Level of friendliness of the Bouke Ami fishing gear technology at the Nusantara Fishing Port (PPN) Kejawanan in Cirebon

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Abstract. Squid nets technology (Bouke Ami) are the most used fishing gear by fishermen in the Nusantara Fishing Port (PPN) Kejawanan. This research was conducted in April 2019. The purpose of this study was to analyse the level of friendliness of the bouke ami fishing gear based on the Responsible Fisheries Ethics Code (CCRF). The research method used survey and in-depth interviews with related parties related to the results of research and the level of friendliness of environmental equipment. Data analysis was carried out in accordance with 9 criteria for environmentally friendly fishing gear from the Food and Agriculture Organization (FAO). The results of the study showed that 27 species of bouke ami were captured with a total catch of 1,939 tons. The composition of the main catch is greater, which is equal to 82.69% compared to 17.31% bycatch. The value in the bouke ami environment is 27. Based on this value, the bouke ami is classified as a fishing gear which is categorized as an environmentally friendly fishing gear.

1. Introduction

Squid is a superior commodity. The size of the catch of squid landed in the Nusantara Fishing Port (PPN) Kejawanan has the size of the category of large squid 27-30 cm and small size of squid 1-7 cm. Potential squid resources indicate conditions that allow it to be developed, so this research is needed. Bouke ami is a fishing gear classified as a lift net. The name bouke ami comes from Japanese and this fishing gear is known as the "stick held dip net" [1]. Based on the Decree of the Minister of Maritime Affairs and Fisheries No. KEP.60/MEN/2010 regarding the productivity of fishing vessels, it is stated that squid from bouke ami vessels are the main catch, where the percentage of catches is 80% of the total catch.

Squid is an economic commodity that has strategic value as a source of foreign exchange for the country. The need for squid to meet export demand is supported by ports that produce squid catches. Fishery Port Nusantara (PPN) Kejawanan is one of several ports that landed squid catch in the north coast of Java, reaching 2,831 tons in 2018.

The fisheries sector in the Cirebon region is a base sector [2]. The PPN Kejawanan located in the Cirebon region, West Java, has a number of catches with large production volumes. The main catches based on the 2014-2018 LQ analysis include squid (Loligo sp.) with an average production of 2,632 tons per year and a positive LQ growth value with a score of 3. Based on 2018 PPN Kejawanan surprise statistics on bouke ami ships producing squid dominated the fishing fleet compared to other fleets (45.36%). The volume of squid production in 2018 by this fishing unit reaches 1,603 tons higher than the production of other types of fishing gear.
Previous research on squid nets has been carried out that examines aspects of the production model and catch rate of squid nets [3]. Then research on the relationship between production and squid prices with squid net fishing gear has been carried out in PPN Kejawanan [4]. However, research on the level of hospitality of bouke ami fishing gear has not been done much. On the other hand, the development of world fishing activities continues to increase and has shown symptoms of overfishing in some parts of the waters [5]. Based on this, this study aims to analyze the level of bouke ami fishing equipment friendliness based on the Code of Conduct for Responsible Fisheries (CCRF) on their catches based on the PPN Kejawanan Cirebon. CCRF is used as a guideline for implementing fisheries activities responsibly [6]. These guidelines provide completeness for national and international efforts to ensure the sustainable and sustainable use of marine resources [7]. The catches discussed are those that are landed and are recorded at the port. It is expected that the results of this study can provide information that can be used for the development of bouke ami fisheries, especially in Cirebon and surrounding areas.

2. Materials and methods
This research was conducted in April 2019, located in the hygienic fish marketing place of the Kejawanan Cirebon fishing port. The research method is a method of surveying and in-depth interviews with interviews with related parties related to the composition of the catch and the level of environmental friendliness of the fishing gear. Information about a fishing unit is obtained from respondents who have sufficient knowledge about fishing gear. The data analysis method was conducted in accordance with the criteria for weighting environmentally friendly fishing gear issued by the Ministry of Maritime Affairs and Fisheries in 2006. The weighting is based on 9 criteria for environmentally friendly fishing gear according to the Code of Conduct for Responsible Fisheries (CCRF) in 1995. Food Agriculture Organization (FAO, an institution under the auspices of the United Nations that deals with world food and agriculture issues), in 1995 issued a procedure for responsible fishing activities. In this CCRF, FAO sets a set of criteria for environmentally friendly fishing technology. The level of hospitality assessment for types of catches is presented in Table 1 [8].

After the score or the value has been obtained, then made reference points that can be a reference point in determining ranking. Here the maximum score or score is 36 points, while the category of environmentally friendly fishing gear will be divided into 4 categories with a range of values as follows: 1-9 not very environmentally friendly, 10-18 not environmentally friendly, 19-27 environmentally friendly, 28-36 very environmentally friendly. So as to determine the final result namely; the total weighted value divided by the total respondents or used the following formula [9].

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X = \frac{\sum x_n}{N}
\]

Information:
X = environmental friendliness score
\(\sum x_n\) = total number of scores
N = number of respondents
Table 1. Criteria for assessing the environmental safety level of fishing equipment.

| No | Criteria | Sub criteria                                                                 | Score |
|----|----------|-----------------------------------------------------------------------------|-------|
| 1  | Has a high selectivity | - Catch more than three species of fish with variations of different sizes | 1     |
|    |          | - Catch three species of fish or less with variations of different sizes    | 2     |
|    |          | - Catch less than three species of relatively uniform size                  | 3     |
|    |          | - Catch one species of fish with a relatively uniform size                  | 4     |
| 2  | Does not damage habitats | - Causes habitat destruction over large areas                          | 1     |
|    |          | - Causes habitat destruction in a narrow area                             | 2     |
|    |          | - Causes damage to some habitats in a narrow area                         | 3     |
|    |          | - Safe for habitat                                                        | 4     |
| 3  | Produce high quality fish | - Dead and rotten fish                                                   | 1     |
|    |          | - Dead, fresh, physically deformed fish                                   | 2     |
|    |          | - Dead and fresh fish                                                     | 3     |
|    |          | - Live fish                                                               | 4     |
| 4  | No harm to fishermen | - Can result in death of fishermen                                        | 1     |
|    |          | - Can result in permanent disability to fishermen                         | 2     |
|    |          | - Only temporary health problems                                          | 3     |
|    |          | - Safe for fishermen                                                      | 4     |
| 5  | Production does not harm consumers | - Great opportunity to cause death to consumers                         | 1     |
|    |          | - Potential to cause health problems in consumers                         | 2     |
|    |          | - Relatively safe for consumers                                           | 3     |
|    |          | - Safe for consumers                                                      | 4     |
| 6  | Low by-catch | - By-catch how many species and not sold in the market                    | 1     |
|    |          | - By-catch how many species are there and what types sell well on the market | 2     |
|    |          | - By-catch less than three species and sell well in the market            | 3     |
|    |          | - By-catch is less than three species and has a high price                | 4     |
| 7  | Impact on Biodiversity is low | - Causing the death of all living things and destroying habitats           | 1     |
|    |          | - Causes the death of several species and destroys habitats               | 2     |
|    |          | - Causes death of several species but does not damage habitats            | 3     |
|    |          | - Safe for biodiversity                                                   | 4     |
| 8  | Does not endanger protected fish | - Protected fish is often caught                                          | 1     |
|    |          | - Protected fish is caught several times                                  | 2     |
|    |          | - A protected fish has been caught                                        | 3     |
|    |          | - Protected fish is never caught                                          | 4     |
| 9  | Socially acceptable | - Low investment costs                                                   | 1     |
|    |          | - Economically profitable                                                 | 2     |
|    |          | - Does not conflict with local culture                                    | 3     |
|    |          | - Does not conflict with existing regulations                             | 4     |
|    |          | Total score                                                               | 36    |

3. Results and discussion

3.1. Bouke Ami’s arrest unit

The most dominant arrest unit in PPN Kejawanan is bouke ami. In 2018 the number of bouke ami fishing gear as many as 94 units is much more used by local fishermen compared to other squid fishing units such as 33 units of squid fishing rods and 31 units of cast net. Bouke ami is included in the classification of fishing net equipment lift (lift net) in the operation of the net is only installed on one side of the ship, which is the right side of the ship. Bouke ami ships based on PPN Kejawanan when operating, not only operate bouke ami but also use hand lines. The bouke ami found in PPN Kejawanan is operated by motorboats that have different gross tonnage sizes, while conducting research on ships measuring 21-100
GT with the power of a diesel engine as its driving force which is 45-370 PK. The number of crew (ABK) in operation ranges from 10-12 people. The division of labor from ABK, namely as: (1) lighting regulator; (2) operation of setting and hauling the net; (3) clearing the net after the squid capture process; (4) net repair.

All of the Bouke ami ships in the PPN Kejawanan have freezers inside the hatch. On average all ships have 3 hold. Bouke ami operation uses the help of lights to attract hordes of squid. The lamp used has 800-2000 watts of power and amounts to 25-85 pieces. The number of bouke ami trips ranges from 30-100 days/trip, in one day it takes 5-7 settings. The time needed for setting is 1 hour, while for the hauling process it takes 30 minutes; with a waiting time of 30 minutes. The arrest operation was carried out at night, starting at 5 pm until 4 am.

3.2. Arrest method
This Squid is one of the biotas that is effectively carried out at night. The time of the capture process depends on how many squid are available and how long the squid can gather on the net. The setting process takes one hour to lower the net as deep as 10-15 meters and the hauling process takes up to 30 minutes. The squid catch operation using bouke ami is divided into three stages, namely:

![Figure 1. (a) Boat of bouke ami and (b) packaged squid catch.](image)

3.2.1. Preparation. The first phase of the fishing operation is carried out by determining the fishing ground area by the captain who also doubles as a fishing master. Determination of fishing location is assisted by GPS technology and fish finder. Information about fishing ground is also often obtained from other squid ships that have carried out fishing operations.

3.2.2. Setting. The second stage is carried out when the capture unit arrives at the location of the capture. First, find the right place to lower the net, which is not too close to the squid so that the squid does not move away from the location. Second, lower the net using goalposts so that the mouth of the net opens in a rectangular shape. Third, the bulb contractor lights are lit on both sides of the ship as many as 25-85 pieces with 800 watts of power for each lamp. Third, squid have gathered around the ship and the tokki lamp is mounted on the net. The tokki lamp is the contractor lamp which is lowered over the net, which functions to concentrate the squid so that it can collect on the right side of the ship. Tokki lamp power reaches 2000 watts (mercury or LED) and the amount of light from this lamp can be adjusted.

3.2.3. Hauling. The third stage is raising the net and the catch onto the ship. When the squid had been crowded under the ship, the light bulb's contractor light began to dim and the token lamp was turned on. The tokki lamp focuses its light on the net, so that the squid still approaches the light source. After the tokki lamp is turned on, slowly the dimmer light begins to dim little by little until the squid reaches the surface of the water. Squid that has been collected and centered on the surface of the water above the net can be captured. Fishermen provide all supplies before the fishing trip; it takes two days to prepare the entire trip stock. The supplies prepared included fuel, consumption, kitchen equipment and fresh water. The fishing trip was carried out for almost three months with a distance of 2-3 days to the fishing ground [10].
3.3. Catch

Bouke ami fishing gear catches 27 species with a total catch of 1,939 tons. The catch of the bouke ami fishing unit is not only squid but there are various other types of fish. The catch is divided into two categories, namely the main catch and the bycatch. Catches obtained by fishermen are often used as additional food consumption as food menus during fishing trips. During the research, the production volume by the bouke ami capture unit can be seen in Figure 2.

![Figure 2](image)

**Figure 2.** Production volume of bouke ami catching unit (a) catch composition, (b) composition of bycatch (fish).

The main catch of the bouke ami catching unit is squid (Loligo sp) amounting to 1,603 tons or contributing 82.69% of the total catch, more than bycatch (fish) by 335 tons or contributing 17.31% of the total catch. There are 26 types of catches, including fish Layang, Lemuru, Tenggiri, Selar, Cucut, Manyung, Tembang, Kuwe, Teri, Snapper, Pickle, Talang, Budun, Tetengkek, Japuh, Alu-alu, Semar, Bawal, Tuna, Layur, Machete, Bloated, Grouper, Stingray, Jackfruit seeds. The most caught fish are the flying fish and lemuru.

3.4. Level of environmental friendliness

The level of environmental friendliness of the bouke ami fishing gear based on 9 criteria obtained by the scoring value as in Table 2 below:

| No | Environmental friendliness criteria | Description sub criteria | Scoring |
|----|-------------------------------------|---------------------------|---------|
| 1  | High selectivity                    | Catch more than three species of fish with variations of different sizes | 1       |
| 2  | Does not damage habitats            | Causes damage to some habitats in a narrow area | 3       |
| 3  | Produce high quality fish           | Fish dead and fresh       | 3       |
| 4  | No harm to fishermen                | Safe for fishermen        | 4       |
| 5  | Product does not harm consumers     | Safe for consumers        | 4       |
| 6  | Low by-catch                        | By-catch, how many species and species are there in the market | 2       |
| 7  | Low biodiversity impact             | Causes the death of several species but does not damage habitats | 3       |
| 8  | No harm to protected fish           | A protected fish has been caught | 3       |
| 9  | Socially acceptable                 | Does not conflict with existing regulations | 4       |
|    | Total                               |                           | **27**  |
The total score for bouke ami’s level of environmental friendliness is 27 (Table 2). This value is based on the category of the level of environmental friendliness included in the category of fishing gear that is environmentally friendly. Bouke ami fishing gear fulfills several criteria including: economically beneficial and permitted by the government and the community, fish products produced dead fresh, safe for consumers’ health, fishing gear does not harm fishermen, damage to some habitats in a narrow area and cause death of several species but not damage the habitat. Whereas the criteria for environmental friendliness that needs attention is the low level of selectivity where the tools catch more than three species of different sizes and protected fish have been caught.

4. Conclusion
The results of this study further highlight the composition of the catch and the level of environmental friendliness in bouke ami fishing gear. The main catch of bouke ami in PPN Kejawanan is squid. The value of the level of environmental friendliness on bouke ami equipment scores 27. Criteria for environmental friendliness of bouke ami equipment are included in environmentally friendly fishing equipment.

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Acknowledgements
The authors thank the Ministry of Research and Technology and PPN Kejawanan Survivors who have assisted in data collection.