OPEN ACCESS International Journal of Applied Biology



ISSN : 2580-2410
eISSN : 2580-2119

# The Productivity of Gillnet Mesh Size as A Substitute for *Cantrang* in Tamasaju Village, North Galesong District, Takalar Regency

**Abdalia[1], Sri Suro Adhawati[1], Najamuddin[1], Sutinah[1], Aris Baso[1], Hamzah[1]**

[1] Study Program of Fisheries Science, Faculty of Marine Science and Fisheries, Hasanuddin University, Makassar

## Abstract

The objective of this research was to determine the efficiency and productivity of gillnet mesh size in North Galesong District, Takalar Regency. The type of research was survey research with a quantitative descriptive approach to obtain a sample from a population that describes or explains catch production, productivity, and efficiency of gillnet fishing gear. The population of this research was 40 *cantrang* fishermen who switch to using gillnet fishing gear in North Galesong District. The sample was all *cantrang* fishermen who switched to gillnet fishing gear. The sampling method employed in this study was a census sampling strategy, where all members of the population were used as samples. The methods of data collection were questionnaires, observations, and interviews. The results showed that the most efficient gillnet mesh size of the five mesh sizes 1 inch, 1.5 inch, 2 inch, 2.5 inch and 6 inch is the 1.5 inch mesh size with a value of 3.90. The results of the calculation of the productivity of gillnet fishermen in each mesh size has a different value. The highest gillnet productivity was at 1 inch mesh size with a value of 44.40kg/trip, then the lowest productivity was at 2.5 inch mesh size, which was 24.39 kg/trip.

**Article History**
Received November 3, 2022
Accepted December 14, 2022

**Keyword**
Gillnet;
*Cantrang*;
Productivity;
Efficiency;
Production

## Introduction

Cantrang is a fishing equipment that operates close to the water's bottom. When using a cantrang, the rope is spread out in a circle, the *cantrang* net is lowered, and finally the rope's two ends are brought together. The two ends of the rope are pulled towards the ship until all parts of the net bag are lifted (Luhur, 2018). The use of *cantrang* fishing gear can damage the environment by not paying attention to environmental aspects and causing conflicts between traditional fishermen and machine fishermen (Rawaeni, 2017).

The Minister of Marine Affairs and Fisheries on January 9 2015, has promulgated Ministerial Regulation Number: 2/PERMEN/KP/2015. The regulation stated that the use of trawls and seine nets is prohibited in the Fisheries Management Area of the Republic of Indonesia due to the fact that their usage on Indonesian territory has led to a decline in fish resources and jeopardized their environmental sustainability. (Permen KP No. 2/2015)

CONTACT : ABDALIA liaabda03@gmail.com

For fishermen, regulations prohibiting the use of *cantrang* fishing gear can cause turmoil for fishermen, because *cantrang* is a tool that fishermen use every day. When *cantrang* is prohibited, fishermen will be concerned and worried about the work they are experiencing (Zulbainarni et al., 2016). Therefore, in order to survive, fisherman must alter their equipment or convert to non-prohibited, environmentally acceptable equipment (Adhawati, et all, 2017).

North Galesong District is an area that has had a significant impact from the ban on *cantrang* fishing gear. The impact of the ban has caused fishermen to switch to fishing gear that is more environmentally friendly and not banned, namely gill nets. Gillnet is a fishing gear that has a general rectangular shape with tool parts consisting of main net, top rigging rope, bottom rigging rope, and towing ropes.

The gill nets used by fishermen have several types of different mesh sizes. The size of the mesh used by fishermen consists of 5 types of mesh sizes, namely 1 inch, 1.5 inch, 2 inch, 2.5 inch and 6 inch. Research on the productivity of gill net mesh sizes in North Galesong District, Takalar Regency is required so that a variety of mesh sizes can be used as an alternative to *cantrang* fishing gear.

## Materials and Methods

### Research Location and Time

The research was conducted in North Galesong District, Takalar Regency which was carried out from September to October 2021. The choice of the research site was made purposively, taking into account that fishermen in the area had previously relied on *cantrang* fishing gear but have since switched to Gillnet fishing gear, which is more environmentally friendly.

### Data Collection

The data collection technique used in this research is direct observation by obtaining basic data sourced from respondents in the form of fishermen's activities in Takalar Regency and interviews to obtain clearer information regarding research problems. The population of this research was all *cantrang* fishermen who switch to using gillnet fishing gear in North Galesong District. In the North Galesong District, the most users of fishing gear are located in Tamasaju Village and Aeng Batu-Batu Village. The total population of gillnet fishermen in North Galesong District is 40 people. According to Arikunto (2014), if the number of a population is less than 100 people, then the number of samples taken is entirely, but if the total population is more than one hundred, then the sample taken is 10-15% or 20-25% of the total population. Based on these considerations, the sample taken in this study was 100% of the total population of gillnet fishermen, namely 40 respondents. Thus, the sampling technique used in this study was a saturated sampling technique (census), where all members of the population are used as samples (Sugiyono, 2014)

### Types of Research

The research type was survey research using a quantitative descriptive approach to obtain a sample from a population that describes or explains the catch production, income, efficiency, and productivity of gillnet fishermen.

## Data Types and Sources of Data

There were two data used in this study, namely primary data and secondary data. Primary data is data obtained from interviews with respondents based on questionnaires that have been made, including respondents' identities, catches, costs used, length of nets, selling prices, and number of gillnet fishermen's trips. While secondary data is data obtained from institutions or agencies related to research problems.

## Data Collection Methods

The data collection methods used in this study were observation, interviews, and library research. The method of observation or direct observation is a data collection method that obtains basic data sourced from respondents in the form of fishing activities in the North Galesong District. Interview is a method used to obtain clear information in relation to research problems. While the library research is a collection of data obtained by reading literature or research results that are relevant to the research theme.

## Data Analysis

The data analysis used in this study consisted of several analytical methods in order to achieve the desired results. The data analysis method used is as follow:

a. Efficiency and economic feasibility of gillnets

To answer the first point, descriptive analysis of comparative percentage is used with a sematic differential measurement scale approach by Osgood. The assessment criteria use 5 economic indicators (Mallawa 2016 and Adhawati 2018), which include: annual production (X1), annual cost (X2), annual revenue (X3), annual income (X4), net length (X5).

In the assessment of all criteria in an integrated manner, standardization of values is carried out. Value standardization can be done by using the scoring method. The scoring method in the scoring method starts from the lowest to the highest score (Iskandar Dahri and Ade Guntur, 2014). Standardization with value functions can be done using the following equation (Mangkusubroto & Trisandi, 1985; Najamuddin et al, 2017):

$$V(x) = \frac{X - X_0}{X1 - X_0}$$

$V(A) = \sum V_i\ (X_i)$ untuk i = 1.2.3. ……., n

Where:

V (x) = The best function of the variable X
X = Variable X
X1 = The best value of criteria X
$X_0$ = The worst value of criteria X X
V (A) = Value function of alternative A
Vi (Xi) = The value function of the alternative on the -i criterion

The order of priority starts from the highest value to the lowest value. By using the value function, the priority order is set in order from the alternative with the highest function value to the alternative with the lowest function value.

b. Productivity of gillnet mesh size

To determine the productivity of gillnet mesh size, the measurement of gill net productivity includes productivity per unit of fishing gear and per trip, using the following formula (Cholik, 1994):

$$\text{Productivity} = \frac{\sum NProduction\ value}{\sum Total\ Cost} \left(\frac{Rp}{trip}\right)$$

## Results and Discussion

### Gillnets

Gill nets are rectangular nets with the same mesh size in all parts of the net. The length of the net is longer than the width or height of the net and the top of the net has a buoy and the bottom has a ballast (Mallawa, 2012).

### Fishing Equipment Operation Method

The catching process was carried out at 05.30 and at 18.00 Central Indonesian Time to the fishing ground. The boat moved from the fishing base area to the fishing area and took about 30 minutes to catch fish. The gillnet operation method has several stages, namely as follows:

a. Preparation

The first step in using gillnet fishing equipment is preparation, which involves paying attention to water conditions such monitoring depth, currents, etc.

b. Setting

The fishermen start to lower the buoy first, followed by the body of the net, after it is deemed safe to do so. In order to prevent the gillnet from drifting or breaking free from the ship while in use, the ship must move backwards when the body of the net is dropped into the sea. This process ends with a rope connecting the gillnet and the ship. In order to avoid getting trapped and have the gillnet fully extended, the ship goes rearward in a straight line at constant speed.

c. Immersing

Immersing is the waiting period for the gillnet to be left in the water until the time specified by the fisherman. The gillnet waiting period is erratic, usually up to 3 to 5 hours. Every now and then the fisherman would check the ropes to see if the gillnet was still attached to the boat.

d. Hauling

Hauling is the process of lifting gillnets from the waters onto the ship, after a long time the gillnets are left in the waters then the gillnets are lifted onto the ship little by little. Until all parts of the gillnet are on board the ship.

The operation of gill nets is installed in the fishing area in an upright position facing the biota/cutting currents (Matsuganda, 2008). One of the reasons gillnet fishing gear is operated by blocking the current is to block the direction of the fish swimming movement (Alwi et al, 2020).

The fishing method on gillnet fishing gear is passive, namely by spreading the net in the waters and waiting for the fish to get entangled in the operculum which is carried out during the day and night without the help of light (Pramesthy et al, 2020). The operating technique of the fishing gear is simple so as not to endanger the safety of fishermen.

Gillnets are among the environmentally beneficial fishing gear since they are highly selective, don't destroy habitats or fishermen's livelihoods, don't harm consumers, don't impact biodiversity, and don't capture legally protected species. Pramesthy et al (2020).

## Catch Result

Based on the results of research that has been carried out, there are several types of fish caught from gill net fishing gear, namely *tembang* fish (*Sardinella fimbriata*), *banyar* fish (*Restrelliger kanagurta*), mullet (Mugil cephalus), *layur* fish (*Trichiurus lepturus*), fourthfinger threadfin (*Eleutheronema tetradactylum*), and milkfish (*Chanos chanos*).

On average, gillnet boats in North Galesong Subdistrict, Takalar Regency, use gypsun boats with a size of 14 GT, with main dimensions ranging from 12 meters long, 2-2.5 meters wide. The machines used were Noncing and Yamaha brands. Fishermen used several types of mesh sizes when catching fish in order to increase their catch.

## Gillnet Catching Unit Efficiency

Efficiency is a comparison between output and input used in the production process. The definition of efficiency is very relative, efficiency is defined as the use of the smallest input to get the maximum production (Soekartawi, 2003). The variables used to determine the efficiency of the Gillnet fishing unit in each mesh size are annual production yield, annual cost, annual revenue, annual income and net length.

**Table 1. Data on Average Production Results per year, Cost per year, Revenue per year, income per year and length of Gillnet fishing nets**

| No | Mesh Size | V1(X1) | Range | V2(X2) | Range | V3(X3) | Range | V4(X4) | Range | V5(X5) | Range |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 Inch | 6.993 | 3.720-11.520 | 19.450.500 | 1.860.000-38.298.090 | 12.537.627 | 0-74.188.800 | 1.460.549 | 0-52.029.162 | 60 | 0-450 |
| 2 | 1,5 Inch | 742 | 22-2.688 | 8.992.873 | 2.866.639-25.570.174 | 89.700.750 | 0-172.800.000 | 75.183.750 | 0-155.520.000 | 356 | 0-630 |
| 3 | 2 Inch | 237 | 18-1.728 | 3.123.440 | 0-989.688 | 57.822.171 | 5.268.293-144.000.000 | 52.787.521 | 4.213.927-131.480.000 | 0 | 0-450 |
| 4 | 2.5 Inch | 74 | 0-817 | 2.167.897 | 65.487-5.569.972 | 9.723.400 | 0-100.800.000 | 6.813.775 | 0-93.400.000 | 165 | 0-450 |
| 5 | 6 Inch | 0 | 0-341 | 0 | 0-174.884 | 0 | 0-25.097.561 | 0 | 0-28.006.295 | 22 | 0-450 |

Source: Processed primary data, 2021

Table 1 shows the production results of each mesh size. The 1-inch size has the highest production value per trip of 6,993 kg with a catch range of 4,301-11,520 kg/year, followed by a 1.5-inch mesh size of 2,619 kg with a catch range of 1,080-5,760 kg/year. Meanwhile, the lowest annual production is at 6-inch mesh size of 891 kg with a catch range of 360-1,800 kg/year.

The highest annual cost for each mesh size is 1 inch with a value of Rp19.450.500/year while the lowest cost per year is at 6 inch mesh size of Rp6.485.625/year. The annual income ranges from Rp31.198.125– Rp89.700.750. The income per year from gillnet fishermen is the largest, which is at the size of a 1.5-inch net, which is Rp75.183.750 /year while the lowest is at the size of a 6-inch mesh of Rp24.712.500/year. This happens because the catch of 1.5 inch mesh size is higher and the selling price is also quite high, while for the 6 inch mesh size the income is lower because the catch is small because this net is used only when the waves are

strong or in the west season which is around month 11 to month 1. Length of net used by gillnet fishermen in North Galesong District ranges from 304 meters – 356 meters.

**Table 2. Comparison of Calculation of Economic Indicators that Determine Efficiency in Gillnet Fishing Equipment**

| No | Mesh Size | V1(X1) | | V2(X2) | | V3(X3) | | V4(X4) | | V5(X5) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Average | Range | Average | Range | Average | Range | Average | Range | Average | Range |
| 1 | 1 Inch | 6.993 | 3.720-11.520 | 19.450.500 | 1.860.000-38.298.090 | 12.537.627 | 0-74.188.800 | 1.460.549 | 0-52.029.162 | 60 | 0-450 |
| 2 | 1,5 Inch | 742 | 22-2.688 | 8.992.873 | 2.866.639-25.570.174 | 89.700.750 | 0-172.800.000 | 75.183.750 | 0-155.520.000 | 356 | 0-630 |
| 3 | 2 Inch | 237 | 18-1.728 | 3.123.440 | 0-989.688 | 57.822.171 | 5.268.293-144.000.000 | 52.787.521 | 4.213.927-131.480.000 | 0 | 0-450 |
| 4 | 2.5 Inch | 74 | 0-817 | 2.167.897 | 65.487-5.569.972 | 9.723.400 | 0-100.800.000 | 6.813.775 | 0-93.400.000 | 165 | 0-450 |
| 5 | 6 Inch | 0 | 0-341 | 0 | 0-174.884 | 0 | 0-25.097.561 | 0 | 0-28.006.295 | 22 | 0-450 |

Source: Processed primary data, 2021

X1 = Yield per year (Kg)
X2 = Cost per year (Rp)
X3 = Revenue per year (Rp)
X4 = Income per year (Rp)
X5 = Net Length (m)

Table 2 shows the results of the comparison of economic indicators for each mesh size on gillnet fishing gear. The comparison shows the efficiency level of each mesh size of the gillnet fishing unit against one of the economic indicators used, namely X1 to X5. Furthermore, to determine the order of priority of mesh sizes that have the best efficiency, calculations are carried out using the value function of each economic indicator. The calculation results determine the order of efficiency of each mesh size of the gillnet fishing unit, as presented in table 3.

**Table 3. Gillnet catching unit efficiency**

| No | Mesh Size | X1 | | X2 | | X3 | | X4 | | X5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Average | Range | Average | Range | Average | Range | Average | Range | Average | Range |
| 1 | 1 Inch | 1,00 | 0,80-1,18 | 1,00 | 1,00-2,07 | 0,27 | 0,00-0,92 | 0,05 | 0,00-0,82 | 0,19 | 0,00-1,00 |
| 2 | 1,5 Inch | 0,28 | 0,02-0,54 | 0,62 | 0,28-1,62 | 1,00 | 0,00-1,00 | 1,00 | 0,00-1,00 | 1,00 | 0,00-1,40 |
| 3 | 2 Inch | 0,14 | 0,01-0,60 | 0,30 | 0,00-0,98 | 0,76 | 0,12-1,00 | 0,81 | 0,11-1,06 | 0,00 | 0,00-1,00 |
| 4 | 2.5 Inch | 0,06 | 0,00-0,28 | 0,23 | 0,01-0,47 | 0,22 | 0,00-1,00 | 0,20 | 0,00-1,14 | 0,50 | 0,00-1,00 |
| 5 | 6 Inch | 0,00 | 0,00-0,19 | 0,00 | 0,00-0,02 | 0,00 | 0,00-0,54 | 0,00 | 0,00-0,73 | 0,07 | 0,00-1,00 |

Source: Processed primary data, 2021

Table 3 shows the calculation of the efficiency of the gillnet fishing gear unit in the North Galesong District. Based on table 13 the size of the 1.5-inch mesh has an overall efficiency level of 3.90 and is ranked first. The second rank is the mesh size of 1 inch with a value of 2.51.

The smallest efficiency level is found in the 6-inch mesh size which has an efficiency value of 0.07.

Assessment of efficiency is carried out to compare the output and input of each fishing gear unit (Suharto 2003). Based on the results of efficiency calculations on each mesh size of gillnets, it is known that the most efficient among the five mesh sizes is 1.5 inch mesh size, this is because at 1.5 inch mesh size the amount of production produced in one year catches more and the selling price is quite high so as to produce a higher level of efficiency compared to other mesh sizes.

## Gillnet Catching Unit Productivity

Productivity is a universal concept that applies to all economic and social systems. The key factor driving global economic expansion is productivity. Increasing productivity is a fundamental challenge for developed countries (McGowan et al., 2015).

The efficiency of the Gillnet fishing units in North Galesong is measured by comparing it to the average output of the Gillnet fishing units per fishing effort, where the effort in this case is the typical annual trip. Table 4 shows the annual productivity for gillnets, including average production, trips, and productivity.

**Table 4. Average production yield, trips and productivity of Gillnet fishermen for each mesh size**

| *No* | *Mesh Size* | Production Result (Kg) | | Trip/year | | Productivity | |
|---|---|---|---|---|---|---|---|
| | | Average | Range | Average | Range | Average | Range |
| 1 | 1 Inch | 6993 | 4.320-11.520 | 158 | 144-180 | 44,40 | 30-40 |
| 2 | 1.5 Inch | 2619 | 1080-5760 | 103 | 72-144 | 25,53 | 10-40 |
| 3 | 2 Inch | 1728 | 720-2880 | 61 | 36-72 | 28,24 | 20-40 |
| 4 | 2.5 Inch | 1251 | 180-2880 | 51 | 36-72 | 24,39 | 7,5-80 |
| 5 | 6 Inch | 891 | 120-1800 | 26 | 18-36 | 33,67 | 15-50 |

Source: Processed primary data, 2021

Based on table 4, it can be seen that the highest average production of gillnet fishermen in North Galesong District is a net with a size of 1 inch which is 6,993 kg/year. while the lowest is the production with a mesh size of 6 inches. This happens because the 6-inch net size is only used at certain times, namely at month 11 to month 1 because at that time it is very suitable for catching large fish. However, the number of trips is low due to very bad weather conditions, so fishermen only go to sea when the weather improves a little. The mesh size of 1 inch has the highest number of trips, which is 158 trips/year due to the fact that nets with a size of 1 inch are often used by fishermen when catching. While the lowest number of trips is at the 6-inch mesh size, which is 26 trips/year.

Table 4 shows that the highest productivity is at 1 inch mesh size, which is 44.40 kg/trip. This happens because when compared to other mesh sizes, the 1 inch mesh size has the maximum production value and number of trips. while the mesh size of 2.5 inches, which has the lowest productivity at 24.39 kg/trip. Based on the research of Yohanes et al (2022) on the productivity of gillnet fishing gear in Nangamerah waters, Bangkoor Village, Kec. Talibura, Kab. Sikka obtained a catch productivity value of 21.53 Kg/trip, which means gillnet fishing gear operating in Nangamerah Waters, Bangkoor Village, Kec. Talibuan has the ability to catch fish as much as 21.53 kg/trip.The amount of production/catch that fisherman obtain and the number of trips they make in a year have a significant impact on the productivity differences

at each mesh size. According to Ariandi (2012), productivity is determined by the quantity of fishing trips as well as the amount of production.

## Conclusion

The conclusions drawn from the research that has been done are as follows the highest efficiency value for gillnet mesh size 1.5 inches is 3.90, and the lowest efficiency value is for mesh size 2.5 inches, which is 24.39 and he Gillnet fishing gear in North Galesong District, Takalar Regency, has a highest productivity value at 1 inch mesh size, which is 44.40 kg/trip, meaning that it has the capacity to catch 44.40 kilogram of fish every trip.

## References


Adzah Rawaeni. Implementasi Larangan Penggunaan Alat Tangkap Cantrang Pada Jalur Penangkapan Ikan, Skripsi : Fakultas Hukum Universitas Hasanuddin, 2017

Adhawati S, S. 2018. Reconstruction Post Moratorium Of Dregged Nets At South Sulawesi. Sekolah PascaSarjana. Universitas. Hasanuddin. Makassar

Adhawati S, S, Aris Baso, dan Achmar Mallawa. 2017. *Social Study of Cantrang (Danish trawl) Fisheries Post Moratorium at Makassar Straits and Bone Gulf, South Sulawesi Province*, *Indonesia. Jurnal AACL Bioflux Vol 10/5.*

Peraturan Menteri Kelautan dan Perikanan No. 2 Tahun 2011 jo No. 08 Tahun 2011 jo No. 18 Tahun 2013 jo No. 42 Tahun 2014 tentang Perubahan Keempat atas Peraturan Menteri Kelautan dan Perikanan Nomor Per. 02/Men/2011 tentang Jalur Penangkapan Ikan dan Penemuan Alat Penangkapan Ikan di Wilayah Pengelolaan Perikanan Negara Republik Indonesia

Arikunto, S. 2014. *Prosedur Penelitian Suatu Penelitian Praktik*. Rineka Cipta. Jakarta.

Alwi *et al,* 2020). Spesifikasi Dan Hasil Tangkapan Jaring Insang Di Desa Prapat Tunggal, Kabupaten Bengkalis, Provinsi Riau. Aurelia Journal VOL. 2 (1) OKTOBER 2020 : 39-46

Cholik Abdul, Rivai Wirasasmita dan Ofan Sofyan. 1994. Evaluasi Proyek (Suatu Pengantar). Pioner Jaya. Bandung. 70 hlm.

Najamuddin *et all*.2017. Performance of fishing gear on skipjack tuna Katsuwonus pelamis in south Sulawesi, Indonesia. *Jurnal AACL Bioflux Vol 10/2.*

Mallawa, A. 2016. Kajian Pengembangan Tehnologi Tangkap Prioritas. *In Strategi dan Kebijakan Pengembangan Perikanan Tangkap (Berkelanjutan)*. Makassar

Mallawa achmar. 2012. Dasar-Dasar Penangkapan Ikan . Masagena Press. Makassar

Mangkusubroto K., Trisnadi C. L., 1985 Decision analysis with system approach and project management. Ganesa Exacta, Bandung.

Martasuganda S. 2008. Jaring Insang (gill net). Institut Pertanian Bogor

Minggo Yohanes D.B.R, Erfin dan Febronius Florianus M R. 2022. Produktivitas Alat Tangkap Gillnet di Perairan Nangamerah, Desa Bangkoor, Kecamatan Talibura, Kabupaten Sikka. Jurnal Ilmu Kelautan dan Perikanan Vol.04, No.01.

Pramesthy et al., 2020. Analisis Alat Tangkap Jaring Insang (Gill Net) Berdasarkan Kode Etik Tatalaksana Perikanan Bertanggung Jawab Di Perairan Kota Dumai. Aurelia Journal VOL. 1 (2) APRIL 2020 : 103-112.

Soekartawi. 2003. Agribisnis Teori & Aplikasinya. Raja Grafindo Persada. Jakarta

Sugiyono. (2014). Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta.

Zubainarni N, Yani,A. Faradissa. 2016. Kajian Valuasi Dampak Ekonomi dan Sosial Pelarangan Alat Tangkap Cantrang di Jawa Tengah. Bogor (ID) : Agro Maritim.