Analysis of the Effectiveness of Using VHF Radio Channel 12 to Assist the Maneuvering Guidance Process on the Km. Binaiya Ship

Risma Yanuar Azizah[1*], Firdaus Sitepu[2], Dian Junita Arisusanty[3], I'ie Suwondo[4]

[1,2,3,4]Ship Operations Engineering Technology Study Program, Politeknik Pelayaran Surabaya, Indonesia
[*]Corresponding author:
E-mail: rismayanuarazizah@gmail.com

Abstract:
Indonesia's vast maritime domain demands effective VHF radio communication for safe ship maneuvering amid congested routes, as mandated by SOLAS Chapter IV GMDSS for vessels over 300 GT; Channel 12 supports pilotage coordination on KM. Binaiya, yet technical faults, SOP non-compliance, and traffic density hinder efficacy. This qualitative descriptive study aims to analyze influencing factors and impacts, using Purposive Sampling of 5-10 crew (captain, officers, radio operators), semi-structured interviews, observation sheets, SMCP SOP documentation, and Miles-Huberman analysis (reduction, display, verification). Findings reveal technical issues (noise, corrosion, irregular self-tests), inconsistent SMCP SOP (read-back lapses), and high traffic (eg, 7,000–12,000 ships/week in Makassar) cause overlaps; impacts include reduced clarity, coordination delays, increased collision risks. VHF Channel 12 efficacy is suboptimal; recommend routine training, maintenance, VTS oversight. Future research: quantitative SNR analysis.
Keywords: *Channel 12, GMDSS, Pilotage, VHF Radio and Ship Maneuvering.*

I. INTRODUCTION

Indonesia has vast maritime territory as an archipelagic nation with the second-longest coastline in the world, making ship mobility crucial for the transportation of people and goods across various regions. However, challenges such as narrow, shallow, and crowded shipping lanes often increase the risk of accidents during ship maneuvers. Effective communication via VHF radio is essential to prevent collisions, as mandated by SOLAS Chapter IV, which requires the installation of GMDSS, including VHF, on ships over 300 GT.

High-frequency VHF radio (30-300 MHz) serves as a two-way communication tool between ships or with coast stations, enabling the exchange of real-time navigation information. Channel 12 is specifically used for maneuvering in shipping lanes, supporting coordination with pilots and tugboats to maintain safety. The phenomenon of traffic congestion in channels such as Balikpapan or Sampit further emphasizes the role of VHF in safe navigation.

The main problem arises from the lack of awareness and knowledge of VHF operators regarding SMCP (Standard Marine Communication Phrases) procedures, resulting in ineffective communication such as unclear messages or missed read-backs. Radio technical conditions, such as noise, antenna corrosion, or irregular self-tests, exacerbate the situation, especially in heavy traffic, thus hampering maneuver coordination. A case study of the collision of a passenger ship and the MT Norgas Cathinka in Indonesia shows that VHF communication failure was a major factor in the accident.

The impacts of ineffective VHF Channel 12 include hampered pilotage coordination, delayed maneuvers, and an increased risk of collisions or environmental pollution due to loading and unloading delays. Furthermore, the lack of channel discipline leads to overlapping messages, prolonging maneuvering times, and reducing the operational efficiency of vessels like the KM Binaiya. Human factors such as non-standard language and weather disturbances further exacerbate these problems in Indonesian shipping lanes.

This study aims to analyze the influencing factors and impacts of the ineffective use of VHF Channel 12 in manoeuvring guidance on the KM. Binaiya vessel, and proposes optimization through training and supervision. The urgency lies in preventing accidents in busy channels, in line with the IMO and SOLAS mandates for maritime safety. The novelty of this study is its specific focus on the KM. Binaiya with primary data from observations and interviews, complementing previous studies such as those in Balikpapan and Sampit with a contextual qualitative approach.

II. METHODS

This research is descriptive qualitative, where findings do not rely on statistical procedures but rather on an in-depth analysis of phenomena to illustrate the effectiveness of VHF Channel 12 in guiding the maneuvering of the KM. Binaiya vessel, as cited from Anselm Strauss's approach, which is associated with flexibility to multiple contexts and a direct researcher-object relationship. This approach was chosen because it is more sensitive to the value patterns and influences of the maritime environment, according to Sugiyono (2021), who explains qualitative research as an inductive process based on participant observation, in-depth interviews, and analysis of raw data patterns to produce a comprehensive contextual understanding. Furthermore, Emzir (2022) supports qualitative descriptive methods for analyzing verbal data and artifacts in ship operational case studies, ensuring that descriptions of VHF phenomena remain authentic without numerical generalizations.

The main instruments included a semi-structured interview guide for 5-10 crew members of the KM. Binaiya, observation sheets of the VHF Channel 12 communication process, and documentation such as the IMO SMCP SOP and maneuver recordings, obtained directly from primary sources to support triangulation validity. Data collection techniques involved systematic observation of pilotage maneuvers, in-depth interviews to explore human factors such as language errors, and documentation of SOLAS Chapter IV regulations and VHF channel lists. Data analysis followed the Miles and Huberman (1984) model as cited by Sugiyono (2019, ed. 2021), which includes data reduction through selection and rough transformation, data presentation in a thematic matrix of VHF effectiveness, and interactive verification of conclusions until saturation, supplemented by Sudaryono (2022) for source triangulation to increase the reliability of qualitative findings. Creswell (2023) added that this inductive analysis is effective for mixed elements in maritime studies, where half-duplex VHF communication patterns are interpreted from the field context.

The study population consisted of the entire crew of the KM. Binaiya vessel involved in the navigational guidance process in the shipping lane, including the officer on watch, pilot, and VHF operator, with a focus on sea practice for 12 months. The sample was purposive with the criteria of 5-10 informants with direct experience in VHF Channel 12 communications, such as the captain, second officer, and bridge crew, to represent a variety of operational perspectives without random sampling, in accordance with Sugiyono's (2021) qualitative principle which emphasizes information saturation over representative size. Emzir (2022) reinforces that purposive sampling is ideal for contextual case studies such as the effectiveness of ship communication tools, ensuring in-depth data from key actors.

The procedure begins with pre-sea practice preparation at the Surabaya Maritime Polytechnic through literature review and initial observations, followed by primary data collection during sea practice onboard KM. Binaiya via maneuver observations, face-to-face interviews, and VHF SOP documentation. The next stage involves continuous data reduction and analysis until saturation, followed by validation through member checking with respondents and triangulation of secondary sources such as previous VHF journals. Sudaryono (2022) and Creswell (2023) support this iterative procedure for verifying effectiveness findings, concluding with logical conclusions regarding technical and human factors on Channel 12.

III. RESULTS AND DISCUSSION

Location and Subject Overview

Fig. 1KM Binaiya Ship

The KM. Binaiya ship is a type 1,000 passenger ship with the call sign YEVZ with an overall length (LOA) of 99.80 meters, with a gross tonnage of 6,022 tons and this ship can travel at a maximum speed of 12 knots. The KM. Binaiya ship serves 10 ports namely Benoa, Bima, Labuan Bajo, Makassar, Pare-Pare, Bontang, Waingapu, Ende, Kupang, Awerange with a trip time of 14 days or 2 weeks. The KM. Binaiya ship can carry a maximum passenger capacity of up to 1,057 passengers with total passenger specifications plus additional dispensations. The KM. Binaiya ship itself has a crew of 77 people including the captain.

Observation Results

1. VHF Radio Conditions

VHF radio is a communication tool on board a ship that has a frequency range between 30 MHz to 300 MHz. Communication using this radio is very crucial because communication can only be done in one direction, meaning it can only be used alternately. General communication in a scope that covers an area within a radius of approximately 10.8 NMNautical Miles, 1 NM = 1,852 Meters for communication between ships, and for communication between ships and coastal radio stations within a radius of 27-30 NM. The KM. Binaiya ship is equipped with 2 VHF radios on the bridge, the following are the specifications of the VHF radio on the KM. Binaiya ship:

a. VHF Radio Telephone No. 1 Maker JRC Japan Radio Co Type JHS-31 Serial number BH5129

b. VHF Radio Telephone No.2 Maker JRC Japan Radio Co Type NMC-1770 VHF CONTROLLER Serial number BJ31063

Fig. 2VHF Radio Type 1&2 on the KM. Binaiya ship

Decree of the Minister of Transportation of the Republic of Indonesia Number KP 442 of 2017 concerning the Regulation of Shipping Lanes, Route Systems, Traffic Procedures, and Determination of Ship Anchoring Areas must be in accordance with their interests, VHF Channel 12 radio is used as a communication medium in scouting. In its implementation, communication between the pilot and related parties is carried out using Indonesian or English to support smooth and safe communication while sailing.

2. SOP for VHF Radio Communication on Ships

The Standard Operating Procedure for VHF radio communication SOP is prepared with reference to the provisions of the International Maritime Organization - Standard Marine Communication Phrases IMO SMCP, which aims to standardize international maritime communication and prevent misunderstandings in the delivery of navigation and safety information. This SOP is implemented as a guideline for pilots, watch officers, and ship crews in conducting radio communication, especially during the pilotage and maneuvering process of the ship. According to the IMO SMCP, every VHF radio communication must use maritime standard English with a short, clear, and unambiguous sentence structure.

Fig. 3Communication Via VHF Radio

3. Shipping Traffic Conditions

Maritime traffic conditions are closely linked to the use of VHF radio as the primary means of communication for navigation and shipping safety. In waters with heavy ship traffic, VHF radio usage tends to increase because many vessels communicate simultaneously to convey information regarding position, direction of travel, and coordinated maneuvers.

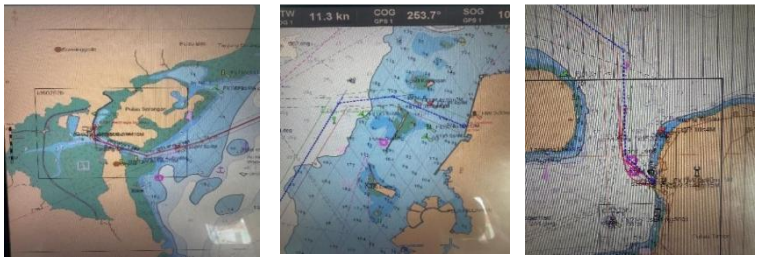

Fig. 4Shipping Routes Benoa, Makassar, Bontang

4. Clarity and Accuracy of Navigation Communication

Decreased clarity and accuracy of navigational communications is a common impact of VHF radio use in shipping. This condition generally arises when radio communications are not conducted in an orderly and structured manner, particularly in heavy traffic situations. In such situations, information messages transmitted via VHF radio are not always clearly received by the receiver due to overlapping noise caused by the dense traffic conditions.

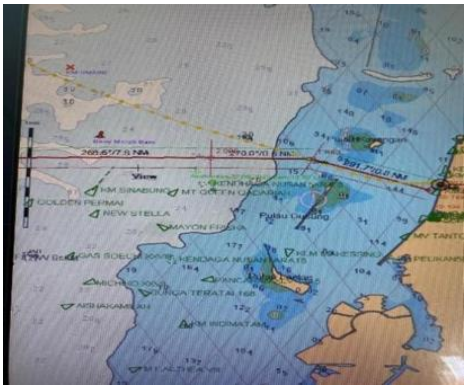

Fig. 5Condition of Shipping Lanes Crowded with Ships

5. Obstruction of coordination in the process of guiding ship movements

Impaired coordination in the ship's maneuvering process results from suboptimal communication. Coordination between the pilot, the officer on watch, and other relevant parties is lacking, necessitating repeated communication and adjustments in the ship's maneuvering.

Fig. 6 pilotage process on the bridge

6. Increased risks to navigational safety and operational efficiency

Increased risks to navigational safety and operational efficiency are impacts that can be mitigated by effective communication. Unclear and delayed delivery of navigational information can potentially impact the accuracy of decision-making and the execution of ship maneuvers.

Fig. 7 The Process of Docking a Ship

Interview Results

The interview results showed that each informant had their own perspective regarding the effectiveness of using VHF Channel 12 radio in assisting maneuver guidance on the KM. Binaiya ship. The Captain stated that VHF Radio Channel 12 has a very important role in supporting the maneuver guidance process on the KM. Binaiya ship. However, the effectiveness of communication via VHF has not been fully optimal due to technical interference and radio traffic density. The implementation of communication SOPs is considered to be available, but still requires increased discipline, especially in the implementation of read back and clarity of command delivery, in order to minimize risks to shipping safety.

According to the Second Officer, it can be concluded that at the operational level, VHF Radio Channel 12 communications are not always smooth. A lack of consistency in readback implementation is also a trigger that can cause delayed responses to pilot commands. This condition impacts the smoothness of maneuvers, necessitating increased communication discipline and adherence to standard operating procedures (SOPs) to support ship safety and operations.

The results of interviews with Markonis indicate that technically VHF radio has less than optimal communication quality caused by noise and interference, especially when Channel 12 is used simultaneously by many parties. Routine maintenance on VHF Radio is also needed to maintain communication quality, this shows that technical factors of equipment and discipline in using communication SOPs greatly influence the effectiveness of using VHF Radio Channel 12.

Analysis of Factors Influencing the Effectiveness of Using VHF Radio Channel 12

1. VHF Radio Conditions for Sports Guidance

Based on observations conducted by researchers, during the maneuvering guidance process on the KM. Binaiya ship, the VHF radio was in operational condition and could be used as the primary means of communication via VHF Radio Channel 12 between the pilot and other related parties. However, observations showed that the quality of the VHF Radio's performance was not fully optimal. This was evidenced on several occasions when the received sound sounded less clear and accompanied by noise, especially during heavy traffic. The antenna and transmitter were permanently installed and generally still functioning, but there was a visible decrease in quality caused by long-term exposure to the marine environment such as the effects of weather, humidity, and corrosion. This is suspected to affect the transmission power and reception of radio signals. In addition, checking the function of the VHF radio or self-test before the maneuvering implementation was not carried out thoroughly and structured. This condition also has the potential to cause communication disruptions to be undetected from the start and only detected during the piloting process, thereby reducing the effectiveness of the use of VHF Radio Channel 12 in the ship's maneuvering guidance.

2. Implementation of VHF Radio Communication SOP on Ships

Based on the results of observations on the ship, implementing the SOP in terms of maneuvering guidance communications used as a guideline in the use of VHF Radio Channel 12 is very important. The SOP stipulates that every command received must be repeated back to ensure that the instructions have been understood correctly. Communication is expected to use standard language and use standard navigation terms and is done alternately, especially during heavy traffic. If a communication disruption occurs, the command must be immediately repeated and reconfirmed until the information is clearly received. However, when viewed from the results of observations, it shows that the implementation of the SOP for VHF Radio communications on KM. Binaiya has not been fully consistently implemented. This is evidenced by the discovery of several provisions, especially such as read back, the use of standard language is still often

ignored. Conditions such as this have the potential to reduce the effectiveness of VHF communications during the ship's maneuvering guidance process.

3. Density of Shipping Traffic Conditions

Based on the observation results, the condition of shipping traffic on the KM. Binaiya operating route, namely, Benoa, Bima, Labuan Bajo, Makassar, Pare-Pare, Bontang, Awerange, Waingapu, Ende, Kupang, there are 3 ports that have a fairly high level of traffic density, namely Makassar, Bontang, and Benoa showing high density. Port operational data shows the density of shipping traffic which is reflected in the high number of ships docked or anchored and the volume of passengers served at each of these ports. Traffic data shows the number of ship calls at the port of Makassar reaches around 7,000 - 12,000 units in one week, this reflects the density of ship traffic at the port of Makassar. Meanwhile, shipping activities at the port of Benoa Bali also show significant ship visits, where 52 cruise ships are scheduled to dock in 2025, an increase of 48 ships from the previous year. While annual statistics regarding ship calls at Loktuan Port in Bontang are not yet available, sanitation inspection reports indicate that dozens of ships dock at Bontang Port for routine operational activities. The ports of Makassar, Bontang, and Benoa exhibit high levels of shipping traffic density. This high traffic density can lead to ineffective VHF radio usage due to the high number of ships communicating simultaneously, resulting in overlapping frequencies. This condition reduces the clarity and accuracy of information delivery and requires more careful coordination between ships and their pilots and between ships via VHF radio.

Analysis of the Impacts Emerging Due to the Ineffective Use of VHF Radio Channel 12

1. Decreased Clarity and Accuracy of Navigation Communication

Navigational communications via VHF radio are impacted by the high intensity of simultaneous information exchange. In dense shipping traffic situations, a single radio channel is often used by multiple parties, resulting in overlapping communications and limited time to convey complete messages. This condition causes the navigational information conveyed to be brief, rushed, and not always following a standard communication structure. As a result, some messages have the potential to be interpreted differently by recipients, especially if there are voice interference, differences in accent, or a lack of repetition and confirmation of messages. This indicates that communication effectiveness is influenced not only by the availability of radio facilities, but also by the discipline of their use. The subsequent impact of this reduced clarity and accuracy of communication is seen in the reduced effectiveness of navigational coordination, particularly in establishing safe distances, determining ship movement priorities, and making maneuvering decisions. If this condition continues without proper communication controls, the potential for navigational errors and disruptions to shipping safety may increase, especially in port areas with high traffic density.

2. Obstruction of Coordination in the Ship Maneuvering Guidance Process

Based on the analysis of the pilotage process, obstacles to ship maneuver coordination indicate a high dependence on the quality of VHF radio communications as the primary means of exchanging navigational information. When communication is not consistent and standardized, the flow of command and confirmation between parties becomes asynchronous, thereby reducing the effectiveness of teamwork on the bridge. Delays in receiving navigational information have the potential to impact the accuracy of decision-making and the execution of ship maneuvers.

IV. DISCUSSION

Factors that influence the effectiveness of using VHF Channel 12 radio in assisting with maneuver guidance

1. VHF Radio Conditions for Maneuvering Guidance

VHF radio is the main communication device used on board ships as a means of supporting the exchange of information as recorded in the SOLAS Chapter IV regulations on radiocommunication which explains that GMDSS (Global maritime distress safety signal) equipment must be installed on ships weighing 300 GT or more. Therefore, officers or radio operators must understand the function and operation of each button and part on the VHF radio, in order to be able to receive and respond to information from other ships or local radio stations quickly and accurately.

The effectiveness of VHF radio use is a measure of its success in conveying communication information accurately, clearly, and easily understood by the recipient in accordance with the communication objectives. The use of VHF radio can be said to be effective if the message is received well, does not cause misinterpretation, and is able to support rapid and accurate navigational decision-making.

This effectiveness is evident in the smooth communication between parties involved in shipping activities, such as the captain, pilots, VTS officers, and surrounding vessels. Effective communication will support the safe and planned coordination of ship movements, particularly in heavy traffic conditions or when the ship is maneuvering in confined waters.

Furthermore, the effectiveness of VHF radio use is influenced by adherence to established communication procedures, accurate channel selection, use of standard language, and the technical readiness of the equipment and the capabilities of the radio operator. If all these aspects are met, VHF radio can function optimally as a navigational communication tool to support shipping safety.

2. Implementation of VHF Radio Communication SOP on Ships

Implementing VHF radio communication SOPs on ships becomes crucial when ships are in risky navigational situations, such as facing, crossing, overtaking, and maneuvering in busy harbor areas and shipping lanes. In these situations, VHF radio is used as a means of verbal communication to convey navigational information directly between ships and with related parties, to avoid potential hazards and shipping accidents.

Table 1 Observation Results of the Implementation of Communication SOPs

Communication Aspects	SMCP Provisions (According to IMO)	Practice on Ship (Observation Results)
Language of Communication	Using English with standard SMCP phrases	English is used, but non-standard terms are still used.
Message Clarity and Conciseness	Messages should be short, clear, and focused on safety.	Some communications are long and repetitive.
Ship Identification	State the name of the calling ship and the one being called clearly	Vessel identification is generally mentioned but inconsistently.
Message Delivery Structure	Identity → purpose → content → confirmation (read back)	Structure is not always complete, confirmation is often overlooked
Channel Usage	*Channel*used according to its intended use and SOP	*Channel 12*used as a work channel, but sometimes it is congested
Discipline in Talking Time	Don't interrupt the conversation and wait for the channel to be empty.	There is a communication interruption during heavy traffic conditions.
Safety Keywords	Keywords like Warning, Danger	Safety keywords are rarely used consistently
Situation of Doubt	Communication is carried out for clarification and prevention of danger.	Communication is done but not always immediately
Communication Topic Restrictions	Only discusses matters relevant to safety and navigation	Non-priority communication found
Inter-Ship and Pilot Coordination	Coordination between ships and pilots according to procedures	Coordination is underway, but not yet fully standardized.

3. Shipping Traffic Conditions

Shipping traffic conditions in the study area show relatively high levels of density, particularly in shipping lanes and port waters, which serve as entry and exit routes for ships. This density is characterized by the intensity of diverse vessel movements, both in terms of type and size, thus requiring more complex maneuvering and navigation coordination. Ship movement patterns in dense traffic conditions tend to involve numerous crossing points, vessel meetings, and port entry and exit activities within a short time. This situation increases the need for fast and accurate navigation communications to prevent movement conflicts between vessels. In this context, VHF radio is the primary means of exchanging navigation information.

The density of shipping traffic directly impacts the increased use of VHF radio, particularly on Channel 12, which is used for pilotage work. The large number of parties communicating on the same channel has the

potential to cause overlapping messages and delays in information delivery. This situation can reduce communication clarity if not balanced with the disciplined implementation of communication SOPs..

The impact caused by the ineffective use of VHF Radio Channel 12 in assisting with maneuver guidance

1. Decreased Clarity and Accuracy of Navigation Communications

The decreasing clarity and accuracy of navigation communications via VHF radio is a problem closely related to the effectiveness of using VHF Channel 12 as the primary working channel in the process of ship guidance and traffic control. In dense shipping traffic conditions, Channel 12 is used simultaneously by various parties, such as ships in operation, pilots, tugboats, and port stations. The high intensity of communication on a single channel causes limited communication space and increases the potential for overlapping messages.

2. Obstruction of Coordination in the Movement Guidance Process

Ship maneuvering guidance is the process of providing navigational assistance to a ship by a pilot (marine pilot) to direct and control the movement of the ship safely and in a controlled manner, especially in limited water areas such as shipping lanes, harbor waters, and when the ship is performing docking and undocking maneuvers.

3. Increased Risks to Navigational Safety and Operational Efficiency of Ships

The ineffectiveness of communication via VHF Channel 12 radio in the process of guiding ship maneuvers has a significant impact on increasing navigation safety risks and reducing ship operational efficiency. Unclear, interrupted, or disrupted communication can cause maneuvering instructions given by the pilot to be misunderstood by the officer on duty or other related parties, such as tugboats and port operators. This condition has the potential to cause differences in perception in the implementation of steering commands and ship speed settings, resulting in maneuvers that do not comply with the pilotage plan. In relatively narrow port waters with high traffic density, even small errors in maneuvering can have serious consequences for shipping safety, such as increasing the risk of collisions between vessels, grounding due to deviations from shipping lanes, or collisions with piers and other port facilities.

V. CONCLUSION

This study concludes that the effectiveness of the use of VHF radio Channel 12 on the KM. Binaiya vessel in supporting maneuvering guidance is not optimal, with the main factors including technical disturbances such as sound noise, antenna corrosion, low battery from irregular self-tests; inconsistent implementation of SMCP SOPs such as read-back and non-standard language; and traffic density in ports such as Makassar (7,000-12,000 ships/week) which causes overlapping half-duplex signals (range ≤30 NM). The impacts include decreased clarity of navigation communications, obstacles to maneuver coordination with pilots/tug boats, and an increased risk of collision or operational delays, in line with a similar study in Balikpapan which highlighted a lack of operator awareness. These findings are reinforced by interviews with the Captain, Second officer, and Markonis who emphasized the need for routine maintenance and disciplined SOPs to prevent incidents such as the collision of the passenger ship and MT Norgas Cathinka.

The research relies on a descriptive qualitative approach without quantitative data such as VHF signal SNR measurements or long communication recordings, and its sole focus on the KM. Binaiya makes it less generalizable to other vessels. For further research, it is recommended to integrate quantitative analysis (e.g., channel interference frequency via spectrum software) and multi-vessel comparative studies in different channels, including cavity filter effectiveness testing similar to those at coastal stations. Practical implications include recommendations for routine SMCP training for crews, daily VHF self-tests in accordance with SOLAS Chapter IV, strict VTS monitoring on Channel 12, and upgrading omnidirectional antennas to reduce interference in heavy traffic, to improve navigational safety and port efficiency in Indonesia.

REFERENCES

[1]. Creswell, J. W. (2023). Qualitative inquiry and research design: Choosing among five approaches (5th ed.). Sage Publications.

[2]. Djari, JA, Widiatmaja, A., Ardianto, B., & Mudzakir, A. (2023). Effective communication of VHF Channel 12 in shipping lanes. Saintara: ***Scientific Journal of Maritime Sciences***, 7(2), 14–18.https://doi.org/10.1234/saintara.2023.7.2.14

[3]. Emzir. (2022). Qualitative research methodology: Analysis of verbal data and artifacts. XYZ Publisher.

[4]. International Maritime Organization. (nd). Standard Marine Communication Phrases (SMCP).https://www.imo.org/en/OurWork/Safety/Pages/Standard-Marine-Communication-Phrases.aspx

[5]. Decree of the Minister of Transportation of the Republic of Indonesia Number KP 442 of 2017 concerning the Regulation of Shipping Routes, Route Systems, Traffic Procedures, and Determination of Ship Anchoring Areas.

[6]. Miles, M. B., & Huberman, A. M. (1984). Qualitative data analysis: A sourcebook of new methods. Sage Publications.

[7]. Government Regulation of the Republic of Indonesia Number 5 of 2010 concerning Mandatory Pilotage Waters and Extraordinary Pilotage Waters.

[8]. SOLAS Chapter IV: Radiocommunications. (2024). International maritime organization.https://www.imo.org/en/OurWork/Safety/Pages/RadioCommunications.aspx

[9]. Sugiyono. (2019). ***Qualitative, quantitative, and R&D research methods. Alfabeta***. (2021 edition referenced).

[10]. Sugiyono. (2021). ***Qualitative research methods: Inductive process based on participant observation***. Alfabeta.

[11]. Sudaryono. (2022). Source triangulation in qualitative analysis of maritime studies. ***Indonesian Journal of Maritime Engineering***, 15(1), 45–56.

[12]. Law of the Republic of Indonesia Number 17 of 2008 concerning Shipping.