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Design Of a Semi-Automatic Hand Line (Hand Line) For Semi-Automatic Squid in Wangi-Wangi Selatan Sub-District, Wakatobi District

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Abstract **The amount of energy drained on fishermen when catching and using traditional squid fishing gear takes a long time, affecting fishermen's income. This research aims to design a semi-automatic squid fishing rod and determine the efficiency of using the new design of semi-automatic squid fishing gear. This research was conducted in the South Wangi-Wangi District, Wakatobi Regency, Southeast Sulawesi Province, from December 2023 to January 2024. The research method used was experimental fishing, which was used to design a semi-automatic fishing rod to know the effect of using semi-automatic fishing gear on catches. The construction of the semi-automatic squid fishing rod is by the planned design and is technically feasible to use. The productivity of the research shows that from the weight of the semi-automatic squid fishing rod catch of 36.02 kg, the number of 459 tails during 16 trips. The catch of traditional squid long line with a total weight of 34.76 kg and 511 tails during 16 trips. The results of statistical tests using t-test analysis show a difference that does not significantly affect the results of both fishing gears.**

Keywords—Semi-automatic Squid Reel Fishing Rod, Design and Build.

I. INTRODUCTION

Wakatobi Regency is where most people fulfill their needs from fishery resources. The capture fisheries sector is essential in meeting the needs of the Wakatobi community.

Based on data from the Wakatobi Regency Marine and Fisheries Service (DKP) (2022), Wakatobi Regency fisheries production, one of which comes from the capture fisheries sector, is 18,855 tons per year. One of the commodities derived from capture fisheries in Wakatobi Regency is jawak squid (Loligo SP). Squid production in Wakatobi Regency is 302,882 kg/year (DKP Wakatobi 2021) and 118,151 kg/year (DKP Wakatobi 2022).

The fishing gear commonly used by Wakatobi fishermen to catch squid is a squid hand line. Squid hand line is a traditional fishing gear that is widely used by fishermen; it is technically easy to operate and does not require much cost (Sadhori 1985); according to (Karyanto K.2022), the components of traditional squid hand line fishing gear consist of reels, ris ropes, fishing eyes. According to Bagaskara (2020), squid fishing rods have different shapes and constructions from other fishing rods. Fishermen conduct squid fishing operations around the coast at night using flashlights as a tool (Baskoro 2018). According to (Aras M 2016), The existence of squid is at a depth of three to ten meters.

To increase squid catch during hauling, which is done manually, the traditional handline fishing gear is developed by adding technology to the traditional fishing gear. Automatic squid fishing gear was first developed in Japan (Puspito, 2009). It is expected that with the addition of technology to traditional squid fishing gear, squid released from the fishing line during hauling can be significantly reduced, impacting catch and making it more optimal.

Semi-automatic squid, fishing gear design, is also expected to be more effective than traditional fishing gear commonly used by Wakatobi fishermen because the withdrawal of squid fishing gear will be more constant than human labor. In addition, this technology is also expected to increase efficiency in using the number of fishermen.

The development of fishing gear in this study is needed because it aims to make it easier for fishermen to operate squid fishing. Before developing the squid fishing gear, the first step is to identify the fishing gear used by fishermen, make a semi-automatic squid fishing gear design, review the catch of fishermen without using tools, design fishing gear, conduct experiments on fishing gear that will be built, then compare the catch of squid using tools and not using tools. Assessment of the catch of fishermen using traditional squid fishing gear needs to be done by comparing the number of catches of fishermen using traditional fishing gear with the number of catches using semi-automatic squid fishing gear. Sedarmayanti (2014) states that the effectiveness of capture is related to achieving maximum work, meaning that the achievement of targets is related to the quality of the catch.

The research results are expected to be a source of information for fishermen of Wakatobi Regency

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regarding the use of semi-automatic fishing lines to increase catches. This research is also expected to be a reference and provide further information on the use of semi-automatic fishing rods and information for the Wakatobi Fisheries Service in the development of squid fisheries in the Wakatobi Regency.

As fishing gear is used daily in the squid fishing business, the fishing gear must be developed because this will impact fishermen. Problems in fishermen, such as squid escapes during fishing operations, the amount of energy drained on fishermen when catching, and the use of traditional squid fishing gear taking a long time, will affect fishermen's income.

This research was conducted on a laboratory scale. Until now, no research has been carried out on the design of squid fishing rods. Therefore, it is necessary to design a squid fishing rod to develop traditional fishing gear fishermen use in squid fishing areas.

The research was conducted with the aim of designing a semi-automatic squid fishing rod. Assess the level of effectiveness and efficiency of using the new design of semi-automatic squid fishing gear during haulling.

II. METHOD

A. Research Methods

The research method used in the first objective is experimental fishing. This experimental research tries to design a semi-automatic fishing rod to determine the effect of using semi-automatic fishing gear on catches.

The research method used in the second objective is descriptive analysis. To determine the income of squid by using traditional squid fishing gear and semi-automatic fishing gear. The goal is to see how semi-automatic fishing gear affects catches.

B. Data Processing

The type of data to be collected is primary data obtained from field observations and interviews. The type of data to be collected is in the form of traditional handline materials used: the conventional squid catches handline and the catch of semi-automatic handline fishing gear and comparing the level of effectiveness of traditional handline fishing gear and semi-automatic handline fishing gear when hauling.

C. Designing a Semi-Automatic Squid Reel Fishing Rod. Automatic.

This study for the manufacture of semi-automatic fishing gear using experimental methods is to see the effect of stability when hauling with the addition of technological tools on manual fishing gear commonly used by squid fishermen in Wakatobi Regency.

Assessing the Level of Effectiveness and Efficiency Using the New Design of Semi-Automatic Squid Fishing Gear During Hauling

In this study, the experimental design used was a complete randomized design (CRD) to answer objective two. The complete randomized design (CRD) is a design that is randomized throughout the experiment and has equal opportunities in each treatment, as in (Table 4). Furthermore, to determine the number of repetitions, the formula of Federer (1963) was used, namely, Data Analysis

Catch Yield

The data analysis used to determine the catch of semi-automatic and traditional longlines is descriptive analysis. This descriptive analysis uses one or more variables but is independent. Therefore, this analysis is not in the form of a comparison or relationship (Nasution 2017). Istijanto (2009) also explains that descriptive analysis transforms data to make it easier to understand. Catch data will be made into a percentage with the following formula:

$$\text{PERCENTAGE OF CATCH} = \frac{\text{SPECIES} - \text{SPECIFIC CATCH WEIGHT}}{\text{TOTAL WEIGHT OF CATCH}} \text{ x } 100$$

The processed data will be presented in the form of tables and diagrams. Furthermore, the data is analyzed descriptively by the subject matter.

Normality Test

The normality test is used to determine whether the data is normally distributed or not. According to Ghozali (2011), if the data population is too small, there is only an alternative non-parametric statistical test if the population distribution is known. In this study, data on the number of catches of semi-automatic and traditional squid longlines were tested using SPSS software to determine the normality of data distribution. Furthermore, if the data obtained is usually distributed, the t-test will be conducted, but the Mann-Whitney test will be performed if the data received is not normally distributed.

Homogeneity

The Homogeneity Test aims to determine whether the nature of the data to be tested is homogeneous and not because the t-test requires that the data must be homogeneous. Sianturi R. (2022) Homogeneity test is a statistical test procedure that aims to show that two or more groups of data samples are taken from populations with the same variance.

T-test

Montolalu (2018) explains that the T-test is one of the hypothesis testing methods where the data used are paired. The most often encountered characteristic is that one individual (research object) gets two treatments. In this study, namely semi-automatic hand line fishing line and traditional hand line fishing line.

III. RESULTS AND DISCUSSION

A. General Situation

The research location was on the southern island of Wangi-Wangi, precisely in the waters of Matahora Village, South Wangi-Wangi Sub-district. Based on the observations, there are coral areas in the south of Wangi-Wangi Island and Atolls at that location. The two looks described are all used as fishing locations for squid fishermen. This type of squid is a fishing destination for fishermen because the price is relatively high, so it is widely hunted by fishermen (Norman, 2003).

In this study, which was conducted for 20 trips using only one boat, squid fishing was carried out using two different fishing gear: traditional longline fishing gear and semi-automatic squid fishing gear. Both fishing gears will be operated simultaneously.

B. Squid Fishing Rod Design.

- Demonstration of Conventional Longline Fishing Gear

Squid fishing gear has a construction similar to a fishing rod in general, but several parts are specially made to increase catches. The parts of the traditional squid fishing gear used by fishermen are roll strings, all strings, spotlights, fish bait, and fishing eyes that are put together with weights; some separate the weights from the fishing eyes.

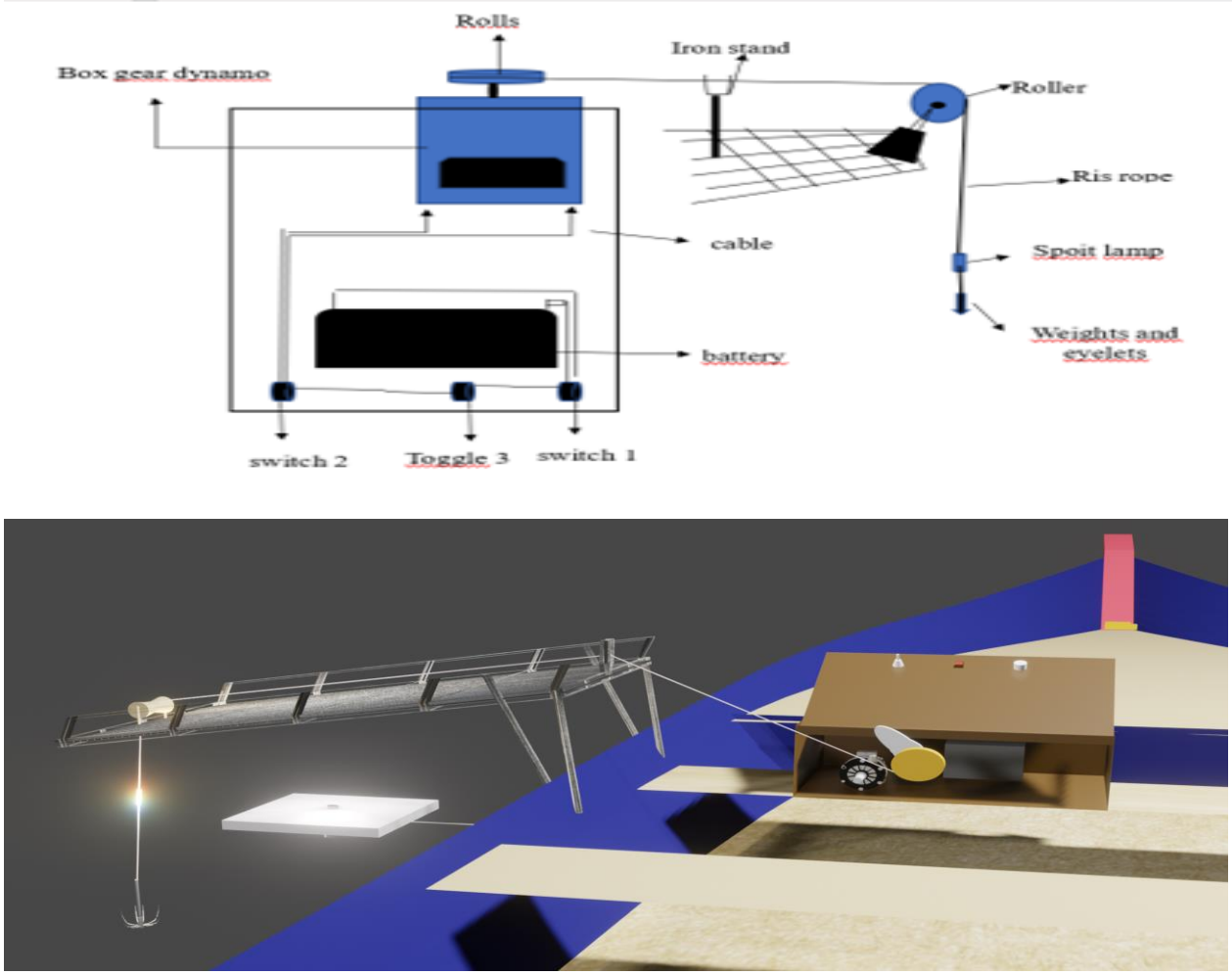

Figure 1: design of semi-automatic squid reel fishing rod

The community in Wakatobi Regency, Matahora Village, is dominated by people who make a living as fishermen. Some fishermen in Matahora Village depend on capture fisheries, with the magnitude of the existing fishery potential, the community utilizes it as a source of income; one of the capture fisheries utilized is squid fishing.

Traditional squid reel fishing gear is a fishing gear used by fishing communities in Matahora Village, South Wangi-Wangi District, Wakatobi Regency. A squid reel fishing rod is one of the squid-catching tools that can be classified as a fishing rod that is usually specifically used to see various types of squid (Ernaningsi et al., 2022). The catching of squid (Loligo sp.) in other areas is also partly carried out with various fishing gears, namely payang, beach seine, bagan tancap, boat chart, trap, and purse seine (Antika et al., 2014).

To operate traditional squid fishing gear, the fishermen will first make preparations or check the tools used when going to sea. Then, check the boat (Bodi) that will be used because the squid fishing location is around 6-10 miles from the coast by boat the use squid fishing rods first by installing bait on the fishing line and then extending the fishing rod rope at a depth of 3-7 fathoms or 4-10 meters, the limit of extending the fishing rod rope is adjusted to the level of presence of squid around the Bagan, then after squid eats the bait then immediately withdraw, the squid that has been caught will be immediately put into the box. The reel of string used has a diameter of 10 cm so that it is easy for fishermen to grasp.

Squid fishing conducted by fishermen also uses attractor lights. An attractor lamp is a tool to collect squid to be around the boat when conducting fishing operations (Jayanto et al., 2016) while researching began tancap in developing squid catches.

C. Squid Reel Fishing Gear Demonstration Semi-Automatic

- Procedure for Making Semi-Automatic Squid Reel Fishing Gear Machine

Making a semi-automatic squid reel fishing machine takes a long process. Before entering the process of making a semi-automatic squid reel fishing gear, manufacturing certainly goes through stages. The concept and prototype stages of the engine design, as well as the features that will be embedded in the manufacture of semi-automatic fishing gear. This is all done carefully so that the resulting tool can work optimally.

The design of a semi-automatic squid hand line has several components, namely batteries, gearbox dynamos, switches, toggle 3, cables, fishing reels, ris ropes, fishing rollers, swivels, and squid jigs with several components that have been prepared; the manufacture of semi-automatic hand line fishing gear will be carried out.

The stages of the process of making a semi-automatic squid fishing rod are:

1. Making semi-automatic squid fishing rods, namely by preparing the materials to be used such as batteries 113 mm long and 70 mm wide, switches with a length of 3cm wide, 1.8cm thick 1cm, toggle 3 has dimensions 29 mm long 16 mm wide 19 mm high Body 27 mm and high body switch has a size of 3cm 1.8 cm thick 1cm, voltage strength 12 volts.
2. Assembly on materials that have been prepared: 1. the battery will be connected to the switch on which this battery serves to drain electricity to all components; 2. Then, the switch will connect the voltage cable to the toggle 3; this switch serves as a system of activating all tool components. 3. Toggle 3 will disclose the flow to the switch; the toggle functions as a fishing gear management system when lowering and pulling the fishing line; 4. After that, the switch will channel electricity to the dynamo gearbox; this switch also functions when withdrawing or lowering. It will enter the next stage after successfully assembling the fishing gear components.
3. Making a semi-automatic screw fishing machine box. This is made of wood and acrylic boards; wood and acrylic boards will be cut according to the needs of the fishing gear that has been assembled; the shape of the engine box is rectangular, with a size of 38 cm and a height of 25 cm, the components of this material are made so as not to rust when exposed to seawater, this tool is made according to the boat that will be used when carrying out squid fishing operations.
4. Squid beds as a tool: Squid beds are made with a design that sticks out of the boat; this tool is made of round iron and iron expanded; this is used to anticipate squid that is usually released when it is above sea level and makes it easier to take squid catches.

3.3 Effectiveness of the New Design of Squid Fishing Gear Semi-Automatic

3.3.1 Composition of Catches

Fishermen in Matahora Village have various fishing businesses; some fishermen focus on catching squid (Loligo sp.), while fishermen who catch squid do not have bycatch because the fishing gear used is specifically for catching squid.

Squid is the main catch of fishermen because the sales value of squid is relatively high. Nuzul, Fadhlan (2015). Good squid catches are of great economic value (Kurniawan, K., 2012).

3.3.2 Catches of Traditional Line Fishing

Based on the results of research conducted with 16 trips, the results of fishing using traditional methods can be seen in Figure 2.

The presentation of the catch of traditional fishing gear during the research in Matahora village amounted to 511 fish in 16 trips with an average of 31 fish or with a total weight of 34.76 kg with an average amount of 2.17 kg/trip. The highest production during operation in squid fishing using traditional fishing gear reached 35 tails weighing 2.57 kg for 16 visits.

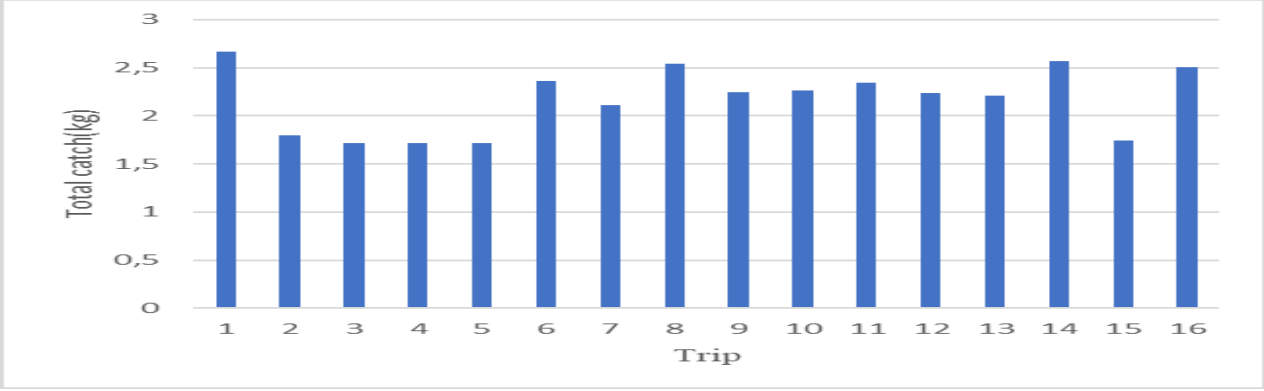

Figure 2. Catch of Traditional Squid Longline Fishing Gear

3.3.3 Catch Results of Semi-automatic Squid Reel Fishing Line

Based on the research results conducted with 16 trips, the total catch using traditional and semi-automatic methods can be seen in Figure 3.

The presentation of the results of the catch using semi-automatic squid fishing gear reached 459 tails in 16 trips with an average of 28 tails or with a total weight of 36.02 kg with an average of 2.25 kg/trip and the highest production during operation in squid fishing using semi-automatic squid fishing gear 47 tails weighing 3.32 kg for 16 visits.

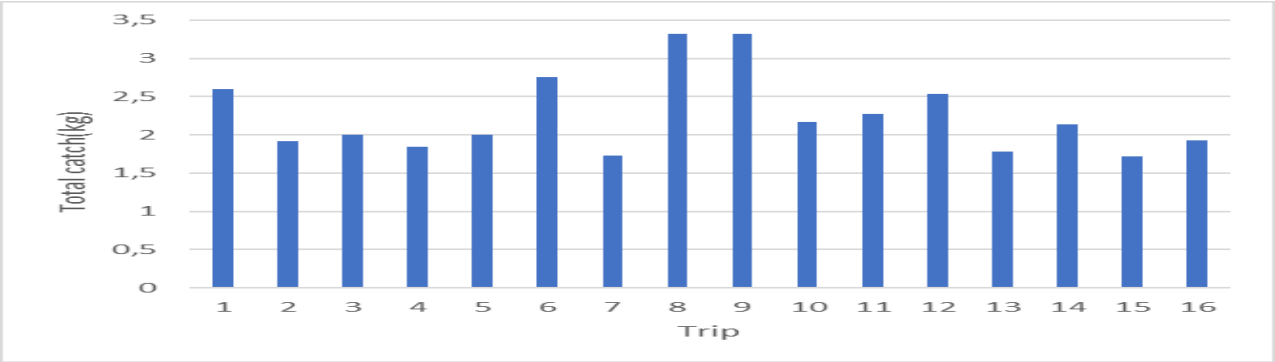

Figure 3. total catch of semi-automatic squid reel fishing gear

3.4. Catch Comparison

Based on the results of the comparison of research conducted with a total of 16 trips between the results of fishing using the traditional squid reel fishing method and semi-automatic squid reel fishing can be seen in Figure 4.

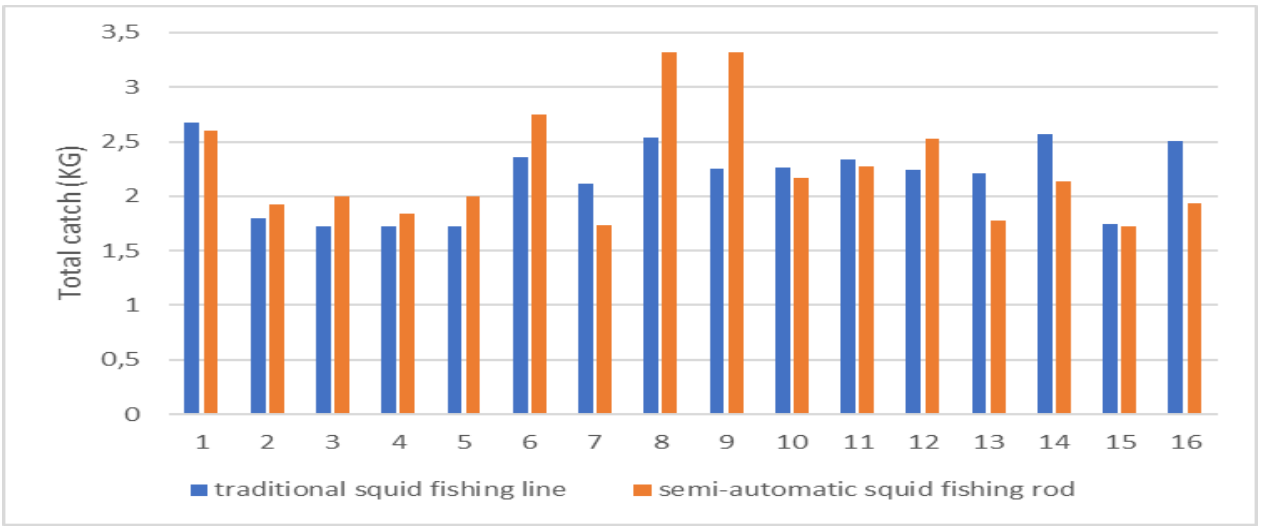

Figure 4. total catch of traditional and semi-automatic squid longline gear

Squid (Loligo sp) caught on both fishing gear has varying amounts of catch. The catch of semi-automatic squid longlines only sometimes has more results; this shows that semi-automatic squid longlines only sometimes get superior results than traditional squid longline fishing gear.

The operation of squid longline fishing gear is very influential with weather factors and fishing areas so that it affects the catch of squid so that the fishing gear used is less effective when catching, such as waves and currents, this will affect the presence of boats at the point of capture location that is along with moving from the fishing location. Another thing that affects the catch according to Mulyawan (2015), The condition of the entire squid affects the catch because the response of the whole squid will be slow to grab the fishing line. This is in line with the opinion expressed by Barnes (1987) that squid actively search for food at night after dusk, and squid are more at the bottom of the water during the day. Squid fishing was conducted from October to April. Febrianto et al. (2017) said that the squid fishing season greatly influences catch production in certain months, so by knowing the squid fishing season, the timing of fishing can be done more effectively and efficiently. Squid fishing activities are predominantly conducted in the northeastern waters or ship crossing areas. In addition to the presence of squid resources and the wind season factor, the fishing location away from the open ocean is thought to be influenced by competition with other fishermen.

3.4.1 Effectiveness Test (Catch Difference Test Using Statistical Analysis)

Testing the effectiveness of traditional squid fishing gear with semi-automatic squid fishing gear is using the t-test. The tests carried out first before conducting the t-test are 1) the normality test and 2) the homogeneity test.

The normality test determines whether the data will follow a normally distributed form (Wiratna 2014). Based on the normality test calculation results, the catch

data from both fishing gear spread commonly. Based on the test results, a significant value of more than 0.05 means that the data usually spreads. One of the requirements for the t-test is done the data must be expected.

The Homogeneity Test aims to determine the nature of the data to be tested, whether it is homogeneous or not (Usmadi, U 2020) because the t-test requires the data to be homogeneous. Based on the homogeneity test calculation results, the significant value is greater than 0.05. This value indicates that the two fishing gears' catch data are homogeneous.

The T-test aims to determine whether the catch data from traditional and semi-automatic squid reel fishing gear significantly differs between the two fishing gears. Krisanti, M. A. (2019). To test a hypothesis, it is necessary to conduct a statistical test, namely the independent sample t-test, with the object being analyzed is the catch between the two-fishing gear used. From the results obtained using the Ttest test, the result is 0.614, which means that the analyzed data does not have a significant difference.

IV. CONCLUSION

Based on the results of data processing and analysis, the following conclusions are obtained:

1) The construction of the semi-automatic squid fishing rod has been made is to the planned design and is technically feasible.
2) The productivity of the research shows that the weight of the catch of semi-automatic squid fishing gear is 36.02, with an average of 2.25 kg/trip. Total 459 tails for 16 visits with an average of 28 tails/trip. The catch of traditional squid fishing gear with a total weight of 34.76 kg with an average of 2.17 kg/trip with a total of 511 tails during 16 visits with an average of 31 tails. Based on the results of statistical tests using t-test analysis, a difference does not significantly affect the results of the two fishing gear.

Suggestions

1) Making semi-automatic squid fishing rods in further research requires adjusting the speed in dynamo playback so that squid fishing is more efficient and constant because squid fishing is uneven in size.

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