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*RESEARCH ARTICLE*

# EFFECT OF THE DIFFERENCE IN SOUND WAVE-BASED ATTRACTOR FREQUENCY ON THE CATCH OF HALFBEAK FISH (OXYPOHAMPHUS MICROPTERUS) USING TRAMMEL NET AT SURABAYA COAST.

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## Manuscript Info

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Trammel net, attractor, frequency.

## Abstract

The purpose of this study was to determine the effect of differences in frequency of sound wave-based attractors on the catch of halfbeak fish (oxyporhamphus micropterus) on a three-layer trammel net on the Surabaya coast. In this study the frequency difference treatment of sound wave based attractors with a range of 500-1000 Hz mounted on a three layer gill net (trammel net). The material used is sound wave-based attractors totaling 6 pieces with different frequencies such as 500 Hz, 600 Hz, 700 Hz, 800 Hz, 900 Hz and 1000 Hz. The effect of the different frequencies used on sound wave based attractor on the catch of halfbeak fish (oxyporhamphus micropterus) with a three-layer trammel net on the Surabaya coast obtained significant or significantly different results. The frequencies of 800 Hz, 900 Hz and 700 Hz are frequencies that get a higher response compared to frequencies of 500 Hz, 600 Hz and 1000 Hz. The results of the analysis using the Duncan test, obtained results that the frequency of 800 Hz is the frequency that produces the highest average value. The distribution of the number of catches of halfbeak fish (Oxyporhamphus micropterus) using sound wave-based attractors in a three-layer net, obtained the highest value at the 800 Hz frequency of 12.7 kg (34.3%), followed by a 700 Hz frequency of 8.8 kg (23.7%) and a frequency of 900 Hz of 6.0 kg (16.3%).



## Introduction:-

Today, it is needed a simple appropriate technology, easy to implement and efficient which able to respond the increasingly complex fisheries (Susanto A, 2011). One of the fishing gears that require a touch of catching assistive technology is the three-layer gill net or commonly called a trammel net which composed of 3 layers of nets with different mesh sizes. The three-layer net has a smaller inner mesh size compared to the outer mesh net. This fishing gear is widely used by fishermen on the coast of Surabaya. The operational method of trammel net fishing gear is passive, where the net is installed blocking the current and the fish that come close to the net will be entangled. According to Hufiadi, (2017) several types of fish caught using trammel net include *bilis fish* (Thryssa sp), *pepetek fish* (Leiognathus spp) and *pearin fish* (polynemus sp). From the results of studies that have been done, to increase the catch of gill net fishermen, a fishing aid or attractor based on the sound wave of "*Piknet*" with a frequency range of 500-1000 Hz (N Rosana et al, 2018).

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**Research Purpose:-**
The purpose of this study was to determine the effect of differences in frequency of sound wave-based attractors on the catch of halfbeak fish (oxyporhamphus micropterus) on a three-layer trammel net at the Surabaya coast.

## Research Methods:-

The experimental method is a research method used to look for the effect of certain treatments on others under controlled conditions (Sugiyono 2011). N Rosana and Suryadhi (2017) state that the process of determining the frequency range used in the manufacture of "Piknet" fish calling devices can be done based on references from the results of previous studies related to fish responses to sound waves. Rosana, N and Rifandi, S (2018) have made and conducted a trial of a fish summoning device for gill net fishing gear called "piknet", which will be used in this study. In this study the frequency difference treatment of sound wave based attractors with a range of 500-1000 Hz mounted on a three layer gill net (trammel net). The material used is sound wave-based attractors totaling 6 pieces with different frequencies namely 500 Hz, 600 Hz, 700 Hz, 800 Hz, 900 Hz and 1000 Hz. The sound wave based attractors used are as follows (Figure 1):

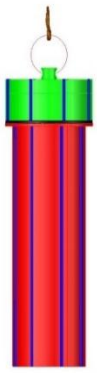

**Figure 1:-**Sound Wave Based Attractor

Drift gill nets used in this study were 3-layer gill nets or called trammel nets with an outer mesh size of 4 inches and an inside of 1 inch. Nets used amounted to 30 sheets, where each sheet of net measuring 15 meters long. The boat used is a wooden boat with a length of 7 meters, 1.5 meters wide and 0.5 meters high. The driving machine used is a Honda engine with 6.5 PK power using gasoline. The fishing operation was carried out in May and June 2019. The fishing operation was carried out with 9 repetitions of settings at a depth of water about 5 meters from the surface. The arrest operation was done first time setting at 07.00 WIB, with a time of soaking the net was 30 minutes. Sound wave-based attachment installation is done randomly on a three-layer net by hanging it on the upper ris-rope. The installation distance is intermittent every 5 piece of the net and the data obtained in each trip is the data of the catches number, total length and weight of the Halfbeak (Oxyporhamphus micropterus). The distance from the fishing village to the fishing area is about 5.8 nautical miles.

Data analysis was performed with a quantitative approach and reviewed the measurement results. The statistical analysis used is statistical inference which is a complete randomized design test, so that the best frequency range is obtained from the instrument used. Analysis of the composition of the catch of halfbeak fish (Oxyporhamphus micropterus) using sound wave-based attractors at different frequencies in the trammel net is done with descriptive statistics.

The initial hypothesis used is (Ho): The difference in frequency in sound wave based attractors operated using a trammel net is not significantly different; (H1): The difference in frequency at sound wave based attractors operated using a trammel net is significantly different.

## Research Result And Discussion:-

A trammel net is a type of drift gill fishing gear. According to Martasuganda S (2008), it is said that drift gill nets are gill nets which are left to be washed away in waters, whether they are washed away on the surface of the water, in the water column or washed away in the waters.

The main catches obtained during the study by using a three-layer gill net (trammel net) using a sound wave based attractor in the frequency range of 500-1000 Hz and tested at each frequency are Halfbeak (Oxyporhamphus micropterus) which is a type of fish economically important and consumed by society.

In table 1 we can see the distribution of catches of halfbeak fish (Oxyporhamphus micropterus) at different frequencies, where the total catch in one trip with 9 settings is 37 kg.

**Table 1:-**Catching results of Halfbeak fish (Oxyporhamphus micropterus) Using Three-Layer Net (Trammel Net) Using Sound Wave-Based Catching Aids at Different Frequencies

| **Frequency (Hz)** | **The result of Halfbeak (Oxyporhamphus micropterus) catching (kg), repeated to..** | | | | | | | | | **Amount (kg)** | **Presentage (%)** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | | |
| 500 | 0.3 | 0.0 | 0.2 | 0.6 | 0.2 | 0.2 | 0.9 | 0.1 | 0.3 | 2.8 | 7.5 |
| 600 | 0.5 | 0.4 | 0.0 | 0.4 | 0.3 | 0.2 | 0.8 | 0.4 | 0.2 | 3.2 | 8.6 |
| 700 | 1.6 | 0.9 | 0.3 | 1.7 | 0.2 | 1.0 | 2.1 | 0.6 | 0.4 | 8.8 | 23.7 |
| 800 | 1.2 | 2.1 | 0.7 | 3.3 | 0.5 | 2.4 | 0.9 | 0.4 | 1.2 | 12.7 | 34.3 |
| 900 | 0.4 | 1.3 | 0.2 | 0.6 | 0.7 | 1.2 | 0.6 | 0.8 | 0.2 | 6.0 | 16.3 |
| 1000 | 0.1 | 0.2 | 0.0 | 0.5 | 1.0 | 0.4 | 0.7 | 0.3 | 0.3 | 3.5 | 9.5 |
| Total | | | | | | | | | 37 | | |

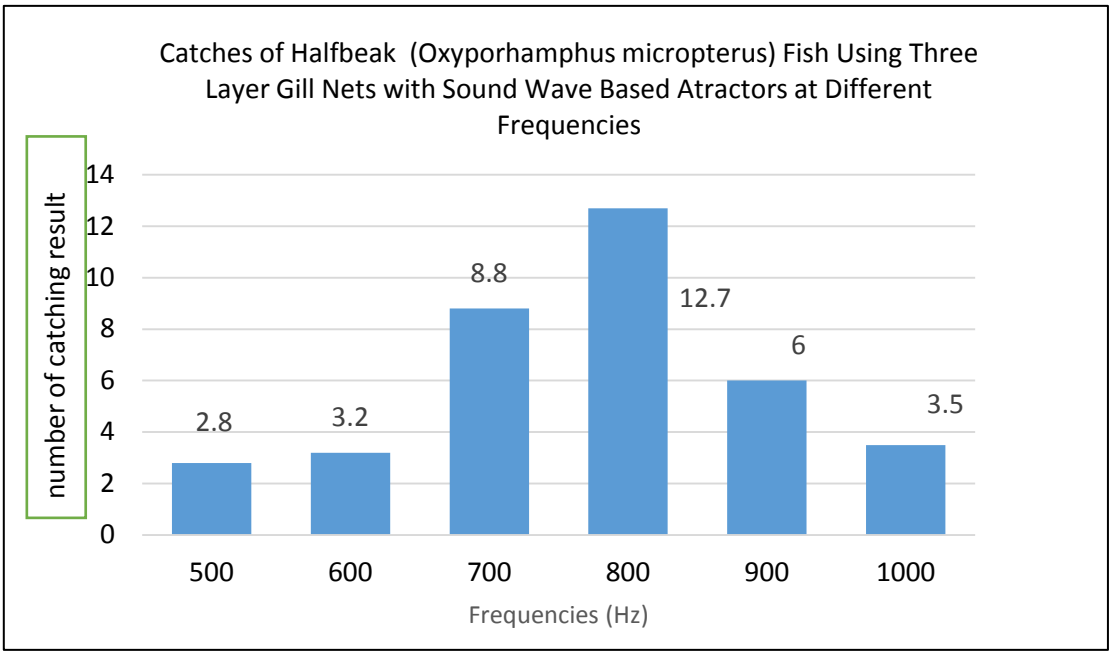


**Figure 2:-**Catching of Halfbeak fish (Oxyporhamphus micropterus) Using a Three Layer Net (Trammel net) with Sound Wave Based Attractors at Different Frequencies

The distribution of the number of halfbeak fish (Oxyporhamphus micropterus) catches using sound wave-based attractors in a three-layer net, obtained the highest value at the 800 Hz frequency of 12.7 kg (34.3%), followed by a 700 Hz frequency of 8.8 kg (23.7%) and a frequency of 900 Hz of 6.0 kg (16.3%) (Figure 2). At frequencies 500, 600 and 1000 Hz the number of catches of halfbeak fish (Oxyporhamphus micropterus) gets lower yields.

To find out whether the use of sound wave-based attractors with different frequencies affects the number of catches of the three-layer net, a data analysis was performed using a completely randomized design test (CRD). Data obtained in the field / waters are assumed to be normally distributed and homogeneous, because they are taken at the location (fishing ground) and in the same season, namely the east season, where the catch of fishermen is higher than the period of the western and transitional seasons.

The results of data analysis of halfbeak fish (Oxyporhamphus micropterus) with a complete randomized design test (figure 3) obtained a significance value of 0.00, below 0.05 so that it rejects Ho or accepts H1, which means that the frequency difference in sound wave based attractors operates using a triple layer net (trammel net) is significantly different. To find out the best treatment, it is done using the Duncan test, where the 800 Hz frequency is the frequency that produces the highest value of 1.4 (figure 4).

| ANOVA | | | | | |
|---|---|---|---|---|---|
| Number of Fish | | | | | |
| | Sum of Squares | df | Mean Square | F | Sig. |
| Between Groups | 8,670 | 5 | 1,734 | 5,645 | ,000 |
| Within Groups | 14,744 | 48 | ,307 | | |
| Total | 23,415 | 53 | | | |

**Figure 3:-**Analysis Results of the Complete Randomized Design of Halfbeak fish (Oxyporhamphus micropterus)

| **Halfbeak Number** Duncan[a] | | | | |
|---|---|---|---|---|
| Frequency | N | Subset for alpha = 0.05 | | |
| | | 1 | 2 | 3 |
| 1000 | 9 | ,2889 | | |
| 500 | 9 | ,3111 | ,3111 | |
| 600 | 9 | ,3556 | ,3556 | |
| 900 | 9 | ,6667 | ,6667 | |
| 700 | 9 | | ,8778 | |
| 800 | 9 | | | 1,4111 |
| Sig. | | ,195 | ,051 | 1,000 |
| Means for groups in homogeneous subsets are displayed. | | | | |
| a. Uses Harmonic Mean Sample Size = 9,000. | | | | |

**Figure 4:-**Best Treatment Test for Halfbeak fish (Oxyporhamphus micropterus)

From the results of statistical tests, the frequency of 800 Hz is the frequency that gets a higher response compared to other frequencies by halfbeak fish (Oxyporhamphus micropterus). The fish's response to the 800 Hz frequency is thought to be due to an interest in the sounds issued by the attractor so it wants to come closer to find food or reproduce. According to Rosana et al, (2018) fish respond to sounds issued by sound wave based attractors with a frequency range of 500-1000 Hz. The frequencies of 800 Hz, 900 Hz and 700 Hz are frequencies that get a higher response compared to frequencies of 500 Hz, 600 Hz and 1000 Hz. This proves that differences in the frequency range can be used to determine the level of attraction of fish to approach the sound source as a positive response.

Collette, B.B. and J. Su, (1986) said that halfbeak fish (Oxyporhamphus micropterus) is a kind of small pelagic fish that live to a depth of about 6 meters and are found in warm waters. The length of the fish when the gonad is first cooked is about 14 cm. Maximum size for male fish up to 23 cm, while females range from 17.6 cm. In this study bean fish (Oxyporhamphus micropterus) were caught using a noise-based wave form measuring between 14.7 cm to 21.3 cm.

## Conclusions And Recommendations:-

**Conclusions :-**

The effect of the different frequencies used on sound wave based attractors on the catch of halfbeak fish (oxyporhamphus micropterus) with a three-layer trammel net on the Surabaya coast obtained significant or significantly different results. The frequencies of 800 Hz, 900 Hz and 700 Hz are frequencies that get a higher

response compared to frequencies of 500 Hz, 600 Hz and 1000 Hz. The results of the analysis using the Duncan test, obtained results that the frequency of 800 Hz is the frequency that produces the highest average value.

The distribution of the number of catches of halfbeak fish (Oxyporhamphus micropterus) using sound wave-based attractors in a three-layer net, obtained the highest value at the 800 Hz frequency of 12.7 kg (34.3%), followed by a 700 Hz frequency of 8.8 kg (23.7%) and a frequency of 900 Hz of 6.0 kg (16.3%).

**Recommendations :-**

It is necessary to modify the sound wave based attractor related to the fish's response to the sound produced and analysis of fish behavior to the frequency range.

**Thank You Note:-**

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