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Original research article

The Effectiveness of Traditional Traps Fishing Gear (Bubu) at Nusantara Fishing Port of Tanjungpandan (NFPT), Belitung Regency

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ABSTRACT

Bubu is a non-selective fishing gear in which the types of fish caught varied, especially demersal. Among several fishing gears, bubu has high economic value, so the demand for fisheries resources caught by bubu has increased. This research aims to identify the construction of a particular fishing gear (bubu) and analyze its caught result effectiveness. The research was conducted from March- April 2022 in Nusantara Fishing Port of Tanjungpandan (NFPT), Belitung Regency. Methods used in this research were descriptive analyses, which collected the data directly through interviews with the critical person fishermen who used Bubu. The number of critical persons is determined using the census method, resulting in 46 key persons being interviewed. The methods used to identify the effectiveness of caught results were seen from the main species caught, production per trip, fishing ground, and fishing gear construction. Results showed that bubu has constructions consisting of a body frame made of wood and rattan, a mouth frame made of wires, with 100-155 cm length, 60-165 cm wide, 20-85 cm height, and the outer mouth diameter is 30-50 cm, mouth wide is 10-25 cm while the inner mouth diameter is 20 cm with 3 cm mesh size. The effectiveness of bubu as the fishing gear was 80%, showing that bubu was practical to use.

Introduction

Nusantara Fishing Port of Tanjungpandan (NFPT) is a type B port that has levelled up from Coastal Fishing Port since 2011 (MMAF, 2020). The existence of NFPT Tanjungpandan, located in the South China Sea management area with a sustainable potential, is 1,2 billion tons/year. This port can be improved to anticipate the fishery resources potential in this area to improve the economic growth in Belitung Regency (NFPT, 2020). Fishing gears used by the fishermen in this port consist of handlines, bubu, arrows/spear, drifts gill nets, fixed gills nets, bouke ami,

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bottom longline, and traps. Bubu is the Belitung regency's most frequently used fishing gear, comprising 15.475 units (Dahlan, 2011). The coral reef ecosystem is small-scale fishermen's most dominant fishing area (Adibrata, 2018). The massive number of fishermen using bubu is because of its affordability by small-scale fishermen in Belitung Regency. Each fisherman could have 5-10 units.

Generally, Bubu is made from bamboo and rattan, which is easy to find in Belitung Regency (Dahlan, 2011). Bubu has a passive characteristic. It traps fish inside and makes fish challenging to escape. The main target of this fishing gear is demersal fish. Among many fishing gears, Bubu has good economic value, a high market price, and good quality because it results in fresh caught and environmental-friendly results. It does not jeopardize ocean ecosystems such as coral reefs. However, there needs to be a study that identifies the construction and its effectiveness. This research is expected to fulfill the information regarding the caught result analyses using Bubu, its construction, the caught result compositions, and its effectiveness in the Nusantara Fishing Port of Tanjungpandan, Belitung Regency.

Methods

The research was conducted on March 2022, located in Nusantara Fishing Port of Tanjungpandan (NFPT), Belitung Regency, Bangka Belitung Islands Province (Figure 1)**.** The method used in this research was the descriptive analysis by collecting the data directly from the fishermen who use Bubu as fishing gear. The data was collected through interviews. The number of fishermen interviewed was decided through census and resulted in 46 interviews. Refers to Prasetyo (2005), the sampling technique using the census aims to get more information complete about the actual situation because the population is investigated unconditionally. This census method is usually known as total sampling or Complete Enumeration. It is used when the population number is manageable. The total number of fishing boats using Bubu in NFPT Tanjungpandan was 46 (NFPT, 2022). Tools and materials used in this research were a camera, questionnaire, stationery, ruler, GPS, and software (Microsoft Office and Excel). The construction of fishing gear was analyzed by visiting the location directly and collecting the data on Bubu by observation.

Furthermore, the data was analyzed to see the effectiveness of caught Results using Bubu. Caught results are divided by the main species caught, productions per trip, fishing ground, boat volume, total trip, and the construction of Bubu. Those six items were analyzed using the Linkert scale. According Yulistiana (2008) *in* Safitri (2011), the percentage level of effectiveness of fishing gear is analyzed by Equation (1). Thus, after the calculation was done, it was standardized using the effectiveness ratio.

$$\text{Effectiveness} = \frac{Actual\ Score}{Expected\ Score}\ x\ 100\% \quad \text{.....(1)}$$

Information:
Actual Score = ∑ Frequency of Respondent's answer x Answer score
Expected Score = ∑ Respondent x highest Score x total items
Source: Yulistiana (2008) in Safitri (2011)

Table 1. The standardized using the effectiveness ratio.

Effectiveness Ratio	Standard
< 40 %	Very ineffective
40%-59,9%	Not Effective
60%-79,9%	Effective
>80%	Very Effective

Source: Ministry of Home Affairs (1991) *in* Budiani (2009)

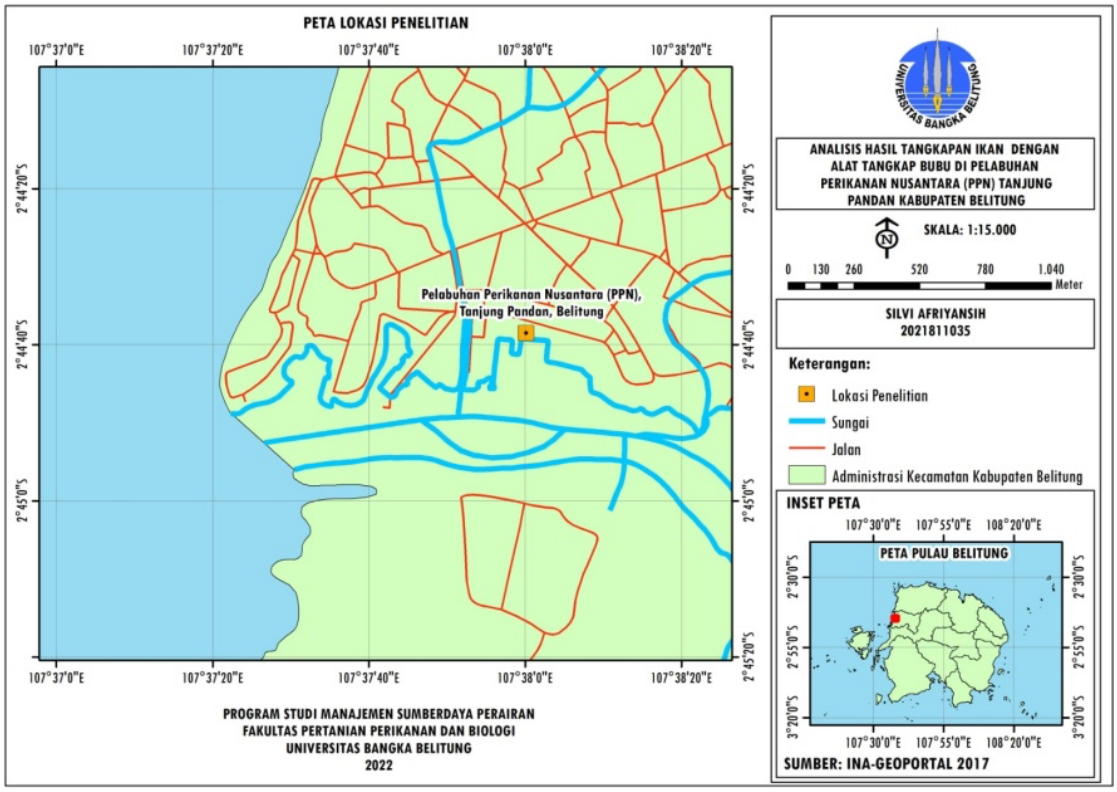

Figure 1. Research Location

Result and Discussion

The Construction of Bubu

Based on interview results from 46 fishermen who use Bubu in PPN Tanjungpandan, the construction of Bubu consists of a frame, body, and mouth of various sizes. The body and mouth were made using the same material. The Result showed that the body frame was made from wood and rattan, while the mouth was made from wires with a length range from 100-155 cm, the wide was 60-165 cm, 20-85 cm high, and the outer mouth diameter was 30-50 cm, and the wide of the mouth was 10-25 cm while the mouth diameter was 20 cm with 3 cm mesh size (Table 2).

The construction of Bubu in NFPT Tanjungpandan was dominated by rattan and wooden materials. Bottomline Bubu in NFPT Tajungpandan has three main construction parts: frame, body, and mouth. Rahman (2020), Bubu shapes vary, such as squares, elongated triangles, cylinders, trapezium, drums, half-cylinders, multi-facets, and parallel circles.

Table 2. The Construction of Bubu

No	Body Frame					Mouth		
	P (cm)	L (cm)	T (cm)	Frame Material	Body Material	P (cm)	L (cm)	Mouth Material
1	150	100	80	Rattan	Wire	30	20	Wire
2	155	100	45	Rattan	Wire	40	20	Wire
3	129	100	48	Rattan	Wire	40	20	Wire
4	130	120	40	Rattan	Wire	50	15	Wire
5.	120	80	40	Rattan	Wire	50	15	Wire
6	120	100	50	Rattan	Wire	40	15	Wire
7	150	100	50	Rattan	Wire	50	25	Wire
8	130	110	60	Rattan	Wire	50	25	Wire
9	150	100	40	Rattan	Wire	50	25	Wire
10	100	70	47	Rattan	Wire	40	15	Wire
11	150	100	80	Rattan	Wire	50	20	Wire
12	155	120	65	Rattan	Wire	50	20	Wire
13	150	100	80	Rattan	Wire	50	20	Wire
14	150	100	85	Rattan	Wire	35	15	Wire
15	100	60	40	Rattan	Wire	50	15	Wire
16	150	100	50	Rattan	Wire	30	15	Wire
17	100	70	40	Rattan	Wire	45	15	Wire
18	100	60	40	Rattan	Wire	50	10	Wire
19	155	120	65	Rattan	Wire	40	20	Wire
20	155	120	65	Rattan	Wire	40	20	Wire
20	100	80	40	Rattan	Wire	30	15	Wire
21	100	70	40	Rattan	Wire	50	15	Wire
22	100	80	20	Rattan	Wire	50	15	Wire
23	100	70	40	Rattan	Wire	50	15	Wire
24	135	165	65	Rattan	Wire	50	10	Wire
25	100	80	20	Rattan	Wire	50	10	Wire
26	100	80	30	Rattan	Wire	50	15	Wire
27	150	100	40	Rattan	Wire	50	20	Wire
28	150	100	30	Rattan	Wire	40	15	Wire
29	130	160	60	Rattan	Wire	50	10	Wire
30	100	70	40	Rattan	Wire	30	15	Wire
31	100	70	40	Rattan	Wire	45	15	Wire
32	100	60	40	Rattan	Wire	50	10	Wire
33	155	120	65	Rattan	Wire	40	20	Wire
34	155	120	65	Rattan	Wire	40	20	Wire
35	150	110	60	Rattan	Wire	30	20	Wire
36	155	120	65	Rattan	Wire	40	20	Wire
37	100	80	40	Rattan	Wire	30	15	Wire
38	100	80	40	Rattan	Wire	30	15	Wire
39	100	70	40	Rattan	Wire	50	15	Wire
40	100	80	20	Rattan	Wire	50	15	Wire
41	100	70	40	Rattan	Wire	50	15	Wire
42	150	100	40	Rattan	Wire	50	20	Wire
43	150	100	30	Rattan	Wire	40	15	Wire
44	100	70	35	Rattan	Wire	50	20	Wire
45	100	80	40	Rattan	Wire	50	15	Wire
46	100	70	20	Rattan	Wire	50	15	Wire

1. Frame

The frame functions to give a shape to Bubu. The bottom line Bubu frame in PPN Tanjungpandan was varied by size; the total length range was 100-155 cm, 60-165 cm wide, 20-85 cm, and the outer mouth diameter was 33 cm while the inner mouth diameter was 20 cm. This fishing gear has many facets and is made of rattan (Figure 2). Rattan was used due to the resource that exists in Nature and due to its affordability.

2. Body

The body of the bottom line bubu in NFPT Tanjungpandan was made from wire matting of 1-meter size and 0,5 meters wide, with various bubu sizes. The weight was made from corals or broken reefs and tied up in every corner. Fishermen got the corals from the island during their trip, functioning to sink Bubu. Based on the study (Martasuganda, 2008), the wires used in Bubu use wire last longer than other materials. The Bubu's body shape was cage-like, which was used to trap the fish that came inside (Fachrussyah, 2020).

3. Mouth

Based on the interview and observation, the mouth has a funnel-like shape. Materials used on the mouth part was wires with various mouth size. The most considerable mouth size was 50 cm long and 25 cm wide, and the smallest size was 30 cm long and 10 cm wide. The mouth functioned as the door where fish entered the trap and was located in the front of the construction. The mouth has a 33 cm outer diameter and 20 cm inner diameter with a 3 cm mesh size. There was a funnel on the mouth, so fish could not escape (Lukman, 2013). Bottomline Bubu in NFPT Tanjungpandan also has additional weight as the anchor using the bricks, corals, or rock stones from the island's side. The buoy function was to give the floating power in the centre between the bottom line and the weight. Connecting tie was used on the bottom and the anchor. The buoy used was plastic bottles or using foam and net buoy.

Figure 2. The Construction of Bubu

The Effectiveness of Bubu as Fishing Gear

During the work process at sea, the trap is placed in front of the coral mound from the direction the water currents are coming from; the mouth of the trap is installed facing the reef so that the fish come out of hiding and welcome the water currents which contain food so that the fish are expected to enter the trap (Adibrata, 2018). This information becomes the basis for confirmation with fishermen using traps in Tanjungpandan. Based on the research result, the effectiveness of traditional traps (bubu) as fishing gear consisted of some parameters, including input, process, and output:

1. Gross Tonnage (GT)

This study found that the boat volume range was 2-22 GT with a value

of 3 and was categorized as moderately good. It is because the volume of the boat was significant. The results of the analyses using the Linkert scale portrayed the details about the number of boats. The volume under 5 GT consisted of 2 boats, while in the range of 5-20 GT, there were 43 boats. Next, a boat with a volume >20 GT was 1. Furthermore, it resulted in the input parameter being calculated from the dominant number of boats. The study by Kisworo et al. (2013) stated that the greater the gross tonnage of the ship, the higher the catch.

2. Fishing Gear Construction

The construction of traditional trap fishing gear (bubu) in NFPT Tanjungpandan was categorized as environmental-friendly fishing gear because it is passive. It does not have a destructive impact on the surrounding ecosystem. Based on the criteria made by the Marine and Fisheries Department in 2006, Bubu has high selectivity and does not deteriorate the surroundings and organisms. It also produces high-quality fish and does not jeopardize fishermen, by-catch fishermen are low, and the product (fish) caught by this fishing gear is safe for the consumer (Subehi et al., 2017).

3. Boat Trip

Boat trips in NFPT Tanjungpandan were conducted for 5-10 days/ trip, with the caught Result reaching>500 kg with more than ten species. Boat trips are related to effectiveness based on the total day trip. The longer the trip, the higher the number of caught Results. It refers to the study from Dewi et al. (2020) that showed that the more significant total time of the trip would also result in the bigger caught Result. In other words, it will give a win for the fishermen.

4. Fishing Ground

The fishing ground of fishermen who use bubu in NFPT Tanjungpandan was around Pongok Island waters in Belitung Regency, Tanjung Merun waters in South Bangka Regency, and Karang Gading waters in Bangka Regency. Those fishing grounds were the area still inside Bangka and Belitung zone. Based on Law Act 32 in 2004 about local autonomy in marine and fishery, the local government has rights to manage the fishery in that zone, including the fishing ground. The zone that becomes the rights of the local government is 12 miles from the sea zone. Furthermore, the fishing ground of bubu fishermen in Tanjungpandan waters was 12-15 miles from the coastal zone. In capture fishery, especially fish trap fishermen who catch bar-cheeked coral trout grouper, the availability of bathymetry is essential information. Mapped coordinates and corrected bathymetries for 12 months become a reference for those fishermen diving to set and take up their fishing traps with measured time duration and being a referenced fishing grounds. By changing months and years, For the grouper fishermen, recorded coordinate spots and bathymetry have proven as fishing grounds and become vital in operating their business. Based on the information, setting and taking up fish traps are hopped optimally, catching many fish (Adibrata et al., 2019). Kekenussa (2017) says fish use bubu for shelter and curiosity. Fish will swim closer to the Bubu, follow the Bubu body and stop again in front of the entrance. Fish that do not enter the Bubu is caused by several factors, among others, because there are predatory fish in the Bubu.

5. Caught Result per Trip

The caught results produced using Bubu in NFPT Tanjungpandan reached >500 kg in 5-7 days/trip. The catch results depended on how long the trip was. Besides, some factors influenced the caught results, such as weather, caught season, and internal factors like boat machines and several fishermen in one boat. Yellowtail is an essential Bubu fish catch with high economic value; of course, it can encourage an increase in

yellowtail fishing and affect its population (Rapella *et al*., 2019).

6. Main Species in Caught Result

The species caught were varied, with the main species caught being Orange-spotted spinefoot (*Siganus guttatus*) (local name = Libam / baronang), Golden trevally (*Gnathanodon speciosus*) (local name = Manggali / Kuwe macan), Lethrinus lentjan (*Lethrinus lentjan*) (local name = Ketambak / Lencam), Brown-marbled grouper (*Epinephelus fuscoguttatus*) (local name = Kerapu macan), Starry triggerfish (*Abalistes stellatus*) (local name = Jebung / Ayam-ayam), Brownstripe red snapper (*Lutjanus vittus*) (local name = Ganas / umela), Redbelly yellowtail fusilier (*Caesio cuning*) (local name = Ekor kuning), Blue-barred parrotfish (*Scarus ghobban*) (local name = Ketarap / Kakatua), Areolate grouper (*Epinephelus areolatus*) (local name = Kerapu sawar), Painted sweetlips (*Diagramma pictum*) (local name = Seminyak / Gajih), Crimson snapper (*Lutjanus erythropterus*) (local name = Kakap merah / Bambangan), Leopard coral grouper (*Plectropomus leoparius*) (local name = Kerapu sunu). Brown et al., (2016) that the demersal fish is a type of fish whose habitat is at the bottom of the waters; the demersal fish is fish caught using essential fishing gear.

Based on the analyses of 6 parameters, it can be explained that bubu was adequate for the fishermen in NFPT Tanjungpandan. In addition, the average value on the Linkert scale calculation was 80%, which is very practical. Besides, the effectiveness of fishing is also influenced by fishing gear construction, fish behavior, resources, oceanography condition and the caught season (Bakari & Baruadi, 2020). The concept of area utilization for sustainable fisheries exploited by small-scale fishermen requires careful regulation (Adibrata, 2018). Management strategies require effective regulation and monitoring to ensure population stability (Rhodes et al., 2016; Adibrata et al., 2019). Therefore, in a sustainable fisheries management framework, trap fishing gear is much-needed information (Apriliani et al., 2018).

Table 3. Value of Input Parameter in The Effectiveness of Bubu

No	Questions	Point	Result	Value
1	Boat Volume	<5 GT = 1 5-20 GT = 3 > 20 GT = 5	2-22 GT	3
2	Fishing Gear Construction	Not Environmental-friendly =1 Environmental-Friendy=5	Environmental-Friendly	5

Table 4. The value of Process Parameter in The Effectiveness of Bubu

No	Question	Point	Result	Value
1	Boat Trip (Day)	<3 days = 1 3-7 days =3 >7 days =5	5-10 days	5
2	Fishing Ground	<10 Miles=5 10-15 Miles =3 >15 Miles =1	12-15 Miles	3

Table 5. The Value of Output Parameter in The Effectiveness of Bubu

No	Question	Point	Result	Point
1	Caught Result Per trip	<100 Kg = 1 100 kg -1 Ton = 3 > 1 Ton = 5	200-950 Kg	3
2	Total Species Caught	<4 Species=1 4-10 Species=3 >10 Species=5	12 Species	5

Conclusion

As fishing gear in NFPT Tanjungpandan, Bubu has a construction consisting of the same materials made from rattan. However, the sizes vary with the range length 100-255 cm, wide range from 60-165 cm, and height 20-85 cm. The body and mouth were made from wires. The outer mouth side is 30-50 cm long and 10-25 cm wide, while the inner mouth side has 20 cm in length with a 3 cm mesh size. The Result using the Linkert scale showed that based on six effectiveness parameters, the effectiveness of bubu as fishing gear in NFPT Tanjungpandan was 80% and standardized as very practical to be operated in NFPT Tanjungpandan.

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