Analysis of Owner Requirements of Purse Seine Vessel 180 GT for Fishing Activities on Fishing Line III-Fisheries Management Area (FMA) 572

Mei Edi Prayitno[1], Marimin [2], Taryono [3], Sugeng Hari Wisudo [3]

Abstract— **fish resources in FMA 572 have not been managed optimally, especially small pelagic species of 82,573 tons. These waters with high wave conditions of 0.2 – 6 meters are located around the waters of West Aceh, the West Indian Ocean of Aceh, the waters of Nias–Sibolga, the waters of the Indian Ocean–West Lampung, and the Sunda Strait. The purpose of this study was to analyze the owner requirements for 180 GT purse seine vessels as a basis for planning the ship's technical specifications. The research method using a single case study with research respondents is purposive sampling. The research findings explain that the Ship dimension is around 35 meters, the Service velocity of 8 knots, the propulsion system is I line engine model, the auxiliary engine system is a dual-engine model, the Fish storage system uses Cargo hold freezer system, and Fishing aids using Fish Aggregating Devices (FADs) and light lamps, Total crew of 27 Personnel, Fish detection equipment using fish finder equipment, Fishing gear pulling with winch mechanical and power block and the ship's operating time 50 days as well. To increase productivity, it is recommended to standardize purse seine vessels with modern equipment to improve fuel efficiency, and ship crew and reduce ship production costs, so that the price of ships is affordable for fishery business actors.**

Keywords—**fishbone diagram, FMA 572, owner requirements, purse seine.**

I. INTRODUCTION

Fish resources in fishing line III-FMA 572 have not been managed optimally, consisting of 82,573 tons of small pelagic, 16,021 tons of large pelagic, 72,159 tons of demersal fish, and 2,667 tons of squid [1]. This area is waters with high wave conditions of 2.0 – 2.5 meters located around the West Aceh Waters, Aceh West Indian Ocean and Nias–Sibolga Waters. Waves with a height ranging from 1.00 to 2.50 M are in the Bengkulu waters, the East Enggano waters and the Bengkulu West Indian Ocean. The area around the Indian Ocean–West Lampung Waters with wave heights ranging from 2.50 – 4.00 meters occurred in the southern part of Lampung Bay. Wave heights ranging from 4.00 – 6.00 meters occur in the West Lampung waters, the western Sunda Strait, and the West Indian Ocean in Lampung [2].

Abundant fish resources and these have not been managed optimally, requiring strategic steps that are able to integrate various related elements to increase the number of fishing vessels for fishing activities [3]. Fishing results are determined by the number and capacity of operating fishing vessels supported by high-productivity fishing gear and the intensity of fishing activities [3]. The availability of the fishing vessel numbers that are relevant to the potential number of fish in a fisheries area will provide adequate fishing results for the national fisheries industry.

The fish resource management in FMA 572 is not yet optimal through the 180 GT purse seine vessel, so research questions about owner requirements of the purse seine vessel can be formulated to support the technical specifications of the vessel. The availability of owner requirements data will support the development of vessels for small pelagic resources fishing activities on fishing line III-FMA 572. The preparation of owner requirements to support the technical specifications of 180 GT purse seine vessels is influenced by the potential of fish resources that can still be caught [4-6].

Research on data development of 180 GT purse seine vessels based on owner requirements is expected to contribute ideas for researchers to develop fishing vessel construction technology. Practically, the results of this study are expected to be useful for the industrial world and fishing business actors in increasing the production of capture fisheries products.

II. METHOD

This study uses a single case study method is research to answer single research questions with the questions "How" and "Why"[7]. Single case study method research, which is research conducted to define an individual problem, group or a unit either institution, company or government based on a special unit with one problem-solving method [8].

A. Research design

The design of this study was compiled to obtain data on owner requirements which was carried out through

Mei Edi Prayitno. Study Program of Agribusiness Strategic and Management, Bogor Agricultural University. Gedung SB-IPB Kampus IPB Gunung Gede, Jl. Raya Pajajaran, Bogor, Indonesia, 16128. E-mail: meiediprayitno@gmail.com

Marimin. Study Program of Industrial System Engineering, Bogor Agricultural University. Gedung Fateta Lantai 2, Kampus IPB Dramaga, Bogor, Indonesia, 16680. E-mail: marimin@ipb.ac.id

Taryono. Study Program of Coastal and Ocean Management, Bogor Agricultural University. Jalan Agathis Darmaga Campus of IPB, Bogor, Indonesia, 16680. E-mail: taryono@apps.ipb.ac.id

Sugeng Hari Wisudo. Study Program of Fisheries Resources Utilization, Bogor Agricultural University. Jalan Agathis Darmaga Campus of IPB, Bogor, Indonesia, 16680. E-mail: wisudo@apps.ipb.ac.id

survey activities to fishing vessel business actors, policy maker and academics, Figure 1. In preparing the ship owner requirements, consider the fish landing place, applicable regulations, maintenance system, shipbuilding site and socio-cultural conditions of the community [4, 9]. Preparation of owner requirements data to support ship technical specifications also considering several variables: ship dimension, ship capacity, fishing gear, fishing aids, ship equipment, auxiliary engines, service velocity, ship safety equipment, endurance, crew, fish storage hold, sea trial and ship delivery

B. Research Sampling

The determination of the research sample was prepared using a purposive sampling model in detail using certain considerations and objectives in accordance with the objectives of this study [10]. The research sampling was prepared based on regulations, fishermen's socio-cultural and secondary data on small pelagic fish resources in FMA 572 as well as the results of interviews with fishing business actors. The research sampling was purposive sampling with 18 personnel consisting of 14 fishery business actors, 2 policy-making personnel and 2 academics.

C. Object Research

The object of formulating owner requirements to plan technical specifications for purse seine vessels 180 GT is arranged on the ship principal dimensions, ship capacity, service velocity, fishing gear, fishing aids, ship equipment, auxiliary engines, ship safety equipment, endurance, crew, fish storage hold, sea trial and ship delivery.
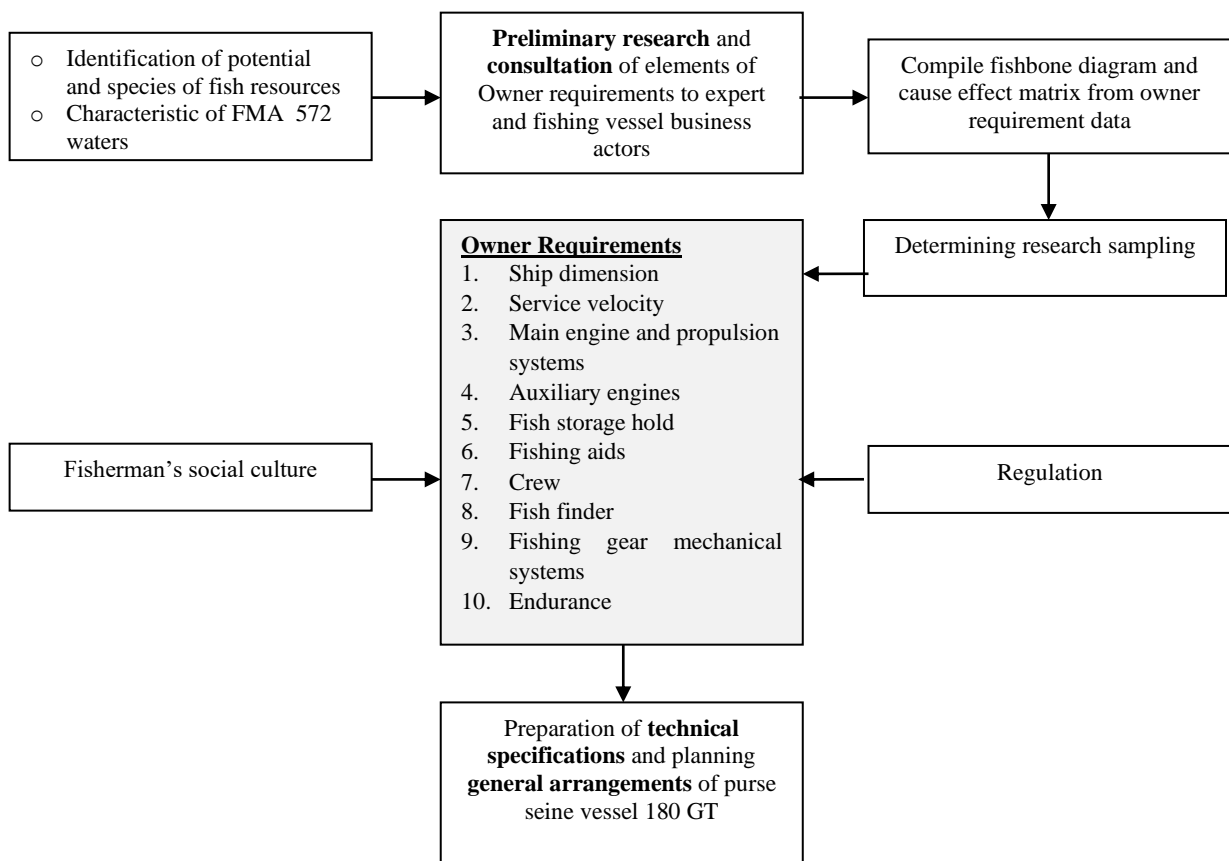

Figure 1. Research design determining owner requirements for 180 GT purse seine vessels

D. Data Processing.

Processing of respondent data to find out information on various criteria: ship dimension, service velocity, main engine and propulsion systems, auxiliary engines, fish storage hold, fishing aids, crew, fish finder, fishing gear mechanical systems and endurance. Processing of respondent data is identified through fishbone diagrams, with identification of problems to determine vessel data according to fishing vessel owner requirements for catching small pelagic resources in fishing line III-FMA 572. The priority of the selected variable is calculated by the formula: $W = \Sigma_{n=1} (w_n \times e_n)$, where W is the cumulative weight of the criteria, w is the weight impact value of each sub-criteria, e is the effect of each sub-criteria and n is the respondent [11].

E. Data Analysis

The results of data processing to determine the owner requirements desired by fish business actors. The results of data processing to obtain owner requirements data with analysis: (1) Assessment through the stages of compiling variables and sub-variables with fishbone diagrams, Figure 2. (2) Preparation and assessment of cause and effect matrix from fishbone diagrams. (3) The cumulative of the highest cause-effect matrix from all respondents is the priority for determining owner requirements.
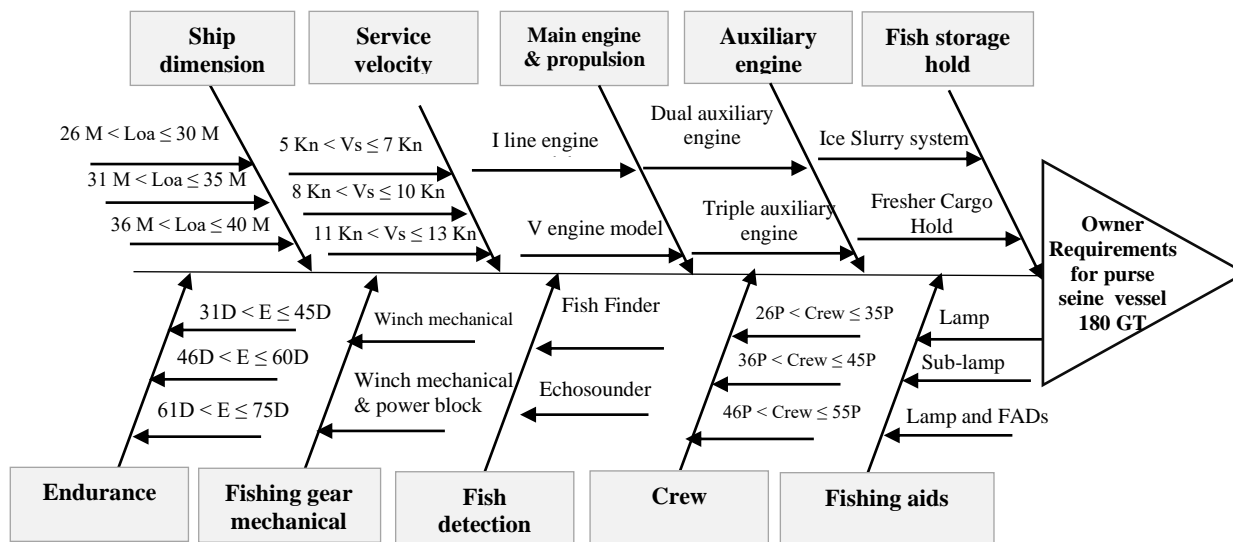
Figure 2. Fishbone diagram determining owner requirements for 180 GT purse seine vessels for fishing activities in FMA 572

III. RESULTS AND DISCUSSION

Distribution of 18 questionnaires to respondents to conduct surveys and interviews about owner requirements and ship technical specifications for fishing activities in fishing line III-FMA 572 obtained 14 respondents (77.78 percent) who are willing to provide information through interviews. The owner requirements data for compiling technical specifications for 180 GT purse seine fishing vessels. Assessment of fishing vessel

owner requirements 180 GT is based on vessel specifications which include: ship dimension, service velocity, main engine and propulsion systems, auxiliary engines, fish storage hold, fishing aids, crew, fish finder, fishing gear mechanical systems and endurance. Owner requirements for 180 GT purse seine vessels are conditions desired by fishery business actors to increase fish productivity. Survey activities and interviews with 14 respondents, according to Table 1.

TABEL 1
CAUSE AND EFFECT MATRIX - OWNER REQUIREMENTS FOR PURES SEINE VESSELS 180 GT

No	Criteria	Sub-citeria	Weight Impact (Height = 5; Medium = 3; Low = 1; Value between=2 and 4)													
			R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
1.	Ship dimension	26 M < Loa ≤ 30 M	2	3	2	3	2	3	3	3	3	2	3	2	3	2
		31 M < Loa ≤ 35 M	4	4	4	4	4	5	5	4	4	5	4	4	4	4
		36 M < Loa ≤ 40 M	5	4	5	5	4	5	4	5	4	4	4	4	5	4
2.	Service velocity	5 Kn < Vs ≤ 7 Kn	2	3	2	3	3	2	3	3	3	3	3	3	3	3
		8 Kn < Vs ≤ 10 Kn	4	3	3	3	3	3	3	3	4	3	3	3	3	3
		11 Kn < Vs ≤ 13 Kn	2	2	1	2	2	1	1	2	1	2	1	2	1	2
3.	Main engine and propulsion system	I Line engine model	4	4	3	5	3	4	4	4	4	4	3	4	5	4
		V Engine model	2	3	3	2	4	4	3	2	4	3	2	3	4	3
4.	Auxiliary engine	Dual auxiliary engine	3	5	4	4	3	3	4	5	4	4	3	3	3	3
		Triple auxiliary engine	2	4	4	3	4	4	4	4	4	4	4	4	4	4
5.	Fish storage hold	Ice slury system	3	3	4	3	3	3	4	3	2	4	3	3	3	3
		Fresher cargo hold	4	4	4	3	4	4	4	4	4	4	4	4	4	4
6.	Fishing aids	Lamp	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		Lamp submersible	4	4	3	4	4	3	4	3	4	3	4	3	4	4
		FADs and Lamp	4	4	4	4	4	4	4	4	4	4	4	4	4	4
7.	Crew	26 Pers < Crew ≤ 35 Pers	5	3	4	3	4	3	3	3	3	3	3	3	3	3
		36 Pers < Crew ≤ 45 Pers	3	3	3	3	3	3	3	3	3	3	3	3	3	3
		46 Pers < Crew ≤ 55 Pers	2	2	2	2	2	2	1	2	3	2	2	2	2	2
8.	Fish detection	Fish finder	4	3	3	3	3	3	4	3	3	4	2	4	3	3
		Echosounder	3	3	2	3	2	2	4	3	2	3	3	4	3	2
9.	Fishing gear mechanical	Winch Mechanical	3	4	3	3	4	3	4	3	3	3	4	3	3	3
		Winch Mechanical and Power block	4	4	4	4	5	5	4	5	5	5	4	4	3	4
10.	Endurance	31 Days < E ≤ 45 Days	2	2	2	2	2	2	3	2	2	2	2	2	2	2
		46 Days < E ≤ 60 Days	3	4	3	3	3	3	3	4	3	4	3	3	3	3
		61 Days < E ≤ 75 Days	4	5	4	4	4	4	4	4	4	5	5	4	4	3

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TABEL 1
(CONTINUED…..)

No	Criteria	Sub-citeria	Effect on Ship Maintenance (Difficult = 1, Moderate = 3; Easy=5; Value between=2 and 4)														Total	Ranking
			R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14		
1.	**Ship dimension**	26 M < Loa ≤ 30 M	5	3	5	4	5	4	5	4	5	5	4	5	5	5	162	2
		31 M < Loa ≤ 35 M	4	3	3	3	3	3	4	3	3	3	3	3	3	3	186	1
		36 M < Loa ≤ 40 M	2	2	2	2	3	2	2	3	2	3	3	2	2	2	141	3
2	**Service velocity**	5 Kn < Vs ≤ 7 Kn	3	3	3	3	3	3	2	3	2	3	3	3	3	3	111	2
		8 Kn < Vs ≤ 10 Kn	3	2	3	3	3	3	3	3	2	3	3	3	3	3	125	1
		11 Kn < Vs ≤ 13 Kn	2	1	2	1	1	2	1	2	1	2	1	1	1	1	30	3
3.	**Main engine and propulsion system**	I Line engine model	4	3	3	3	4	3	3	3	4	4	3	3	3	4	184	1
		V Engine model	3	3	4	2	3	3	3	3	3	3	3	3	3	3	127	2
4.	**Auxiliary engine**	Dual auxiliary engine	4	3	3	3	4	3	4	3	3	3	3	3	5	3	169	1
		Triple auxiliary engine	3	3	3	4	2	3	3	3	3	3	3	3	3	3	158	2
5.	**Fish storage hold**	Ice slury system	2	2	3	3	2	2	2	2	3	2	2	2	2	3	100	2
		Fresher cargo hold	3	3	3	4	2	3	3	3	3	3	3	3	3	3	164	1
6.	**Fishing aids**	Lamp	2	2	2	2	2	2	2	2	2	2	2	2	2	2	84	3
		Lamp submersible	3	3	3	3	2	3	3	3	3	2	3	3	3	3	146	2
		FADs and Lamp	2	3	2	4	2	3	4	3	2	3	4	2	2	2	152	1
7.	**Crew**	26 Pers < Crew ≤ 35 Pers	4	4	3	3	3	4	3	3	4	3	4	3	4	4	161	1
		36 Pers < Crew ≤ 45 Pers	3	3	3	3	3	3	3	3	3	3	3	3	3	3	126	2
		46 Pers < Crew ≤ 55 Pers	2	1	2	1	1	2	2	2	2	2	2	2	2	2	50	3
8.	**Fish detection**	Fish finder	3	3	3	2	3	3	2	3	3	3	2	3	3	3	126	1
		Echosounder	3	3	3	3	3	3	2	2	3	3	3	2	2	3	101	2
9.	**Fishing gear mechanical**	Winch Mechanical	3	3	3	3	2	3	3	3	2	3	3	3	3	3	131	2
		Winch Mechanical and Power block	2	2	3	2	3	2	2	3	3	2	2	3	2	2	143	1
10.	**Endurance**	31 Days < E ≤ 45 Days	4	3	4	3	3	4	3	4	3	4	3	4	4	4	103	2
		46 Days < E ≤ 60 Days	3	3	3	3	3	3	3	3	3	3	3	3	3	3	135	1
		61 Days < E ≤ 75 Days	2	2	2	2	2	3	2	2	2	2	2	2	2	2	120	2

A. Owner Requirments Results

The results of a survey of 14 respondents obtained the cumulative weight of the owner's requirements sub-criteria as follows:

1. Ship dimension (Loa).
   a. 26 M < Loa ≤ 30 M, with a total value: 162
   b. 31 M < Loa ≤ 35 M, with a total value: 186
   c. 36 M < Loa ≤ 40 M, with a total value: 141
2. Service velocity (Vs).
   a. 5 Kn < Vs ≤ 7 Kn, with a total value of 111
   b. 8 Kn < Vs ≤ 10 Kn, for a total value of 125
   c. 11 Kn < Vs ≤ 13 Kn, for a total value of 30
3. Main engine and propulsion system
   a. I Line engine model with a total value: 184
   b. V Engine model with a total value: 127
4. Auxiliary engine.
   a. Dual auxiliary engine with a total value: 169
   b. Triple auxiliary engine with a total value: 158
5. Fish storage hold.
   a. Ice slurry system, with a total value: 100
   b. Cargo hold freezer, with a total value: 164
6. Fishing Aids.
   a. Lamp with a value: 84
   b. Submersible lamp, with a total value: 146
   c. Lamps and FADs, with a total value: 152
7. Crew.
   a. 26 Pers < crew ≤35 Pers, with a total value: 161
   b. 36 Pers < crew ≤45 Pers, with a total value: 126
   c. 46 Pers < crew ≤55 Pers, with a total value: 50.
8. Fish detection.
   a. Fishfinder equipment, with a total value: 126.
   b. Echosounder, with a total value: 101.
9. Fishing gear mechanical (equipment)
   a. Mechanical winch, with a total value: 131.
   b. Mechanical winch and power block, with a total value: 143.
10. Endurance (ship operation time)
    a. 31 days < E ≤45 days, with a total value: 103.
    b. 46 days < E ≤60 days, with a total value: 135.
    c. 61 days < E ≤75 days, with a total value: 120.

The collecting priority data results on the selection of criteria and sub-criteria for owner requirements resulting from the cause and effect matrix can be explained by the results of the requirements according to 180 GT purse seine vessels for catching small pelagic fish on FMA 572 as follows:

1. Ship dimension (the length of the ship) is selected with a size of 31 M < Loa ≤ 35 meters
2. Service velocity of 8 knots < Vs ≤ 10 knots
3. The propulsion system is selected using the I line engine model
4. The auxiliary engine system for the ship's electrical needs uses a dual engine model.
5. Fish storage system uses Cargo hold freezer system
6. Fishing aids using Fish Aggregating Devices (FADs) and light lamps
7. Total crew of 26 Personnel < ABK ≤ 35 Personnel
8. Fish detection equipment using fish finder equipment
9. Fishing geras pulling mechanical equipment using winch mechanical and power block
10. The ship's operating time (endurance) is 46 days < E ≤ 60 days

B. Discussion

The survey results followed by interviews with 10 fishery business actors can describe the requirements for fishing vessels for fishing line III-FMA 572 operations for small pelagic catching as follows:

Fishing vessel capacity. the capacity of fishing vessels must be adjusted to the characteristics of the waters, fish species [12] and fishing gear productivity. productivity The priority for selecting the capacity of fishing vessels to be operated on fishing line III-FMA 572 is vessels with a capacity of 180 GT. The priority results of the 180 GT vessel capacity can be designed fishing vessels with dimensions of length (L), width (B), height (H) and draft (T) that are able to face the characteristics of the FMA 572, especially in the waters west of Lampung with wave heights of up to reach 4-6 meters in the period from October to April.

Fishing gear. The selection of fishing gear has an influence on the productivity of the catch [13]. A fishing vessel with purse seine gear has effective characteristics for catching pelagic fish small around the surface of the water [14]. The selection of the purse seine fishing gear in the large utilization of pelagic resources, it has a productivity 1.03 [15]. Ships with purse seines fishing gear are the most effective vessels for catching fish schooling at the near of sea surface position.

Ship material. The hull is made of standard quality shipbuilding mild steel with welded construction. The mild steel material to be used, the size of the construction parts and the workmanship must meet the steel ship class regulations. For certain construction parts, the steering axle and propeller shaft must also comply with the requirements set by the customer. Steel materials, especially for parts below the maximum load water line, must be sand blasted and painted with anti-corrosive (primer coating) before being fabricated [16]. Parts of construction materials, sizes and or workmanship are not regulated in the provisions of ship class, must be provided, designed and or made in accordance with recognized standards and or good shipbuilding practices and must be approved by the customer. Ship construction must comply with marine ship construction regulations. On the exposed side of the deck, bulwarks and railings are installed according to the general plan drawings and must meet safety requirements. The division of spaces below the main deck must meet the requirements of not sinking if one of the rooms leaks.

Ship dimension. Considerations in planning the dimensions of fishing vessels, the construction aspect has an influence on the ability to deal with the weather at sea. In the aspect of licensing, the dimensions of the ship affect the cost according to the capacity of the ship. On the operational aspect, the larger the ship dimensions will increase the maintenance costs. Ship dimension planning by considering the characteristics of the waters. The condition of the waters of FMA 572 with a low wave of 0.20 to 0.70 meters is around the Mentawai and wave heights ranging from 4.00 – 6.00 meters is located in the West Lampung waters, the western Sunda Strait, and the West Indian Ocean in Lampung [2]. Fishing vessel built with the ship dimension of ± 35 meters have

the ability to catch fish in FMA 572. Fishing vessels with a size of 35 meters are expected to have good stability for fishing activities at FMA 572. The stability of fishing vessels is influenced by the ratio of length (L), width (B), draft (T) and height (H) [17].

Service velocity. The speed of the ship affects the speed to the fishing location. Ship velocity is based on ship propulsion systems and ship resistance. Increasing the power of fishing vessels on fishing line III-FMA 572 requires ships with speeds of about 8 knots. The speed of the ship is important for the movement of the ship to the fishing ground and bringing the fish caught to the designated fishing landing port. The speed of the ship affects the time to the fishing location. The speed of the ship is determined by the limitations of the ship, the power of the main engine, and the efficiency of the propeller. To increase the efficiency of the propeller, a ducted propeller can be used, which is a sheath to direct the flow of water that will pass through the propeller. The simulation results show that the most optimal propeller performance is a ducted propeller with a ratio of length dated (Ld) with a diameter (D) of 0.5 and a tip clearance of 40 mm [18].

Main engine and propulsion system. Fishing vessel are designed with a propulsion model with one engine (single-engine propulsion) with an I line engine model. The main motor (main engine) with a vertical shape, type 4 stroke, uses a closed water cooling system with water cooling media, using a direct injection combustion system and a mechanical control system. Power transmission system from the main driving motor to the gear box, thrust block, propeller shaft and propeller. The propulsion system for fishing vessels is designed with a single main engine with the I line model, which is transmitted by the arrangement of the gear box, thrust block, shaft and propeller. Getting the speed of the ship with 8 knots required propulsion ship about 200 Hp. The resulting propulsion efficiency is highly dependent on the clearance propeller [19]. The placement of the ship's propulsion system components and the slope of the propeller shaft affect the value of the ship's resistance and thrust. Results the simulation shows, the greater the angle of inclination of the propeller shaft, the more evenly it increases smaller, and the resulting thrust is also smaller. Propeller shaft tilt to get the most optimal thrust of 4^0 and main engine position 4m-6.5m from after peak perpendicular (AP) [20]

The auxiliary system. Auxiliary systems is a machine that is on board the fishing vessel either on the deck or in the engine room, its function is to facilitate the operation of the main engine and the operation of the vessel [21] on an ongoing basis, so that the performance of the ship and the main engine remains optimal during the catching activities process. Two diesel engines (dual engine model), each driving an alternating current electric generator for the use of electric power for the fish cooling system and onboard lighting. Starting systems and stopping the engine is done on the engine side. For port and/or emergency purposes, one emergency electric power generator set is installed and facilities for connecting with electricity on land (shore connection). For lighting and communications in an

emergency, a DC – 24 volt electric current must be provided. The ship is equipped with 2 power plants. On the deck of the ship provided an emergency power source, the capacity of the power plant is adjusted to the needs of electrical power which includes: lighting, fishing equipment and fishing gear on deck, fish freezer in the cargo hold, cooling seawater pumps, fresh water pumps, sanitary pumps, fire pumps, lubricating oil pumps and fuel pumps, the navigation and communications equipments, the tools in the engine room, safety equipment and electric stove as well.

Fish storage hold (hatch). The quality of the caught fish storage system affects the quality and freshness of the fish [22]. The fish hatch is a container to store caught fish equipped with a system isolation as heat barrier from outside to enter hold room. The insulating material used must be clean [23], does not cause defects in fish, strong against shocks and impact, does not contain poison and does not cause odor, changes taste and color of preserved material. The hatch cover is equipped with a tight gasket and a clamping device. Fish hatches must be coated with fiberglass reinforced plastic (FRP) for easy cleaning and maintenance. The remaining ice water in the fish hold is to be discharged into the sea using a portable pump on the main deck. Insulation of all fish hatches covered with polyurethane foam and coated with fiberglass reinforced plastic or similar materials. The thickness and details of the insulation are determined based on the calculation of the heat of the fish hatch.

Fishing aids. Fishing aids are tools or materials used to assist in the fishing process fishing, which aims to make fishing activities more effective and efficient. Technically, the function of fishing aids is to collect fish for the fishing process run well and get maximum results. Fishing aids in the form of permanent and non-permanent Fish aggregating devices (FADs) as well as lights [24], both in the form of submersible lamps and lamps installed above the water surface. FADs as fishing aids can collect schools of fish. Fish collection tools are by using light, either by using lights which is above when, until it develops using an underwater lamp. The advantages of FADs and lamps fishermen will be more efficient and effective in determining fishing areas, thereby saving fuel use.

Crew. The crew of the ship are all people who work on the ship, whose duty is to operate and maintain the ship and its cargo, except the captain. Conventional purse seine vessels require a large number of crews [25] to assist in pulling nets and equipment. The number of ship crew affects the total variable cost of fish production. The reduction in total variable costs on the crew aspect of the ship is carried out by using modern equipment to pull nets and move fish from fishing gear to the hold. The number of crew members for ships with a ship capacity of ± 180 GT is 27 people who have a role to support ship operations and fishing operations.

Fish detection. The success of a fishing operation depends on the relationship between school size fish, the size and distance at which the fish can detect the vessel and the speed and direction of the fish swimming [26]. Detection of fish resources requires equipment that has the ability to detect the location, number and size of fish

resources. Fish resources detection equipment uses a fish finder with the support of a direct current (DC) power source.

Fishing gear mechanical. The purse seine type fishing gear pulling mechanical equipment requires a lot of labor between 40 -50 personnel [25], role in assisting the delivery of purse seine nets. In reducing the number of crew members, it is necessary to apply technology to facilitate the operation of the purse seine fishing gear equipment, especially for pulling nets. Making it easier and reduce labor, it is necessary to install mechanical winch and power block equipment. The use of power block equipment can reduce the workforce by about 43.33 percent [27].

Endurance. The endurance is the period when the ship moves from the port to the fishing area and returns to the port to land fish. In accordance with the results of the interview that the endurance is 50 days. This ship's endurance relates to the need for fuel and fresh water for the main engine and auxiliary engine, logistics for the ship's crew and the storage capacity of catch fish [5]. The fishing vessel endurance is planned to continuously carry out fishing activities at an economical speed with the main engine rotation per minute (RPM) ranging from 60%-70% of the maximum rating continues (MCR).

Ship safety system. Supporting the safety of fishing vessels, safety equipment, fire fighting equipment and hull equipment are needed [28]. The placement of ship safety equipment must comply with Indonesian government rules and regulations. The main safety equipment is as follows: Inflatable life raft for 40 people (Class A, with fiberglass container and 4 units of automatic release), 35 life jackets, 4 ring life buoys, 2 smoke signals, 6 red hand flares and 6 parachute signals. Fire fighting equipment must comply with Indonesian government regulations. The main portable type of fire fighting equipment that needs to be placed on a fishing vessel includes: Accommodation room with 1 foam type extinguisher; Engine room room with ship extinguishing equipment type of CO_2.

Ship testing. The fishing vessel that has been built is tested and functions of all tools and equipment on board the performance vessel. Tests and functions to find out that all fishing vessel equipment and tools meet operating requirements include: Inclining test, tightness test, navigation equipment test and instrument measurement, ventilation test, cooling test for each hold room and heat insulation test, radio equipment test, kitchen equipment test, deck machining test, starting main engine and auxiliary engine test, lights test, generator test, piping test, pumps test, electrical equipment test and fishing equipment test. Tests and functions are carried out, in the presence of the class owner and or surveyor in accordance with regulatory requirements. The sea trial test was carried out by an official trial and was attended by Klas surveyors, inspectors from the Indonesian government and representatives of the owners for 2 x 24 hours.

C. *Managerial implications of Owner Requirements on Technical Specifications and Fishing Effort in FMA 572*

Owner requirements are influenced by potential fish

resources and water characteristics. Waters with extreme wave conditions require fishing vessel with reliable construction strength. In building a ship with the ability to face extreme weather, it is necessary to have dimensions and stability of the ship that meet the requirements of ship safety regulations according to the ship class.

Using of modern equipment for purse seine fishing gear operations will reduce the number of ship crews, such as the use of power blocks which will reduce the crew by up to 43.3 percent [27, 29]. Modern equipment

such as fish pumps will speed up the transfer time of fish from the net to the hold, it provides efficiency of labor and fish transfer time, on the other hand increases the use of electricity. The other hand, selection of the location of the shipyard for construction is a consideration for the delivery of the ship. distant shipyard locations will increase shipping costs. Compilation of owner Requirements data as consideration for compiling technical specifications for fishing vessels and fishing businesses at FMA 572, as shown in Figure 3.
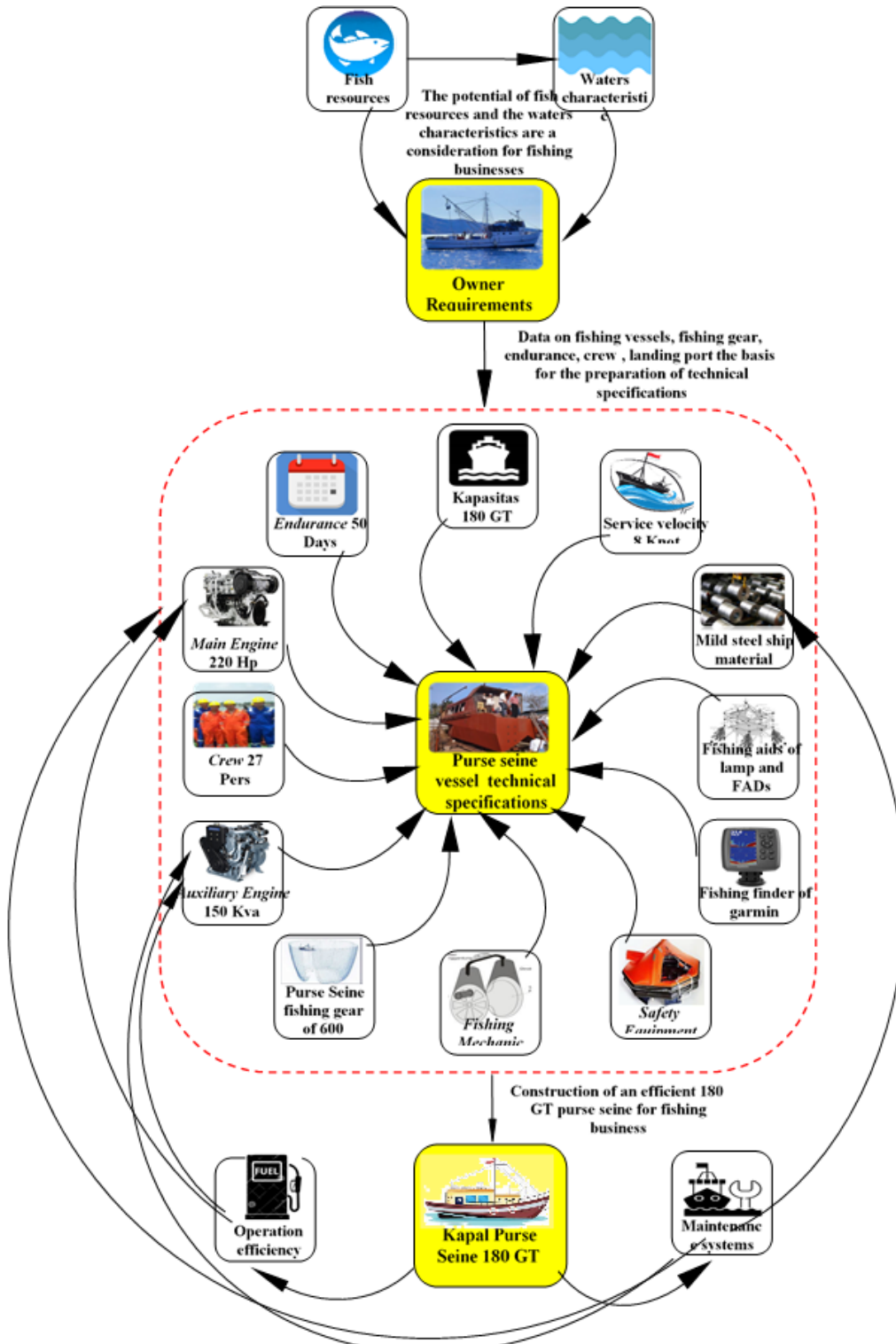

Figure 3. Managerial implications of Owner Requirements on Technical Specifications and Fishing Effort in FMA 572

Owner requirements are important in planning the technical specifications and design of purse seine vessels. Strategic steps to increase the effectiveness of 180 GT purse seine vessels are as follows:

a. Planning the shipbuilding process with class standards, safety standards. By following the procedures for building fishing vessel according to class standards and safety standards, it will improve the quality of the fishing vessel. Purse seine vessels must have good ship stability, especially in purse seine netting conditions (hauling).

b. The layout of the engine room and deck equipment makes it easier for the ship crew to work. The layout of equipment and machinery on the deck [9], such as winch, vessel netting hydraulic power block, and fish pump will increase the effectiveness of net lowering and hauling, so that time is more efficient and saves fuel for the auxiliary engine.

c. Planning for insulation materials and technical development of fish storage systems with good procedures [30], so that the quality and freshness of the fish cargo is maintained. The quality and freshness of the caught fish will maintain the selling price.

d. Setting up the engine propeller matching [19] to prevent loss of power from the main engine to the propeller. The distribution of power from the main engine through the gearbox, thrust block, shaft and propeller provides thrust to the ship's speed.

e. Marine use ship materials and components [5]. The use of marine use ship materials and components will ensure the quality of the ship during fishing activities.

f. Proper painting preparation for the underwater hull, above water hull, deck, wheelhouse, engine room and cab, use of anodes, and corrosion prevention measures [31]. The use of anti-fouling paint will affect the cleanliness of the underwater hull, so that there is no loss of ship speed which reduces the efficiency of the ship.

g. Choose a fishing shipyard that has quality resources and the ability to build ships professionally with adequate after-sales service. The selection of the shipyard will determine the delivery time of the ship and the quality of the fishing vessel.

h. Fish group detection equipment. The use of fish finder equipment will help fishing masters in the process of identifying the number and depth of fish schooling.

i. Design and selection of quality nets and ballast. Purse seine nets and their ballast must have the requirement to be able to sink to the desired depth in the fishing process. The sinking speed of the net with its ballast.

D. Research Limitation

This research is limited to owner requirements for fishing vessels operated in the waters of fishing line III-FMA 572 with locations from 12 Nautical Miles up to 200 Nautical Miles. In the waters of other locations will provide different owner requirements data according to the characteristics of the waters.

IV. CONCLUSION

E. Conclusion

The main aspect in designing purse seine fishing vessel must consider the variables of safety, stability, performance, reliability and endurance. Planning a good purse seine fishing vessel technically requires careful design stages, following the rules of shipbuilding regulations according to ship class and government regulations which are carried out through the initial stages of preparing owner requirements.

Owner requirements of 180 GT purse seine vessels for fisheries management in fishing line-FMA 572, according to owner requirement data with the following data: ship length (Loa) is selected with a size of 35.30 meters, service velocity of about 8 knots, main engine as the propulsion system uses an I line engine model of about 200 HP, the auxiliary system for the ship's electrical needs uses a dual-engine model with a capacity of about 140 Kva, the fish storage system uses the Cargo hold freezer system, the Fishing Aids uses the FADs and lights, the number of crew members is about 27 personnel, fish detection equipment using fish finder equipment, API withdrawal mechanical equipment using Winch Mechanical and Power block and the ship's operating time (endurance) is 50 days.

F. Recommendation

Increasing the fishing vessel fleet can increase the production of catch fish. Recommendations to increase the number of fishing vessels at affordable prices can be made through a collaboration between the Ministry of Industry and the Ministry of Marine Affairs - fisheries to prepare standardization of fishing vessels, materials and components as the basis for the shipbuilding industry, supporting and related industries and suppliers to produce fishing vessel materials and components. Standardizing purse seine vessels with modern equipment to improve fuel efficiency, ship crew and reduce ship production costs, so that the price of ships is affordable for fishery business actors.

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