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Construction and Design of the Dragon Trap in Insit Village, Tebing Tinggi Barat District, Kepulauan Meranti Regency, Riau

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Abstract
This study aims to examine the construction and design of dragon traps used by fishermen in Insit Village, Tebing Tinggi Barat Sub-district, Meranti Islands Regency, Riau Province. Dragon traps are passive and environmentally friendly fishing gear that have only been used since 2022, primarily targeting shrimp, with bycatch including fish and crabs. The research was conducted over two weeks from August 26 to September 9, 2024, using survey and field observation methods. Data were collected through direct measurements of the fishing gear, interviews with fishermen, and visual documentation. The results showed that the dragon traps have a total length of 15 meters, with the main structure consisting of 36 galvanized iron frames. The trap body is made of polyethene (PE) netting with a mesh size of 0.5 inches, measuring 40 cm in length, 45 cm in width, and 30 cm in height. It has 32 entry holes (*ijep)* arranged alternately. Other components include two catch-holding chambers measuring 50 cm in length, 38 cm in width, and 25 cm in height, PE binding ropes, and 5-meter-long stakes. The fishing location is in shallow, muddy waters with a depth of 2–3 meters and approximately 150 meters from the shoreline. During the study, the dragon traps caught 120 kg of white shrimp (*Penaeus merguiensis)* out of a total catch of 149 kg. This indicates that the *bubu naga* is quite effective in capturing shrimp as its main target species.

1. INTRODUCTION

The Meranti Islands City has an area of 3,707.84 km² located at coordinates between approximately 00°42'30"–01°28'00"N and 102°12'00"–103°10'00"E, situated on the eastern coast of Sumatra Island. The Meranti Islands Regency has 9 subdistricts, one of which is Tebing Tinggi Barat Subdistrict. Tebing Tinggi Barat Subdistrict is one of the subdistricts in the Meranti Islands Regency, and part of its territory is located near the coast. Therefore, the community relies on the sea as their main source of livelihood, especially the community in Insit Village, which uses dragon traps as one of their fishing tools. The bubu naga fishing gear, in terms of its method of operation, is a fishing gear for fish and other biota that is categorized as *a* trap. This fishing gear is passive and is commonly known among fishing communities (Zulkarnain, 2012).

The dragon trap is an environmentally friendly fishing gear with shrimp as the main catch and fish and crabs as by-products (Rizky et al., 2018). A good fishing gear is designed and manufactured in a specific way after careful consideration. In the fishing industry, the fishing gear used by fishermen greatly

affects the catch, because the effectiveness of the fishing gear determines a better catch. A preliminary survey by Melianti et al. (2023) showed that there was a fishing gear similar to a bubu, namely the bubu naga, at PPP Bondet, which had only been in use for about 3 months in 2021. The bubu naga is also a modification of the basic bubu fishing gear that has only been in use since the COVID-19 pandemic (Hadi et al., 2022).

The dragon trap is believed to originate from Southeast Asia, particularly Indonesia, Malaysia, Thailand, and Vietnam. The name "dragon trap" itself comes from its shape, which resembles a dragon's body. This fishing gear has been used traditionally by coastal communities. It has entrances on both the right and left sides of the trap. These entrances allow fish to enter the dragon's net. The dragon net is long and snake-like in shape, with alternating entrances and can be folded. The dragon net consists of a cover net, entrances, a frame, and a bag (Melianti et al., 2023). The dragon trap is classified as a passive fishing gear, which is placed in a body of water (sea, river, or pond). The dragon trap is used to catch or trap fish in rivers, ponds, seas, estuaries, and so on. The construction of a fishing gear is a general form that clearly describes a fishing gear and its parts so that it can be understood. Meanwhile, the design of a fishing gear is a combination of making a fishing gear, which includes the size, scale, description in the form of agreed terms and codes, specifications, and design identification.

The dragon trap is a new fishing gear used in Indonesia, and research on this gear is still limited. Furthermore, not many areas operate dragon traps. To determine the effectiveness of the fishing gear used by fishermen, research on the construction and design of this gear was conducted. The construction and design greatly affect the success of the fishing gear in carrying out fishing operations. Therefore, accurate data is needed to be used in developing further research on dragon net fishing gear. This data can help researchers and fisheries practitioners to improve the efficiency and effectiveness of the use of dragon net fishing gear. The purpose of this study was to determine the construction and design of dragon net fishing gear used by fishermen in Insit Village. The benefits of this study are expected to assist in the development of techniques for manufacturing and assembling dragon net fishing gear to produce fishing gear that is more effective and efficient in the use of materials, and adopts the latest fishing technology used by fishermen.

2. RESEARCH METHODS

Time and Place

This research was conducted from August 26 to September 9, 2024, in Insit Village, West Tebing Tinggi District, Meranti Islands Regency, Riau Province.

Material and Method

The methods used in this research were survey and observation, namely by conducting observations, collecting data and information directly, and interviewing fishermen in Insit Village. Data collection on fishing gear was carried out when the fishing gear was not in operation, so that measurements could be easily taken.

Procedures

Data was collected by measuring and examining fishing gear using the following procedures: 1) Construction and design: data on fishing gear was collected by directly observing and measuring the fishing gear samples for each component of the fishing gear. 2) Measurements of dimensions and collection of information on the types of materials and types used were carried out in accordance with the sequence of main components and supporting components. 3) Description of the construction and design of the fishing gear.

3. RESULTS AND DISCUSSION

Construction and Design of the Bubu Naga

The dragon trap is a fishing gear that has been used by fishermen in the Meranti Islands Regency since 2022. This fishing gear is used to catch various types of shrimp and other fish. This trap is effective

for passive fishing, allowing fish to enter the trap without direct interference from fishermen. The dragon trap works by utilizing tidal conditions to capture marine life. This fishing gear is usually placed in waters affected by tides. The trap is usually operated by a motorboat equipped with a pulley. When the tide comes in and goes out, fish and crustaceans are directed into this trap and get caught. The construction of traps used by fishermen today greatly affects existing resources. This is because the use of traps often catches small target species (Tuhumuri et al., 2022).

Fishing gear construction is a common form that describes a fishing tool and allows for the development of fishing gear construction so that when fishing operations are carried out, optimal results can be obtained without damaging the waters (Pattiasina et al., 2020). These traps are operated using pompong boats made of meranti wood powered by diesel engines. In general, the dragon trap consists of a body, a funnel, and a cavity or bag where the fish are trapped. The mouth of the trap is funnel-shaped, serving as an entrance where fish can enter but cannot escape (Mukhlish, 2012). The dragon trap in this study has dimensions of 15 m in length, 0.4 m in width, and 0.3 m in height. This fishing gear has structural components such as the frame of the trap, the net body, the entrance (ijep), the trap bag, and ropes and poles.

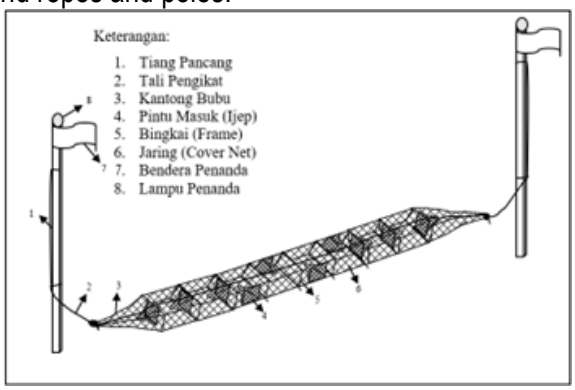

Figure 1. Dragon Bubu Construction

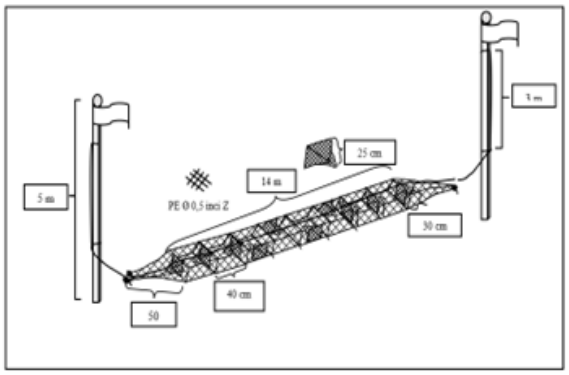

Figure 2. Dragon Bubu Design

This fishing gear uses a 3 mm diameter iron frame, which is then coated with plastic. The purpose of the plastic coating is to prevent the iron frame from rusting due to exposure to seawater. Each dragon trap consists of 36 frames, which indicates that this fishing gear is designed with a large number of components to increase its fish-catching capacity. The dragon trap is made using a rust-resistant galvanized iron frame, which is then coated with D6 PE thread netting, where the distance between the netting and between the netting and the iron frame is tightly and strongly woven. Galvanized iron is iron coated with zinc to protect it from corrosion or rust. Factors such as design, arrangement, location selection, and suitability of the tool to the aquatic environment greatly affect the effectiveness of fishing gear (Rosyidah et al., 2011).

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The body of the dragon trap net is made of PE (Polyethylene) and D6 thread with *a mesh* size of 0.5 inches, which is commonly used by fishermen to catch various types of shrimp. The 0.5-inch mesh size allows medium to large catches to enter the trap, but they cannot easily escape once trapped. PE (Polyethylene*)* is used because it is lightweight and floats in water. However, it has a high level of elasticity and a smooth surface (Ardidja in Alwi et al., 2020). In this study, the dragon trap net has 32 entrance

holes (ijep) made of polyethylene (PE) material, with a 25 cm long ijep door pull rope and a distance of 20 cm between the front of the ijep and the back. The entrance holes on the dragon trap net are located on the left and right sides alternately, with a flat shape that tapers inward.

The upper and lower entrance doors have the same angle of inclination, which is 40º. According to Aditya et al. (2020), the angle of inclination of the trap entrance door, together with the mesh size, has a significant effect on the amount of catch. The mouth of the trap is made of green PE (Polyethylene) material with 380/d6 thread and 0.5-inch mesh size. The construction of the door and entrance path of the trap is one of the factors that influence the success of fish capture using traps (Wijayanti et al., 2018). An optimal trap mouth design will facilitate the entry of crustaceans, thereby reducing the possibility of failure (Susanto et al., 2014).

The trap bag is located at the front and rear of the net body to facilitate the removal of the catch during the hauling process. The trap bag measures 50 cm and has a cone shape that can be opened and closed, and is tied using a pull knot. According to Von Brandt in Nugroho (2004), the main principle in operating a trap is to ensure that the target biota is trapped inside the trap body. The binding rope system used is made of 6 mm diameter PE (polyethylene) with a length of 3 m for each trap, serving to connect one trap to another in a single fishing gear unit. This binding rope is also tied to a stake, which acts as a retaining system to keep the trap in the desired position on the seabed. To prevent the dragon traps from being carried away by ocean currents or disappearing, fishermen use mooring poles to hold the fishing gear in place. These mooring poles are 5 m long, and fishermen generally use 3-4 mooring poles, depending on the number of dragon traps used. These sturdy mooring poles are very important for maintaining the stability of the fishing gear, so that the traps remain in the fishing area.

As a marker for the location of the fishing gear, fishermen use flags during the day to indicate the presence of dragon traps in the water area. This is important to prevent other boats from disturbing or crossing the area. At night, to ensure that the dragon traps can still be found by fishermen, buoy lights or fishing gear marker lights are installed on each stake. These lights serve as visual markers that make it easier for fishermen to find the traps at night.

Operating Methods

The dragon trap fishing gear is operated routinely twice a day (one day of fishing) for seven days in two weeks during the fishing season. The dragon net operation process involves several stages, namely the preparation stage, searching for potential fishing locations, setting the nets, soaking the nets, and hauling the nets (Mariana in Zakry et al., 2024). Fishing using dragon traps is carried out in coastal waters with muddy bottoms. Akbar et al. (2013) also state that shrimp are a type of small crustacean usually found in shallow, muddy coastal waters. The depth of the waters used for fishing ranges from 2-3 m, with a distance of about 150 m from the coastline. According to Dollu & Maro (2019), fishermen tend to utilize areas with a depth of 0-5 m as fishing locations, as this depth falls within the category of coastal waters.

Catch Results of Bubu Naga

Catch results are very important for fishermen and the fishing industry because they determine their income and livelihood. In addition, data on catch results are also used for marine resource management and conservation to maintain ecosystem balance. During the research in Insit Village, catch data was collected twice a day, in the morning and at night. The catch data was recorded immediately after the catch was lifted, as follows:

The use of dragon traps resulted in a dominant or *main catch* of white shrimp (*Penaeus merguensis*) weighing 120 kg or 80% of the total catch, indicating that this fishing gear is effective in catching this type of white shrimp in shallow waters. Shrimp is one of the top marine products as an export commodity in international trade (Hafina et al., 2021).

Table 4. Bubu Naga Catch Results

No.	Name	Weight (kg)
1	White Shrimp (*Penaeus merguensis*)	120
2.	Red Shrimp (*Parhippolyte uveae*)	7
3.	Mantis Shrimp (*Stomatopoda*)	10
4.	Spiny (*Hexanematichthys sagor*)	6
5.	Kurau (*Eleutheronema tetradactylum*)	2
6.	Gulama (*Johnius carouna*)	4
Total		149

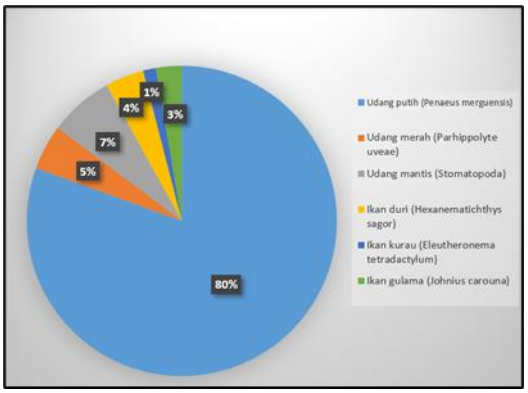

Figure 3. Percentage of Catch

The by-catch consisted of red shrimp (*Parhippolyte uveae*) with a total of 7 kg or 5% of the total catch, mantis shrimp (*Stomatopoda*) with a total of 10 kg or 7% of the total catch, spiny (*Hexanematichthys sagor)* with a quantity of 6 kg or 4% of the total catch, kurau (*Eleutheronema tetradactylum)* with a quantity of 2 kg or 1% of the total catch, and gulama (*Johnius carouna)* with a quantity of 4 kg or 3% of the total catch. According to Puspito (2012), the fishing gear used in Indonesia is generally difficult to effectively catch only one species, because Indonesian waters have very high biodiversity (mega biodiversity). Meanwhile, *the* discards from dragon traps are pufferfish, kekek fish, and eels. These species are discarded because they do not meet market demand or cannot be utilized by fishermen. For example, pufferfish contain toxins that can be harmful if consumed, while eels and kekek fish are often considered unwanted catches.

4. CONCLUSIONS

Based on the results of research conducted in Insit village, it can be concluded that the dragon trap used is 15 m long, 0.4 m wide, and 0.3 m high. The construction of the dragon trap used has components such as a frame made of 3 mm diameter galvanized iron, with a total of 36 frames. The body of the net is made of PE (*polyethene)* and D6 thread with a mesh size of 0.5 inches and has 32 entry holes (ijep) equipped with bubu bags located at the front and rear of the net body. The dragon net is tied using a 3 m long rope with a diameter of 6 mm to a 5 m long stake. The total catch during the study was 149 kg. The main catch was white shrimp (*Penaeus merguensis*) with a catch yield of 120 kg. In addition, the bycatch included red shrimp (*Parhippolyte uveae)*, mantis shrimp (*Stomatopoda)*, and several types of fish, such as spiny (*Hexanematichthys sagor)*, kurau (*Eleutheronema tetradactylum)*, and gulama (*Johnius carouna)*.

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