Effect of different depth on fish catches in Hajoran Coast of Central Tapanuli District: Case on bamboo platform lift net

T H Iqbal	extsuperscript{1,2,*}, D P Sitompul	extsuperscript{1}, D Rianjuanda	extsuperscript{1,2}, E Miswar	extsuperscript{1}, Salmarika	extsuperscript{1} and R M Aprilla	extsuperscript{1,2}

	extsuperscript{1}Department of Fisheries Resources Utilization, Faculty of Marine and Fisheries, Universitas Syiah Kuala, Banda Aceh, 23111, Indonesia.

	extsuperscript{2}Center of Marine and Fisheries Research, Universitas Syiah Kuala, Banda Aceh, 23111 Indonesia

*Corresponding Author: tee.hariss@unsyiah.ac.id

Abstract. Central Tapanuli Regency is one of the regions in North Sumatra that has fishery potential. In Hajoran, the livelihoods of most people as fishermen are on bamboo platform lift net fishing gear. Bamboo platform lift net is a fishing gear that catches small pelagic fish and is installed permanently. The factor of the installation of a bamboo platform lift net at a different depth will affect the income earned by each fisherman. The purpose of this study was to compare the catches of fish that were predominantly caught on a bamboo platform lift net based on different depths. This research was conducted in February 2020 at Hajoran Village, Central Tapanuli regency in Sibolga City, by using a survey method. Data collection was carried out by directly recording the catches 3 units of bamboo platform lift net and then comparing the three results by using One Way ANOVA analysis. The results showed that the amount of catch per lift net varies, depending on the type of fish and its depth. For pony fishes, species were more commonly found at a depth of 30 M with a total of 5.5 kg, while fringescaling sardine and anchovies were found at a depth of 36 M with a total of 10.6 kg and 64.4 kg, respectively. One Way ANOVA revealed that there was a significant difference found on fringescaling sardine and ponyfish in term of water depth (p<0.05), while there was no any significant different on anchovy fish (p<0.05).

1. Introduction

Geographically, Tapanuli Tengah Regency is located on the west coast of Sumatra Island with a coastline of 200 km, and its territory is mostly located on the mainland of Sumatra Island and partly on small islands with an area of 2,188 km². Hajoran is one of the villages in the Central Tapanuli Regency that uses fishing gear as a source of livelihood; this is due to its Marine and Fishery Potential which includes capture and aquaculture production, the potential of Indian Ocean fisheries, the number of fishermen and fishing vessels, facilities and supporting fisheries and fishery commodity-based industries [1, 2, 3].

The bamboo platform net is a rectangular bamboo arrangement measuring 10m x 10m, 11 m high from the water, 5 m deep (low tide), and 13.4 m (tide) embedded in shallow water, which catching anchovy fish (Stolephorus sp.) as its main catch, while squids (Loligo sp.), yellow scad ponyfish (Leiognathus sp.), and other small pelagic fish are bycatch [4, 5, 6]. In its operation, the planting bamboo platform net in Hajoran Village is fixed by sticking a large number of bamboos in coastal waters and installing it at different distances, so that the number and type of catch obtained in each...
stepping platform net varies. The difference in the catch obtained is influenced by the depth of the embedded platform net [5, 7, 8].

Efforts to streamline fishing operations are needed information about the existence of fish resources in waters. The existence of data collection on the number and types of fixed-line catches and at what depths the step-platform net operation to obtain the optimal number of catches will help the income earned by fishermen [8, 9, 10]. Based on its statement, we revealed that there were no similar conducted researches on its investigate. So that it underlies this research is the first investigation that purpose to determine whether depth affects the dominant catch obtained.

2. Material and Methods

2.1. Site and Time
This research was conducted in February 2020 at the Hajoran Coast of Central Tapanuli District (Figure 1).

![Figure 1. Sampling site in Hajoran Coast of Central Tapanuli District.](image)

2.2. Data Collection
Data was taken includes the number and type of catch which is dominantly caught at each depth of the bamboo platform net. As for the depth of the sticky platform net used, the inner part of bamboo platform net pole was in 24 meter, the middle part 30 meter, and the outer part of stick platform net poled at depth 36 meter. The research conducted direct observations on the object in the form of the number and type of fishing gear catch.

2.3. Data Analysis
The One Way ANOVA analysis was used for the comparison of the number of catches in the three depths; inner, middle, and outer part of Hajoran Coast.

3. Results and Discussion
The dominant types of fish catch were anchovy fish (Stolephorus sp), fringescale sardine (Sardinella fimbriata), and ponyfish (Leiognathus sp). There were more anchovy fish found at a depth of 36 meters with a total of 64.4 kg, for this type of fingerscale sardine, the number was found more at depth of 36 meters for a total of 10.6 kg, and for ponyfish the number was more at a depth of 30 meters for a total of 5.5 kg. (Table 1) Based on the depth of the bamboo platform net, the number of all catches were discovered more at a depth of 36 meters with a total of 152.55 kg, the total catch for 4 days at all depths is 378.8 kg. The difference in the amount of catch per depth was varied, for the greater number found in the types of anchovy fish, while for the types of catches of ponyfish and fringescale sardine were not too much varied at each depth. Data also shown that from each depth, anchovy fish and fringescale sardine were mostly caught at a depth of 36 meters, while more ponyfish were caught at a depth of 30 meters.
Each fish species has a different response-ability to light stimuli received, seen from the way the bamboo platform net operates utilizing fish characteristics, namely positive phototaxis (sensitive to light stimuli) [8, 11, 12]. The main factor affecting the ability of fish to respond to light is the arrangement of photoreceptor cells in the retina of the eye [3, 4, 12, 13]. Bamboo platform nets used the same size and type of lamp. The main factor for the success of fishing using a bamboo platform net is the optimal use of light. So that the amount of catch obtained does not affect depth [13, 14, 15]. The number of each type of catch at each depth carried out for four days was presented in Table 1 below:

| Type of fish          | Time  | Depth (meter) | Total amount (kg) | Mean (kg) |
|-----------------------|-------|---------------|-------------------|-----------|
|                       |       | 24 m          | 30 m              | 36 m      |           |
| Anchovy fish          | Day 1 | 16            | 15                | 20        | 51        | 17.00     |
|                       | Day 2 | 10.3          | 12                | 11.6      | 33.9      | 11.30     |
|                       | Day 3 | 5.9           | 18.3              | 20.4      | 44.6      | 14.87     |
|                       | Day 4 | 7             | 15                | 12.4      | 34.4      | 11.47     |
|                       | Total | 39.2          | 60.3              | 64.4      | 163.9     | 54.64     |
|                       | Mean  | 9.80          | 15.17             | 16.10     | -         | -         |
| Fringescale sardine   | Day 1 | 1.5           | 2.2               | 2.7       | 6.4       | 2.13      |
|                       | Day 2 | 0.5           | 1.4               | 2.8       | 4.7       | 1.57      |
|                       | Day 3 | 0.9           | 2.1               | 3.3       | 6.3       | 2.10      |
|                       | Day 4 | 0.5           | 1.2               | 1.8       | 3.5       | 1.17      |
|                       | Total | 3.4           | 6.9               | 10.6      | 20.9      | 6.97      |
|                       | Mean  | 0.85          | 1.72              | 2.65      | -         | -         |
| Ponyfish              | Day 1 | 0.5           | 1.2               | 0.25      | 1.95      | 0.65      |
|                       | Day 2 | 0.25          | 0.5               | 0.7       | 1.45      | 0.48      |
|                       | Day 3 | 0.2           | 1.5               | 1.2       | 2.9       | 0.97      |
|                       | Day 4 | 0.2           | 2.3               | 0.4       | 2.9       | 0.97      |
|                       | Total | 1.15          | 5.5               | 2.55      | 9.2       | 307       |
|                       | Mean  | 0.31          | 1.37              | 0.63      | -         | -         |
|                       | Total | 43.75         | 72.7              | 77.55     | 194       | 21.56     |
|                       | Mean  | 14.58         | 24.23             | 25.85     | 27.06     | 9.02      |

3.1. Types of anchovy fish (Stolephorus sp.)

Based on Figure 2a, it appears that the relationship between depth and catch for anchovy fish obtained an average value at each depth, namely depth of inner part (24 m) was 9.80 kg, middle part (30 m) was 15.17 kg, and outer part (36 m) was 16.10 kg, respectively. It can be concluded that the numbers for anchovy fish at each depth do not differ (p>0.05), which means that the depth does not affect the type of anchovy fish.

Anchovy fish are pelagic fish that inhabit coastal waters and estuaries, based on the results obtained by researchers at three water depths there is no difference in the number of catches of anchovy fish this indicates that anchovy fish can still be at that depth range and light maybe to the bottom so that the waters can be said to be fertile waters [4, 10, 16]. Following its habitat, anchovy fish can be found at depths of 10 to 60 meters with temperatures between 26°C to 32°C [2, 10, 16].
3.2. Types of fringescale sardine (Sardinellla fimbriata)
On Figure 2b, it shows that the type of fringescale sardine obtained an average value at each depth, depth of inner part (24 m) was 0.85 kg, middle part (30 m) was 1.72 kg, and outer part (36 m) was 2.65 kg. It can be concluded that the number of fringescale sardine at each depth is different. ANOVA stated that based on p-value, there was a significant occurrence found among its depth (P<0.05) it is clearly indicates that the depth effects on the distribution of fringescale sardine. This is due to factors that influence the spread of a type of fish in the waters, including competition between species and intra-species, heterogeneity of the physical environment, reproduction, availability of food, water currents, and wind [6, 10, 13, 17].

3.3. Type of ponyfish (Leiognathus sp.)
The type of ponyfish obtained an average value at each depth, depth of inner part (24 m) was 0.31 kg, depth of middle part (30 m) was 1.37 kg, and depth of outer part (36 m) was 0.63 kg (Figure 2c). It can be concluded that the number of ponyfish at each depth differ (p<0.05). Thus, ponyfish is not difficult to find below a depth of 30 m.

Habitat of ponyfish stretch is in coastal waters with a depth of 3-24 meters in groups to form a herd, according to the results of researchers that the largest number of ponyfish is in waters with a depth of below 30 meters [7, 9, 18,]. Moreover, ponyfish has a very low resistance to fishing; this is due to the relatively low distance and relatively low mobility. Yet, ponyfish cannot survive with significant changes in current speed [8, 9, 18].

![Figure 2. Total catches of three fishes in Hajoran Coast of Central Tapanuli District](image)
*Connected line = no significant different between pairwise.*

4. Conclusion
Based on the results of the study, it concludes that from the types of anchovy (Stolephorus sp) and fringescale sardine (Sardinellla fimbriata) was discovered more at a depth of 36 meters, while ponyfish (Leiognathus sp) was found more at a depth of 30 meters. It obviously states that different depth effects on total catches of fish in term of weight of fish (kg). ANOVA reveals that pony fish and fringescale sardine have a significant different upon depth (p<0.05), while anchovy fish did not differ (p>0.05). These finding result help in understanding how fish in Hajoran Coast can be found in different depth with different species.

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