	bagan (4,9,14)	Bagan (3,8,13)
Blue	Bagan (5,10,15)	bagan (4,9,14)	Bagan (3,8,13)	Bagan (2,7,12)	Bagan (1,6,11)	Bagan (5,10,15)	bagan (4,9,14)

Each placement on the Bagan Tancap is done by randomizing the color of the lights sequentially using purposive random sampling. Meanwhile, for the collection of catches using the simple random sampling method, which stated that the simple random sampling method or simple random sampling by taking a sample of some fish equal to 10% of the total weight of the catch.

2.4. Research procedure

The work procedure for this Bagan tancap fishing gear research is as follows:

2.4.1. Operation of Fishing Gear

Setting. Things that need to be prepared before the departure of the motor boat to Bagan Tancap which is a fishing ground, preparations are made at 16.00 WIB. On departure, it takes ± 90 minutes to go to Bagan Tancap. Next, check generators, containers for catching nets, lights that will be used to catch nets, fuel supplies, and supplies while waiting for the catches in the nets.

Immersing. This research will be carried out during the night when at 18.00 - 05.00 WIB the nets begin to be lowered. During the process of lowering the net, it takes ± 15 minutes, the fish attention lamp starts to turn on. Hauling. At intervals of ± 2 hours, the nets were pulled using a roller. The time needed for withdrawal is only ± 15 minutes. The caught fish are lifted above the Bagan, then the catch is put into a box (hold) filled with ice. Then the net is lowered again to wait for the next operation.

2.4.2. Measurement of Environmental Parameters

Measurement of environmental parameters is carried out on each Bagan every time a fishing operation is carried out. Parameter measurements are carried out before hauling. Parameter measurements are carried out once a day in making arrests. Calculations of environmental parameters in this study include temperature, degree of acidity (pH), and current speed.

2.4.3. Collected Data

The data used are primary and secondary. The primary data obtained in this study included the total weight of fish/other species caught from each Bagan catch (kg), the type of catch in the form of other fish/species and bycatch (fish) and the number of catches in the form of fish/ other species (fish) as well as supporting data obtained in this study include pH, current velocity and temperature.

2.5. Data analysis

2.5.1. Catch Analysis

The data were processed using Microsoft Excel 2016 software and statistically analyzed through the F test (analysis of variance) to test the hypothesis about the effect of treatment on the diversity of experimental data. If there is a real effect, then to see the difference between treatments, continue with the Duncan test.

2.5.2. Catch Composition

To find out the composition of the catch using the formula stated by Odum et al. (1996) as follows.

$$KJ = \frac{ni}{N}$$

Description:

KJ = Composition of species caught (%)
ni = The number of individuals in one i-th species
N = The total number of individual species found

3. Result and Discussion

3.1. Composition of Captured Bagan Results with Different Light Colors

The fishing gear used by fishermen around the waters of Sadai Village generally catches fish that live in clusters. The composition of the catches by Bagan using different colors of lights in the waters of Sadai Village can be seen in Table 2.

Table 2. Composition of the number (fish) of the catches at Bagan Tancap using different colors of lights for 7 times catching

Catch Bagan Tancap	Treatment						Percentage (%)	Info
	White	Red	Yellow	Green	Blue	Total		
Loligo sp	225	214	242	122	460	1263	23,4	HTU
Sepia recurvirostra	177	158	238	117	409	1099	20,3	HTU
Atule mate	148	90	122	62	167	589	10,9	HTS
R.brachysoma	176	196	217	139	374	1102	20,4	HTS
N. nematophorus	205	177	215	126	320	1043	19,3	HTS
Abablistes stellaris	74	51	53	40	90	308	5,7	HTS
Total	1005	886	1087	606	1820	5404	100	
Average	168	148	181	101	303	900,67		

Description: HTU = Main Catch; HTS = Bycatch

Based on Table 2, the catch of the Bagan tancap from the overall light color treatment, the most caught was squid with a total catch of 1263 with a composition of 23.4% of the total catch. While the species with a small number of catches were Starry triggerfish with a total catch of 308 with a total catch composition of 5.7%. It is suspected that in the fishing process on the Bagan tancap, many fish or other species approach the lights intending to look for food, so the availability of food also determines the number of fish that gather. In the fishing process on the Bagan tancap, many fish approach the lights intending to find food, so the availability of food also determines the number of fish that gather.

Table 3. Weight composition (kg) of Bagan tancap catches using different light colors for 7 times of catching

Catch Bagan tancap	Treatment						Percentage (%)	Info
	White	Red	Yellow	Green	Blue	Total		
Loligo sp	28,2	26,7	30,3	15,3	57,5	158	17,5	HTU
Sepia recurvirostra	25,3	22,5	34	16,7	58,4	156,9	17,4	HTU
Atule mate	36,9	22,6	30,6	15,5	41,8	147,4	16,3	HTS
R.brachysoma	22	24,5	27,1	17,4	46,7	137,7	15,2	HTS
N.nematophorus	29,3	25,3	30,7	18	45,7	149	16,5	HTS
Abablistes stellaris	37,1	25,3	26,3	20,2	45,1	154	17,1	HTS
Total	178,8	146,9	179	103,1	295,2	903	100	
Average	29,80	24,48	29,83	17,18	49,20	150,50		

Description: HTU = Main Catch; HTS = Bycatch

Based on Table 3 the catches of the Bagan tancap show the weight composition (kg) of the catches of the Bagan tancap for 7 times of catching using 5 light color treatments for each Bagan tancap catch, namely squid, Curvespine cuttlefish, starry cuttlefish, mackerel, Double whip threadfin bream, and yellowtail scads. Squid and Curvespine cuttlefish are the main catches of Bagan tancap while the by-catch is mackerel, Doublewhip

threadfin bream, and Starry triggerfish. According to Mirnawati (2019) that the main catch (HTU) is the catch that is the main target of catching and has high economic value.

3.2 Catch Results Using Different Color Lights Based on Number (fish)

Based on the results of the analysis of variance, it was shown that the treatment of the color of the lights had a significant effect (P <0.05) on the average number (fish) of the catches on the Bagan tancap in the waters of Sadai village. The results of Duncan's further test showed that the color of white lights was not significantly different (P > 0.05) from red and yellow lights but significantly different (P < 0.05) from green and blue lights. Meanwhile, the red, yellow, green, and blue lights were significantly different (P <0.05). The highest mean catches were found in the treatment of blue light, namely 260 fish, then followed by the treatment of yellow light, namely 155 fish, then the treatment of white light, namely 144 fish, the treatment of red light color, namely 126 fish and the lowest was in the treatment of green light color. i.e. 87 fish. It can also be seen in Figure 2 as a diagram of the number (fish) of the catches of the Bagan tancap based on the type of fish in the blue light treatment.

Table 4. The average number (of fish) caught by Bagan tancap using different light colors

Treatment	Average (fish)
White	144^{bc}
Red	127^{b}
Yellow	155^{a}
Green	87^{c}
Blue	260^{d}

Description: Superscript with Different Lowercase Letters in the Same Column Shows Significantly Different (P < 0.05)

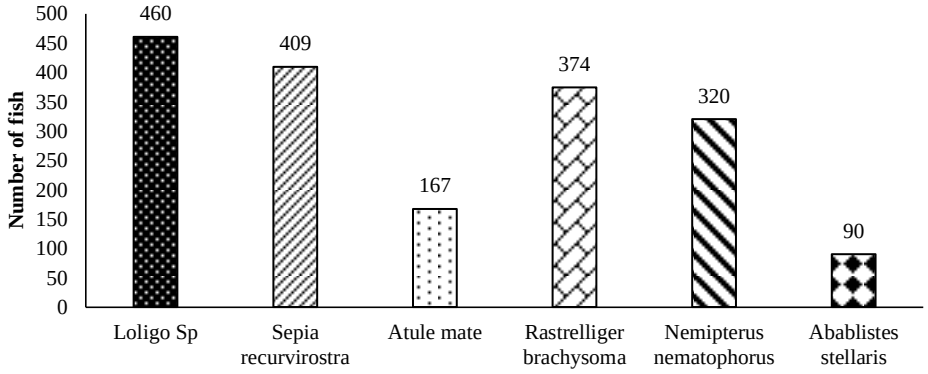

Figure 2. Diagram of the number (fish) of the catch of Bagan Tancap based on the type of fish in the blue light treatment

Based on Figure 2 it can be seen that the blue color is the largest catch based on the number (fish) caught on the Bagan tancap. This is because the blue color has a wavelength that is not too short and not too long and stable so that what is produced is more focused than the bias of other lights. This is what causes the catch to not spread too wide and gather right in the middle of the net. This follows Cahyadi & Wong (2017) who states that fish LED engineering to collect schooling fish has various wavelengths, namely white LEDs (565-600 nm), red (300-400 nm), and blue (465-500 nm) while according to Handoko & Fajariyanti, (2013) in yellow has a wavelength of 500-575 nm and green has a wavelength of 300-385 nm. It is this wavelength that affects the penetrating power in water so that it can be responded to by fish. This is following the research of Ishmah et al. (2015) that the shorter the wavelength, the lower the penetration into the waters.

3.3 Catch Results Using Different Light Colors Based on Weight (kg)

Based on the results of the analysis of variance, it was shown that the treatment of different light colors had a significant effect (P <0.05) on the total weight (kg) of the catches on the Bagan tancap. The results of Duncan's further test showed that the color of white light was not significantly different (P>0.05) from yellow but significantly different (P < 0.05) from red, green, and blue light. Meanwhile, the red, yellow, green and blue lights were significantly different (P <0.05). It can be seen from the average value of the catch that the highest catches showed in the treatment of blue light 42.17 kg, followed by yellow light 25.57 kg, the color of the white light was 25.54 kg/day, the color of the red light was 20.99 kg and the average catch was the lowest on the Bagan tancap, which was the color of the green light which was 14.73 kg. It can also be seen in Figure 3 as a diagram of the number (fish) of the catches of the Bagan tancap based on the type of fish in the blue light treatment.

Table 5. Mean weight (kg) of catches of Bagan tancap using different light colors

Treatment	Average (kg)
White	25,54[a]
Red	20,99[b]
Yellow	25,57[a]
Green	14,73[c]
Blue	42,17[d]

Description: Superscript with Different Lowercase Letters in the Same Column Shows Significantly Different (P < 0.05)

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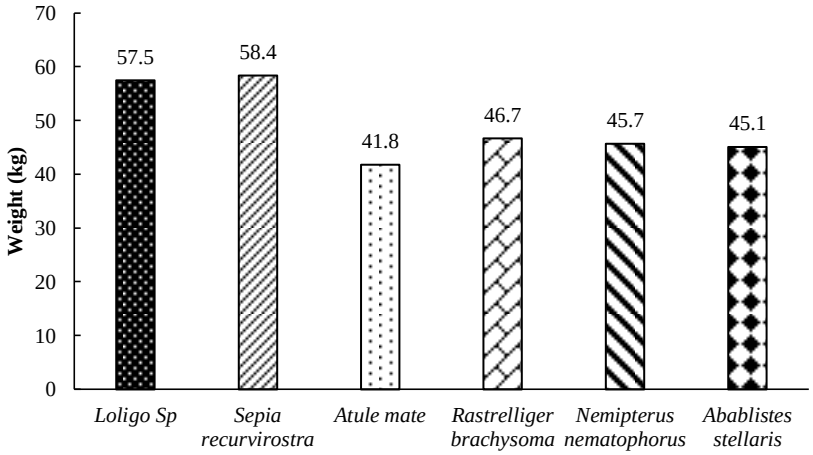

Figure 3. Diagram of weight (kg) of Bagan tancap catches by type of fish in blue light treatment

Based on Figure 3 it can be seen that the blue color is the highest catch weight. the same as in the previous diagram the highest number and weight of the catch was found in the treatment of the blue light color. This is following the opinion of Rahmad (2019) that the greater the number of catches, the greater the weight of the catch. This is also supported by the opinion of Sari (2017) that in the total weight of catches in Panceng waters, Gresik Regency uses the blue light the most, followed by the yellow light, then the white light, and the lowest is the red light.

3.4 Water Quality Parameters

Water quality parameters are needed to show the quality of water in a body of water where this quality will affect the presence or number of biota so that these environmental parameters can affect the success of catching fish in water. Water quality parameters are divided into two, namely physical factors which include water temperature, current velocity, and chemical parameters which include the pH of the waters in Sadai Waters Village during the research process. Based on the results of water quality parameter measurements carried out, the following results were obtained.

Table 6. Results of environmental parameter measurements

Parameter	Repetitions						
	1	2	3	4	5	6	7
Temperature	29,3 - 29,7	29,3 - 29,8	29,4 - 29,7	29,3 - 29,8	29,3 - 29,8	29,4 - 29,7	29,4 - 29,7
pH	7,7 - 8	7,8 – 8	7,7 – 7,9	7,7 - 8	7,7 - 8	7,7 - 8	7,7 – 7,9
Current speed	0,05 - 0,09	0,05 - 0,1	0,05 - 0,1	0,05 - 0,1	0,05 - 0,1	0,05 - 0,09	0,05 - 0,09

Based on Table 6, it can be seen that the water temperature in Sadai Village in the first repetition obtained an average temperature of 29.5^{o}C ranging from 29.3-29.7^{o}C, then the second repetition obtained an average temperature of 29.5^{o}C ranging from 29.3-29.8^{o}C, the third replicate obtained an average temperature of 29.5^{o}C ranging from 29.4-29.7 ^{o}C, the fourth repetition obtained an average temperature of 29.5 ^{o}C ranging from 29.3-29.8^{o}C, on the fifth repetition obtained an average temperature of 29.5 ^{o}C ranging from between 29.3-29.8^{o}C, the sixth repetition got an average temperature of 29.5^{o}C ranging from 29.4-29.7 ^{o}C and the seventh replicate got an average temperature of 29.5 ^{o}C ranging from 29.4-29.7 ^{o}C. This means that the temperature of the waters of Sadai Village which was measured during the research process was categorized as good for the sustainability of the fish in it. Purwati et al. (2020) states that the water temperature on the South Bangka Coast ranges from 29.20-30.32 ^{o}C. This is also supported by the Decree of the Minister of State for Population and Environment No. Kep51/MENKLH/1988 this temperature is still normal for marine life, good temperature for fish life in the tropics ranges from 25-32 ^{o}C.

The results of pH measurements in the waters of Sadai Village obtained an average pH in the first repetition of 7.9 ranging from pH 7.7-8, then the second repetition of 7.9 ranging from pH 7.8-8, the third repetition of 7.9 ranging from between pH 7.7-7.9, the fourth replicate was 7.9 ranging from pH 7.7-8, the fifth replicate was 7.9 ranging from pH 7.7-8, the sixth replicate was 7.9 ranging from pH 7.7–8 and the seventh repetition of 7.9 ranging from pH 7.7 to 7.9. This means that the pH is still categorized as ideal for the survival of fish and allows fish to adapt well. According to the 2004 Decree of the State Minister for the Environment concerning seawater quality standards for marine biota, the pH for marine biota ranges from 7-8.5. This is also supported by the opinion of Andria & Rahmaningsih (2018) stating that the degree of acidity greatly determines the quality of water because it helps the chemical processes of water.

Likewise, for the results of measuring the current speed in the waters of Sadai Village, the average current speed in the first repetition was 0.07 m/s ranging from 0.05-0.09 m/s, then the second repetition was 0.07 m/s ranging from between 0.05-0.1 m/s, the third repetition of 0.07 m/s ranging from 0.05-0.1 m/s on the fourth repetition of 0.08 m/s ranging from 0.05-0 .1 m/s, the fifth repetition of 0.08 m/s ranged from 0.05-0.01 m/s, the sixth repetition of 0.07 m/s ranged from 0.05-0.09 m/s and seventh repetition of 0.07 m/s ranging from 0.05-0.09 m/s. So the current speed in the waters of Sadai Village is the slow current category. This is supported by the opinion of Sari & Usman (2012) that current speed can be divided into 4 categories namely the current speed of 0-0.25 m/s which is called slow current, current speed of 0.25-0.50 m/s which is called moderate current, slow current speed a current of 0.50-1 m/s is called a very fast current. The opinion of Rosalina et al. (2018) who carried out research in South Bangka waters related to environmental parameters. The current speed range in South Bangka waters is 0.05-0.4 m/s.

4. Conclusion

Based on the results of the study, it can be concluded that the composition of the catch on the Bagan tancap of species caught was squid and Curvespine cuttlefish which were the main catch (HTU), while yellowtail scad, mackerel, Curvespine cuttlefish, and Doublewhip threadfin bream were by-catch (bycatch). The color of the light which is good for the catch in the form of number (fish) and weight (kg) in the Bagan tancap fishing gear using a different light color is blue compared to the white (control), red, yellow, and green light colors.

5. Suggestion

Based on the research that has been carried out, the researchers suggest that Bagan tancap fishermen in the waters of Sadai Village use a different color of light, namely the color blue light to get optimal catches of Bagan tancap.

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