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CONSTRUCTION AND OPERATIONAL TECHNIQUES OF TUNA LONGLINE FISHING IN THE INDIAN OCEAN

Konstruksi dan Teknik Pengoperasian Rawai Tuna di Perairan Samudera Hindia

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ABSTRACT

Benoa Port is the main port in Bali Province and is one of the tuna landing bases in Indonesia with tuna longline fishing gear. The study aims to determine the construction and operating techniques of tuna longline. The results showed that the construction of tuna longline on KM. Perintis Jaya 66 consists of a main line made of monofilament with a length of 30 m, a branch line with a length of 15 meters, a radio buoy line (radio buoy line) with a length of 15 meters made of polyethylene, a buoy line (buoy line) with a length of 10 meters made of polyethylene, a float (float) made of plastic with a total of 84 pieces, fishing gear equipped with a radio buoy that functions to determine the location of the tuna longline when hauling and a fishing hook of the circle hook / J4 type made of stainless steel. The process of lowering the tuna longline fishing gear (setting) starts from 07.00-13.00 and takes 6 hours. The fishing gear is immersed for approximately 10 hours, calculated from the time of the first radio buoy launch. Hauling takes place between 5:00 PM and 6:00 AM ship's time. The vessel operates at a speed of 1-2 knots, following the main line on the starboard side at a 45° angle to the ship's bow.

Keywords: Construction, Operational Techniques, Tuna Longline

ABSTRAK

Pelabuhan Benoa merupakan pelabuhan utama di Provinsi Bali dan menjadi salah satu basis pangkalan pendaratan ikan tuna di Indonesia dengan alat tangkap rawai tuna. Penelitian bertujuan untuk mengetahui konstruksi dan teknik pengoperasian rawai tuna. Hasil penelitian menunjukkan bahwa konstruksi rawai tuna pada KM. Perintis Jaya 66 terdiri dari tali utama berbahan *monofilament* dengan panjang 30 m, tali cabang (*Branch line*) dengan panjang 15 meter, tali pelampung radio buoy (*radio buoy line*) panjangnya 15 meter dari bahan *polyethylene,* tali pelampung *(buoy line)* panjang 10 dari bahan *polyethylene*, pelampung (*float*) dari bahan plastik dengan jumlah 84 buah, alat tangkap dilengkapi *radio buoy* yang berfungsi mengetahui letak rawai tuna ketika akan melakukan hauling dan mata pancing dari jenis *circle hook*/J4 yang terbuat dari bahan *stainless steel*. Proses penurunan alat tangkap *(setting)* tuna

long line dimulai sejak pukul 07.00-13.00 dan membutuhkan waktu 6 jam. Perendaman alat tangkap *(immersing)* dibiarkan selama kurang lebih 10 jam dihitung dari waktu Radio buoy pertama. Penarikan alat tangkap *(hauling)* dilakukan pada pukul 17.00-06.00 waktu kapal. Kapal menggunakan kecepatan 1-2 knot, mengikuti arah tali utama (main line) pada posisi lambung kanan arah 45˚ haluan kapal.

Kata Kunci: Konstruksi, Rawai Tuna, Teknik Pengoperasian

INTRODUCTION

The Indian Ocean waters stretching from western Sumatra to southern Bali and Nusa Tenggara are one of the fishing areas for fishermen in Indonesia. Utilization of fish resources in the Indian Ocean waters has driven an increase in the capacity of tuna fishing efforts. Tuna longline fisheries in Indonesia have developed since 1972 (Nugraha & Hufiadi, 2013). Benoa Port is the main port in Bali Province and is one of the tuna landing bases in Indonesia besides Muara Baru (Jakarta), Pelabuhanratu (West Java) and Cilacap (Central Java). As one of the main tuna fishing ports, Benoa Port is the base for industrial-scale tuna fishing vessels operating in the Indian Ocean waters. The development of fish resource utilization in the Indian Ocean waters has driven an increase in fishing capacity. Barata et al, (2011) stated that tropical waters are suitable areas for catching yellowfin and albacore in the Indian Ocean. One of the most potent fishing gears for tuna fishing is the longline, which is used at depths of 260-525 feet (80-160 meters) (Rahayu et al., 2024).

Tuna longlines are a fishing gear used by the Indonesian fishing industry, primarily targeting tuna, which has significant economic value (Jatmiko et al., 2017). Tuna longlines are one of the most commonly used fishing gear in Indonesia for catching tuna and large pelagic fish (Annida et al., 2023). Tuna longlines are used to catch large pelagic fish, including tuna (Saputra et al., 2012). Tuna longlines generally consist of buoys, flags, buoy lines, main lines, branch lines, fishing lines, and wire leaders. The buoys are connected to each other by buoy lines and main lines, with several branch lines attached along the main line. This set of gear is called a longline basket. The number of hooks per basket varies (Sudirman and Mallawa, 2004). The hook used for tuna fishing is a type C (Cicago) circle hook (Karyanto et al., 2014).

Based on the description above, the success of tuna longline operations is largely determined by the construction and operating techniques of the tuna longline. Therefore, to understand this, a study of the construction and operating techniques of tuna longlines is necessary.

RESEARCH METHODS

The equipment used was a longline vessel and tuna longline fishing gear, while the materials used were a questionnaire and writing materials. The research method employed direct observation and conducted fishing activities at sea. Data analysis employed qualitative descriptive methods. The analysis focused on the construction and fishing techniques of the tuna longline.

Fishing activities were conducted from January to March 2024, with the fishing area located in the Indian Ocean, using the vessel KM. Perintis Jaya 66.

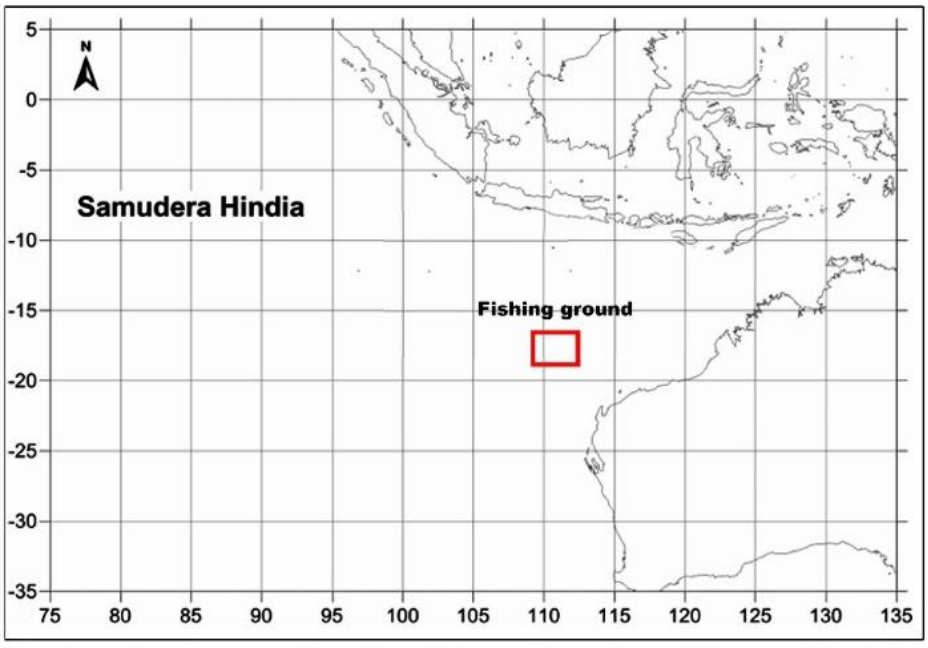

Figure 1. Research Location

RESULT

Fishing Gear Specifications

The specifications of the KM. Perintis Jaya 66 tuna longline consist of a monofilament main line, monofilament branch lines, polyethylene radio buoy lines, polyethylene float lines, circle hooks, radio buoys, and floats, as shown in Table 1.

Table 1. Table 1. Specifications of the KM. Perintis Jaya 66 tuna longline

No	Name	Materials	Long	Amount
1	Main line	Monofilament	30 m	1,512 pieces
2	Branch line	Monofilament	15 m	1,428 pieces
3	Radio buoy line	Poliethylene	15 m	1 piece
4	Buoy line	Poliethylene	10 m	84 pieces
5	Circle hook	Steinless steel	-	1,428 pieces
6	Radio buoy	-	-	1 piece
7	Buoy	Plastik	-	84 pieces

Catch

Based on the research results, it was found that the main catches were 60 bluefin tuna (Thunnus maccoyii), 30 yellowfin tuna (Thunnus albacares), 20 bigeye tuna (Thunnus obesus) and 200 albacore (Thunnus alalunga) (Figure 2). According to Novianto & Nugraha (2014), the target fish caught in the Indian Ocean are bigeye tuna (Thunnus obesus), yellowfin tuna (Thunnus albacares), southern bluefin tuna (Thunnus maccoyii), and albacore (Thunnus alalunga). Bigeye tuna (Thunnus obesus) is the dominant species in every fishing trip in the Indian Ocean (Wudianto et al, 2003).

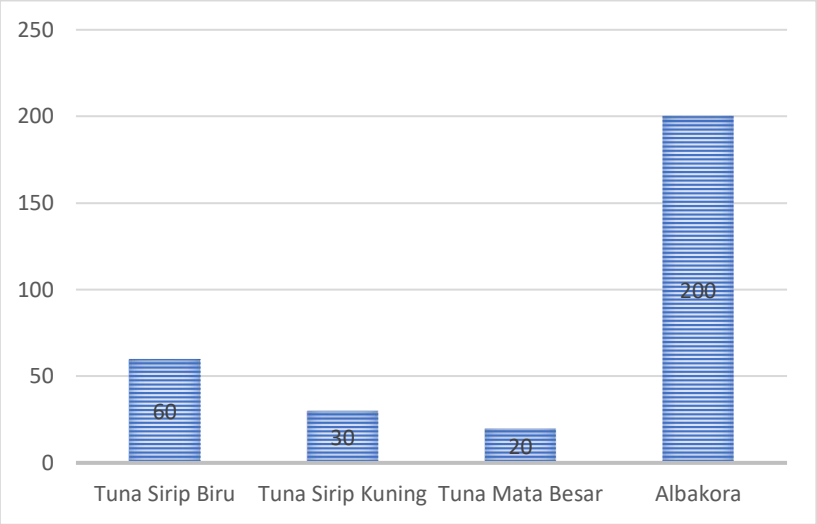

Figure 2. Number of tuna catches

Figure 3. Bluefin tuna (Thunnus maccoyii)

Figure 4. Yellowfin tuna (Thunnus albacares)

Figure 5. Bigeye tuna (Thunnus obesus*)*

Figure 6. Albacora (Thunnus alalunga*)*

DISCUSSION

Fishing Vessel Fleet

The fishing vessel used is the longline vessel KM. Perintis Jaya 66. KM. Perintis Jaya 66 has a gross tonnage of 58 and is made of wood. The vessel was built in 2009 in Banyuwangi, with a main engine of the Nissan brand with a power of 370 HP and diesel fuel. The auxiliary engine or generator set is the Mitsubishi 4D brand. The vessel is equipped with a refrigerator/freezer or cold storage to store the catch.

Figure 7. KM. Perintis Jaya 66

Tuna Longline Construction

The fishing gear owned by KM. Perintis Jaya 66 is a tuna longline consisting of a main line, branch lines, buoy lines, buoy lines, radio buoy buoys and fishing hooks or hooks. According to Rahayu, et al (2014) longline is a fishing gear consisting of a long line as the main line, on the line placed in a row of short lines also called branch lines, which have fishing hooks at the ends. Branch lines are a series of lines consisting of snaps and slap lines (Nurkalam et al., 2025). The construction of the longline fishing gear on KM. Perintis Jaya 66 can be seen in Figure 2.

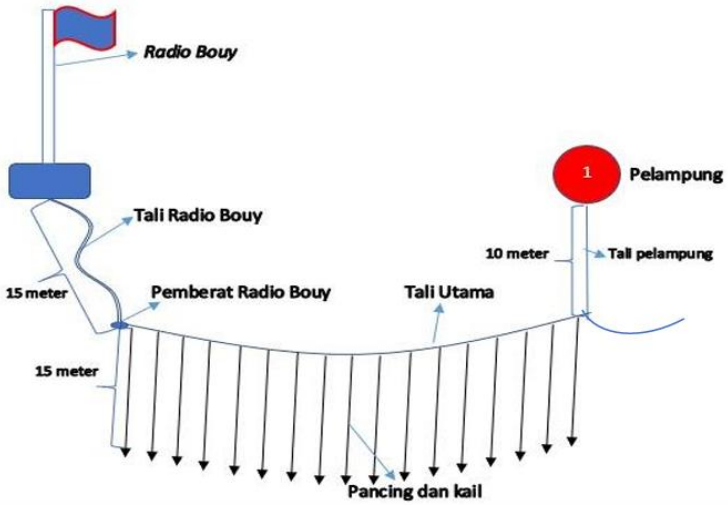

Figure 8. Tuna longline fishing gear

The parts of a tuna longline consist of a main line, branch line, radio buoy line, buoy line, radio buoy, hook and buoy:

a. main line

The main line is the monofilament longline section that serves as a place to hang the branch lines and buoys. The main line is 30 m long for each branch line. Both ends of the main line are knotted to connect them to the other main line.

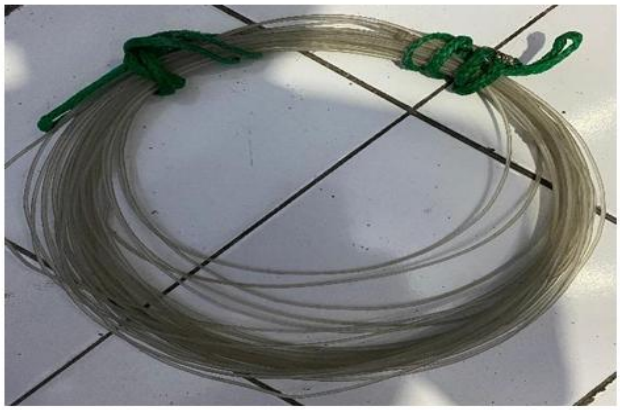

Figure 9. Main line

b. Branch line

The branch rope is a monofilament rope that is 15 meters long and is used for attaching fishing rods and bait. Each branch rope has one hook and the distance between the branch rope attached to the main rope is 30 meters. Every 16 branch ropes are interspersed with one buoy rope.

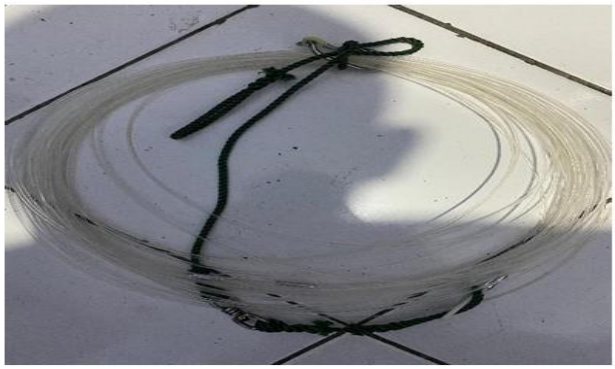

Figure 10. Branch line

c. Radio buoy line
   The function of a radio buoy rope is to tie the radio buoy to the fishing gear to prevent it from coming loose and drifting away. The 15-meter long radio buoy rope is made of polyethylene.
d. Buoy line
   The buoyancy rope is used to tie the buoy to the main rope. The buoyancy rope is 10 meters long and made of polyethylene. The top and bottom ends of the buoyancy rope are secured with snaps.
e. Lifebuoy
   The function of the float is to provide buoyancy to the fishing gear so that it doesn't sink easily. The floats are made of plastic and there are 84 of them.
f. Radio buoy
   Radio buoys function to transmit radio waves that are captured by RDF. With the presence of radio buoys, the location of tuna longlines can be identified when hauling.

Figure 11. Radio buoy

g. Fish hook
   Functions as a bait attachment, made of stainless steel, 5 cm long. The type of fishing line used is a circle hook.

Figure 12. Tuna longline fishing

Fishing Gear Operation Techniques

KM. Perintis Jaya 66 made preparations before setting sail. These included: a sailing permit (SPB), a fishing business license (SIUP), a list of the ship's captain and crew, a certificate of operational worthiness (SLO), a business permit for the high seas fishing sub-sector, fuel, and logistics. KM. Perintis Jaya 66 sailed to the fishing grounds after all preparations were complete. The ship sailed following a predetermined route to the fishing grounds plotted on its GPS. KM. Perintis Jaya 66 traveled 680 miles from the fishing base to the fishing grounds at a speed of 5-6 knots.

The fishing grounds were determined based on the KM's fishing operation permit. Perintis Jaya 66. The fishing ground is located in the high seas of the Indian Ocean with coordinates 17°56¢110²S-110°12¢023²E and 19°43¢050²S-111°57¢379²E. The target fish are bluefin tuna (Thunnus macoyi), yellowfin tuna (Thunnus albacares), and bigeye tuna (Thunnus obesus). According to (Wudianto, et al, 2003) the distribution of tuna longline fishing areas in the Indian Ocean is between 8"-22" S and 108'-118' E. Tuna long line fishing area in the Indian Ocean at coordinates 8°44'16.48"S- 9°34'57.97"S and 108°11'28.27"E- 108°49'57.57" (Wulandari et al, 2022).

Fishing activities begin with the distribution of tasks to the crew members (ABK). 3 people are tasked with lowering the fishing gear (setting), while three other people are on standby to take turns. The tasks carried out by crew members during setting are as follows:

- Main line officer: throws the main line into the sea and ensures that the thrown main line is not tangled, while also being a blong guard. Blong is a container for placing fishing gear.
- Snap officer: attaches the branch line to the main line).
- Bait officer: attaches bait to the fishing hook and throws it into the sea.

The crew lowers the fishing gear (setting) starting from 7:00 AM to 1:00 PM. According to Jatmiko et al. (2016), tuna longline fishing in the Eastern Indian Ocean begins in the morning between 5:00 AM and 9:00 AM. The initial setting stage involves lowering the radio bouy, then the branch lines that have been strung to the main line are lowered along with the first buoy. Each branch line is attached to the hook that has been attached to the branch line with bait. The branch line is attached to the main line using a snap that is already attached to the branch line. The snap serves to facilitate the attachment of the branch line. Lowering the fishing gear

(setting) takes 6 hours, but the length of time used depends on the number of lines lowered. According to (Jatmiko et al., 2016), tuna longlines operated in the Eastern Indian Ocean are spread in the morning between 5:00 AM and 9:00 AM because tuna are actively foraging and undergoing vertical migration in the morning.

Figure 12. Lowering the fishing gear (setting)

The bait used is dead bait such as siro/lemuru fish (Amblygaster sirm), scad (Decapterus sp.), and tuna (Euthynnus affinis). According to (Barata et al., 2011), the most commonly used baits are lemuru, scad, milkfish, and squid. The bait is attached to the gills or in line with the gill cover to prevent it from escaping when thrown into the sea. The bait is released carefully to ensure it remains attached until it is eaten by the tuna.

The boat stops the engine after the gear is set. This is done to allow the gear to submerge and retrieve it. The gear is left to submerge for approximately 10 hours, calculated from the time of the first radio buoy. According to (Firdaus & Kamelia, 2020), this fishing gear is passive, as it waits for the fish to eat the bait. The next step is soaking the fishing gear for a predetermined time and allowing it to drift with the ocean currents for approximately 2 hours.

A total of 7 people are tasked with hauling the fishing gear, lifting the branch line and the fish, while 8 people handle the fish as they are loaded onto the boat and repair tangled main and branch lines. The crew members on duty change every 4 blongs that have been loaded onto the boat. Tasks performed during hauling include:

- First Officer, in charge of steering the ship during hauling.
- The Bosman is responsible for regulating the speed of the line hauler.
- The blong officer is responsible for regulating the fall of the main line from the line hauler to the blong.
- Bait Release Officer, whose job is to release the bait from the fishing hook and pull the fish to the surface of the water.
- Branch line officer, tasked with rolling up the branch rope to be put into the basket.

The hauling process is carried out on the starboard side of the vessel, according to the line hauler's placement. Hauling is carried out between 5:00 PM and 6:00 AM. The vessel operates at a speed of 1-2 knots, following the main line positioned on the starboard side at a 45° angle to the vessel's bow. Tuna fishing operations using tuna longlines are divided into several activities: setting, drifting, and hauling (Widhyasari et al., 2020).

Figure 13. Hauling of fishing gear)

CONCLUSION

1. The construction of the KM. Perintis Jaya 66 tuna longline consists of a main rope made of monofilament with a length of 30 m, a branch line (Branch line) with a length of 15 meters, a radio buoy line (radio buoy line) with a length of 15 meters made of polyethylene, a buoy line (Buoy line) with a length of 10 meters made of polyethylene, a buoy (Lifebuoy) made of plastic with a total of 84 pieces, a radio buoy to find out the location of the tuna longline when hauling and a fishing hook made of stainless steel, has a length of 5 cm and the type of fishing line used is a circle hook/J4.
2. The tuna longline gear setting process begins between 7:00 AM and 1:00 PM. The gear setting process takes approximately 6 hours, but the time required depends on the number of rods lowered. The gear is then immersed for approximately 10 hours, calculated from the time of the first radio buoy launch. Hauling is carried out between 5:00 PM and 6:00 AM, ship time. The vessel operates at a speed of 1-2 knots, following the main line at a 45° angle to the starboard side of the vessel.

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