Report of investigation into the man overboard accident on board the Hong Kong registered bulk carrier "*JIA MAO SHAN*" at sea on 12 March 2022

The Hong Kong Special Administrative Region
Marine Department
Marine Accident Investigation Section

19 December 2022

Purpose of Investigation

The purpose of this investigation, conducted by the Marine Accident Investigation Branch (MAIB) of Marine Department, is to determine the circumstances and the causes of the incident with the aim of enhancing the safety of life at sea and avoiding similar incidents in future.

It is not intended to apportion blame or liability towards any particular organization or individual except so far as necessary to achieve the said purpose.

The MAIB has no involvement in any prosecution or disciplinary action that may be taken by the Marine Department resulting from this incident.

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Summary

On 11 March 2022, the Hong Kong registered bulk carrier "JIA MAO SHAN" (*the vessel*) departed the first loading port of Matarani, Peru to the next loading port of Antofagasta, Chile (*the next loading port*) for loading the cargo of copper concentrate.

In the morning of 12 March 2022, when *the vessel* was en route to Chile, the crew sorted the dunnage (*the work*) stored on the main deck from the last voyage for disposing ashore at *the next loading port* as scheduled. At 1100 hours, *the work* on the port side main deck was completed. The crew commenced to transfer the dunnage stowed on the starboard side main deck by the No.3 crane (*the crane*) to the cross deck between the No.2 and the No.3 cargo holds (*the cross deck*). In order to constrain the movement of the crane hook when transferring the dunnage, three tug lines through the deck rings were held by the crew at the starboard forward, the aft main deck and the hatch cover of No. 3 cargo hold. During the transfer, however, the tug lines were found entangled with the hoisting sling connected to the packed dunnage. The bosun tried to release the tension of the tug lines to untangle the sling by lowering the crane hook at a position about 4 meters from the deck. Suddenly, there was a long swell that led the crane hook to swing thus causing the slack stern tug line to become taut and hit the bosun. The bosun was bounced over the handrail of *the vessel* and fallen overboard into the sea.

A joint search and rescue (SAR) operation coordinated by MRCC Chile with their helicopter and rescue ship, including the SAR operation by a merchant vessel in the vicinity of the accident scene, was carried out and lasted until 16 March 2022. Unfortunately, the bosun still could not be found.

The investigation identified that the contributory factors leading to the accident were that the crew operated the shipboard crane beyond the operational limits[1] set out in the requirements of the "Rules for lifting appliances of ships and offshore installations[2]" (*the rule*) issued by the

[1] The shipboard crane is generally designed to operate in harbours, or sheltered waters where there is no significant movement of the ship due to wave action and the sea state is not worse than that as described for Beaufort scale No.2.

[2] https://www.ccs.org.cn/ccswzen/specialDetail?id=201910000000002282

China Classification Society (CCS); the supervisor at scene of the lifting operation failed to follow the requirement of the "Code of Safe Working Practices for merchant seafarers" (*the Code*)[3] to terminate the lifting operation before conditions deteriorated to the extent that lifting was dangerous; the crew failed to follow the requirements of the shipboard Safety Management System (SMS) to attach the tug lines to the packed dunnage; the shipboard toolbox meetings and its risk assessment on identifying the preventive safety measures to risks for lifting operation were not effective; and that the crew lacked sufficient safety awareness and effective communications between the two departments onboard when executing their duties as well as the risk of unexpected tensioned stern tug line during the lifting operation was not identified.

[3] The Code is a publication required to be carried onboard Hong Kong ships pursuant to the Merchant Shipping (Seafarers) (Code of Safe Working Practices) Regulation (Cap. 478M).

1. Description of *the vessel*

Ship name	:	*JIA MAO SHAN* (Figure 1)
Flag	:	Hong Kong, China
Port of registry	:	Hong Kong
IMO number	:	9602980
Ship Type	:	Bulk Carrier
Year built	:	2011
Gross tonnage	:	32,962
Net tonnage	:	19,142
Summer deadweight	:	56,623 ton
Length overall	:	189.99 meters
Breadth	:	32.26 meters
Molded depth	:	18 meters
Main engine power, type	:	9480 kW, MAN 6S50MC-C8.2
Classification society	:	China Classification Society
Registered owner	:	JIAMAOSHAN SHIPPING S.A.
Management company	:	COSCO Shipping Bulk Co., Ltd.

Figure 1 *JIA MAO SHAN*

2. Sources of evidence

2.1 Information provided by the Master, the crew and the management company (the company) of *the vessel*.

3. Outline of events

(All times were local time UTC -3 hours 40 minutes unless otherwise specified.)

3.1 On 11 March 2022, *the vessel* loaded the cargo of copper concentrate to the No.2 and No.4 cargo holds in the first loading port of Matarani, Peru and departed for *the next loading port* at 1856 hours (UTC -0500 hours) with an estimated time of arrival (ETA) of 0600 hours (UTC -0300 hours) on 13 March 2022.

3.2 *The vessel* crew planned to sort the dunnage stored on the main deck from the last voyage for disposal ashore at *the next loading port.*

3.3 At about 0700 hours on 12 March 2022, the Master discussed *the work* with the Chief Officer (C/O) and the bosun on the bridge. He determined the safety measures and the working arrangement according to the scene situation.

3.4 At about 0745 hours, the deck crew, including the Carpenter, able seamen (AB1 and AB2), ordinary seamen (OS1 and OS2), Deck Cadet (D/C) and Purser, participated in a toolbox meeting held by the bosun at the ballast control room. The working arrangement, identification of safety measures, and the duty assignment of *the work* were carried out at the toolbox meeting, which ended at 0755 hours.

3.5 The engine crew were assigned to assist in *the work* by the Master. The Chief Engineer (C/E), Third Engineer (3/E), Fourth Engineer (4/E), Electrical Engineer (E/E), Chief Motorman (C/M), Motorman1, Motorman2, and Engine Cadets (E/C1 and E/C2) participated in the toolbox meeting of the engine department for *the work* in the officer mess room held by the Second Engineer (2/E) at 0745 hours. The risk assessment of *the work,* and related training, including identification of the safety issues and protective equipment, were carried out during the meeting. The meeting ended at 0830 hours.

3.6 At 0800 hours, *the vessel* was at 19°33'S, 071°36'W, 75 nautical miles away from the nearest coast of Chile. The deck crew started

the work on the main deck.

3.7 At 1100 hours, *the work* on the port side main deck was completed and commenced on the starboard side main deck near the No.3 cargo hold (*the hold*).

3.8 According to the working arrangement in the toolbox meeting, the packed dunnage stowed on the starboard side main deck would be transferred to *the cross deck* (Figure 2).

3.9 *The work* was carried out by using *the crane* with its rigging arrangement (Figure 3) (i.e. a steel wire rope was connected to the crank hook; a nylon rope was connected to the steel wire rope by a shackle; the packed dunnage was tied with another hoisting sling and connected to the nylon rope; and three independent tug lines[4] in the directions of bow, stern and side were connected to the crane hook and controlled by hand through the deck ring (Figure 4)) aiming to restraint the movement of the hook.

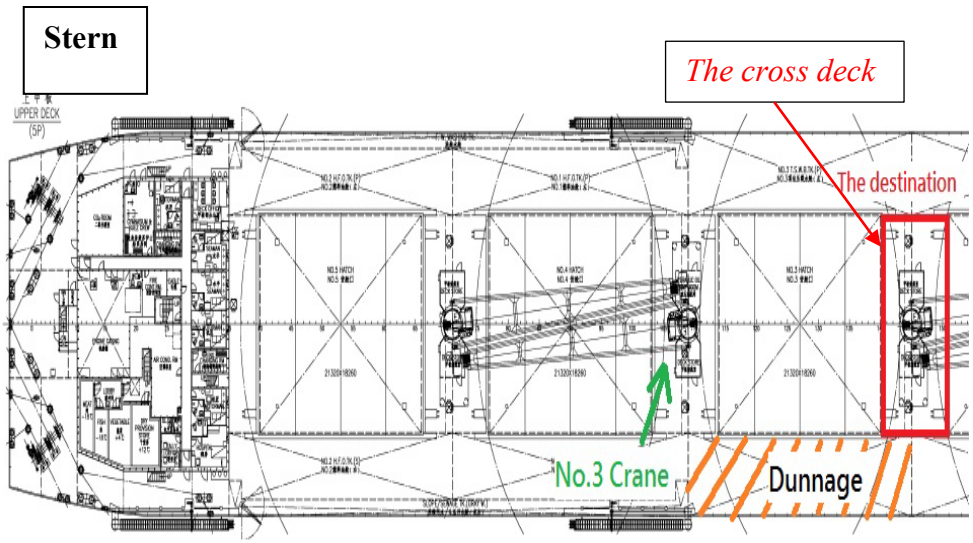

Figure 2 Location of *the work* (from Starboard Main Deck to the Cross Deck)

[4] Three tug lines were made from nylon.

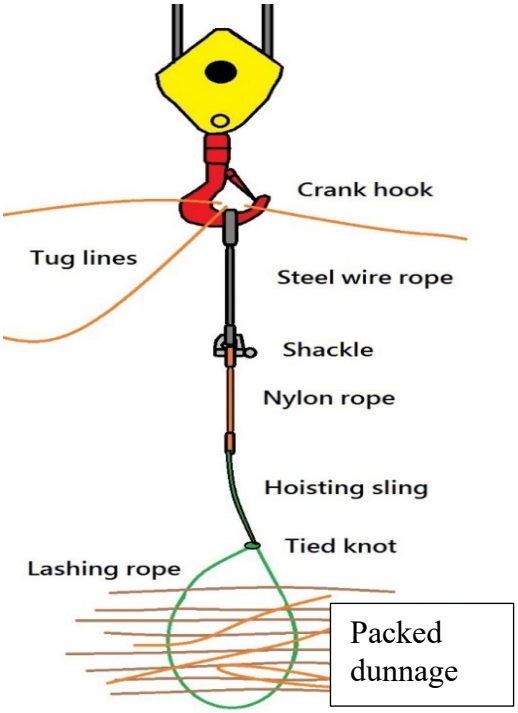

Figure 3 diagram of rigging arrangement

Figure 4 arrangement of tug line and deck ring

3.10 The bow tug line was controlled by the D/C, the Motorman1 and the OS1. The AB2 and the OS2 on *the hold* hatch controlled the side tug line. The stern tug line was controlled by the AB1, the E/C1, the E/C2 and the Carpenter (Figure 5).

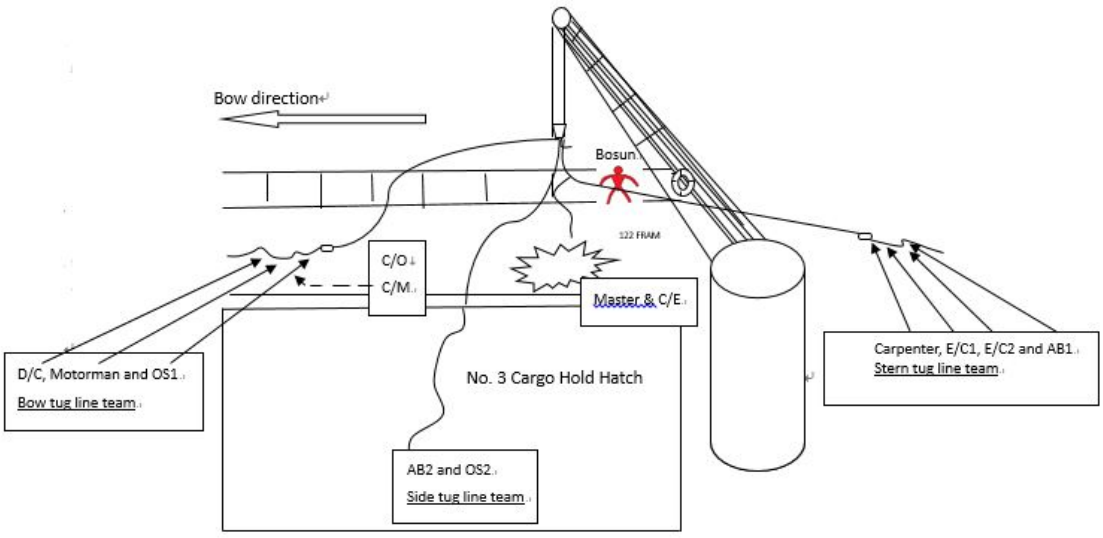

Figure 5 Sketch of the position of the crew on deck during *the work*

3.11 The tug lines were entangled during the transfer of dunnage with the hoisting sling connected to the packed dunnage. The Master ordered the AB3 to lower the crane hook. At about 1110 hours, the bosun tried to fix the tangled tug lines when the crane hook lowered to a position of about 4 meters from the deck. A sudden long swell led the crane hook to swing outside the handrail of *the vessel*.

3.12 The C/M, who was discussing the repair of a cracked stanchion of the safe means of access on the main deck with the C/O, noticed the swing of the hook and immediately assisted the bow tug line team in holding the tug line intending to stop the swing.

3.13 The stern tug line team did not retract the tug line while lowering the crane hook for unknown reason. As such, the stern tug line became slack. The motion of the hook brought the slack stern tug line into tension. The tensioned stern tug line hit the bosun who was standing in the way of the motion of the tug line and the hook (Figure 5), resulting in the bosun being brought over the handrail of *the vessel* and fallen overboard into the sea.

3.14 The C/E immediately threw a life buoy into the sea, and the E/C1 ran to the stern of *the vessel* to throw another life buoy into the sea. There were in total 3 life buoys being thrown into the sea.

3.15 When the Third officer (3/O), who was on duty on the bridge, saw the bosun falling into the sea, he steered the ship to hard starboard, stopped the main engine, and then informed the duty engineer to standby the main engine.

3.16 At 1111 hours, the Master ran back to the bridge from the accident scene and took over the command of the vessel from the duty officer.

3.17 At 1115 hours, *the vessel* returned to the position near where the bosun fell overboard. The crew looked for the bosun but in vain. The Master sent alert distress messages of Man Overboard to MRCC Chile through radio and email and arranged a rescue team to launch the rescue boat to search the bosun. The Master also reported the accident to the company at 1125 hours.

3.18 MRCC Chile coordinated a joint SAR operation with their helicopter and rescue ship, including the SAR operation carried out by the Bahamas flagged vehicle carrier "MORNING COURIER" in the vicinity of the accident scene.

3.19 At 2330 hours (UTC -0300 hours) on 14 March 2022, *the vessel* terminated the SAR operation and resumed her voyage to *the next loading port*.

3.20 At 0350 hours (UTC -0300 hours) on 16 March 2022, the SAR operation lasted for 3 days, 16 hours, and 50 minutes and that MRCC Chile terminated the search and rescue operation without finding the bosun at the end.

4. Analysis

Certificates and manning

4.1 The statutory trading certificates of *the vessel* were valid and in order. *The vessel* was manned by 25 crew members, including the Master. The Minimum Safe Manning Certificate of *the vessel* was issued by the Hong Kong Marine Department (HKMD) on 29 January 2019, and the manning of the vessel fulfilled the requirements.

4.2 The Master joined *the vessel* on 15 July 2021. He had about 15 years of experience as a master. He possessed a Master Certificate of Competency issued by the Government of the People's Republic of China, valid until 9 April 2023, and a valid Class 1 License (Deck Officer) issued by the HKMD on 23 January 2019.

4.3 The C/O joined *the vessel* on 15 October 2021. It was his first time serving as a chief officer. He possessed a Chief Officer Certificate of Competency issued by the Government of the People's Republic of China, valid until 8 May 2026, and a valid Class 2 License (Deck Officer) issued by the HKMD on 23 November 2021.

4.4 The C/E joined *the vessel* on 15 July 2021. It was his first time serving as a chief engineer. He possessed a Chief Engineer Officer Certificate of Competency issued by the Government of the People's Republic of China, valid until 29 April 2026, and a Class 1 License (Marine Engineer Officer) issued by the HKMD on 26 July 2021.

4.5 The bosun joined *the vessel* on 15 July 2021 as a carpenter. He was promoted to bosun on 15 October 2021. He possessed a Certificate of Proficiency issued by the Government of the People's Republic of China, valid until 22 May 2047.

4.6 The AB3 joined *the vessel* on 15 July 2021. He had about 15 months of experience as an able seaman. He possessed a Certificate of Proficiency issued by the Government of the People's

Republic of China, valid until 19 December 2053. The AB3 had 2 years of experience operating shipboard cranes.

Weather condition

4.7 On the day of the incident, the weather was cloudy with southeasterly wind of Beaufort Wind Scale force 4. The dry bulb temperature was 22° C. The visibility was good, about 10 nautical miles. It was a slight sea with occasional long swells. The long swell was a contributing factor to the accident causing the rolling of *the vessel* resulting in the swing of the crane hook.

Fatigue, alcohol and drug abuse

4.8 There was no evidence to show that any crew on board suffered from either fatigue at work or abuse of alcohol and drugs.

Maintenance of the crane

4.9 The test and thorough examination of *the crane*, including its annual examination of the winch and accessory gear, was carried out and certified in Dalian, China by the CCS on 16 October 2021. There were no defects or permanent deformation reported.

4.10 According to the requirements of the "Instruction for operation and maintenance of marine crane and its grab bucket" (Document No.: SMI-S-H07) of the shipboard SMS manual, the wire and mechanical parts of *the crane* were inspected and verified by the C/O and the C/E on 9 March and 22 February 2022 respectively. The moveable joints and parts of *the crane* were greased on 22 February 2022 and verified by the C/O. There were no defects found during the inspection by the crew of the vessel.

4.11 The investigation identified that shipboard maintenance was not a contributing factor to the accident.

Shipboard lifting operation

4.12 The recognized organization of *the vessel* was CCS. According to Section 3.2.1 of *the rule* issued by the CCS, shipboard cranes are generally designed to operate in harbours or sheltered waters where there is no significant movement of the ship due to wave action and

that the sea state is not worse than that as described for Beaufort scale No.2. *The vessel'*s crew should operate the shipboard crane within the operational limits set out in the requirements of *the rule* to operate the shipboard crane accordingly. At the time of the accident, *the crane* was transferring the packed dunnage to *the cross deck* while the ship was underway with the wind of Beaufort Wind Scale force 4, and the sea had occasional long swells. The operation of *the crane* was beyond the operational limits.

4.13 According to Chapter 19.9.4 of *the Code* on weather conditions in lifting operations, it stated that such operations should be suspended before conditions deteriorate to the extent that lifting becomes dangerous. The Master had noticed that *the vessel* had a rolling of 3 degrees and the swinging angle of the hook was about 5 to 6 degrees due to the effect of the long swells at the time of transferring the dunnage. Therefore, *the crane* was operating outside the limitation set out by *the rule*. Accordingly, the lifting operation should be considered dangerous at that time. However, the Master did not follow the requirements of *the Code* to terminate the operation.

4.14 Paragraph 3.2 of the lifting operation procedure (Document No. OHSAS13) of the shipboard SMS manual stated that the enhanced protective measure of at least two tug lines should be attached to the lifting object when the vessel was in rolling condition during lifting operation. The investigation found that 3 tug lines were attached to the crane hook, but not to the packed dunnage, to prevent its swing during the lifting operation. It did not follow the "lifting operation procedure" requirements of the shipboard SMS manual. If the crew had followed the requirements of the lifting operation procedure, the tug lines might not have been entangled with the hoisting slings, and the accident would have been avoided.

Toolbox meeting, Risk assessment and communications

4.15 According to Paragraph 2.1 of the "Instructions for Shipboard Labor Safety Management" (Document No. SMI-S-J06) of the shipboard SMS manual, all persons participating in the work should attend the toolbox meeting. The meeting should include the safety risk assessment, safety protective measures, operating

procedures and task allocation related to the work.

4.16 The engine crew were assigned to assist in *the work* carried out by the deck crew on the day of the accident. Before *the work*, the deck and engine departments separately carried out their respective toolbox meetings and risk assessments on board *the vessel*. The investigation found that the work arrangement, the use of the crane, the rigging arrangement, the duty assignment of the work identified, etc., as discussed in the deck department's toolbox meeting were not included in the engine department's toolbox meeting. It was revealed that the crew lacked safety awareness of the significance of effective communications when executing their duties between the two departments onboard.

4.17 The work arrangement, the duty assignment of *the work,* and the major risks, including the protective equipment, were specified in the toolbox meetings of the deck and engine departments. The related risks discussed were slippery, hitting by ropes, falling objects, ship rolling, unstable operating platforms, etc. However, the preventive safety measures in relation to the risks as mentioned in paragraph 4.16 were not addressed during the risk assessment. It was deduced that the shipboard risk assessment on *the work* was only for the formality and lacked a professional and responsible manner.

4.18 The AB3, who was on bridge watch duty from 0000 hours to 0400 hours on the day of the accident, joined *the work* at 1000 hours as an operator of *the crane*. Since he did not participate in the morning toolbox meeting but joined *the work*, such arrangement did not follow the "Instructions for Shipboard Labor Safety Management" requirement of the shipboard SMS manual.

Safety awareness

4.19 As mentioned in paragraphs 3.11 and 3.13, the tug lines were entangled with the hoisting sling during the lifting operation. The AB3 lowered the crane hook and the tug lines became slack naturally. A sudden long swell causing the hook in swinging. However, the crew, including the supervisor at the scene, i.e. the Master, did not realize that the swinging hook would bring the

slacked tug lines into tension and might hit any person within its range of movement.

4.20 The investigation also found that the bosun stood close to the ship side near the handrail of *the vessel* and within the range of the movement of the stern tug line (Figure 5). The bosun lacked safety awareness that the taut stern tug line might hit and injure him.

5. Conclusions

5.1 On 11 March 2022, Hong Kong registered bulk carrier "JIA MAO SHAN" departed the first loading port of Matarani, Peru to *the next loading port* to load the cargo of copper concentrate. In the morning of 12 March 2022, when *the vessel* was en route to Chile, the crew sorted the dunnage stored on the main deck from the last voyage for disposing ashore at the next loading port as scheduled. At 1100 hours, the work on the port side main deck was completed and the crew commenced to transfer the dunnage stowed on the starboard side main deck by *the crane* to *the cross deck*. In order to constrain the movement of the crane hook when transferring the dunnage, three tug lines through the deck rings were held by the crew at the starboard forward, the aft main deck and the hatch cover of No. 3 cargo hold. During the transfer, however, the tug lines were entangled with the hoisting sling connected to the packed dunnage. The bosun tried to release the tension of the tug lines to untangle the sling by lowering the crane hook at a position about 4 meters from the deck. Suddenly, there was a long swell that led the crane hook to swing thus causing the slack stern tug line to become taut and hit the bosun. The bosun was bounced over the handrail of the vessel and fallen overboard into the sea. A joint SAR operation coordinated by MRCC Chile with their helicopter and rescue ship, including the SAR operation by a merchant vessel in the vicinity of the accident scene, was carried out and lasted until 16 March 2022. Unfortunately, the bosun still could not be found.

5.2 The investigation identified that the contributory factors leading to the accident were that:

(a) the crew operated the shipboard crane beyond the operational limits set out in the requirements of *the rule* issued by the vessel's classification society;

(b) the supervisor at scene of the lifting operation failed to follow the requirement of *the Code* to terminate the lifting operation before conditions deteriorated to the extent that lifting was dangerous;

(c) the crew failed to follow the requirements of the shipboard

SMS to attach the tug lines to the packed dunnage;

(d) the shipboard toolbox meetings and its risk assessment in identifying the preventive safety measures to risks for lifting operation were ineffective; and

(e) the crew lacked safety awareness of the significance of effective communications when executing their duties between the two departments as well as the risk of unexpected taut stern tug line during the lifting operation onboard was not identified.

6. Recommendations

6.1 The management company should issue a circular informing all masters, officers, and crew members of its fleet of the investigation findings and lessons learnt from this accident and instruct them to:

(a) strictly operate the crane within its operational limits issued by the classification society of the vessel or the maker, if available;

(b) strictly follow the requirements of *the Code* to terminate the lifting operation before conditions deteriorate to the extent that lifting becomes dangerous;

(c) strictly follow the requirements of the shipboard SMS when using tug lines during lifting operation;

(d) ensure to effectively carry out the shipboard toolbox meeting and its risk assessment including identifying the preventive safety measures to risks for lifting operation; and

(e) enhance the safety awareness on the risk of unexpected taut stern tug line during the lifting operation and the significance of effective communications when executing their duties between the deck and engine departments onboard.

6.2 The company should pay attention to the findings of the accident when carrying out internal audits to the vessels of its fleet to ensure that the crew on board strictly follow the requirements of *the Code* and the shipboard SMS.

6.3 A Hong Kong Merchant Shipping Information Note is to be issued to promulgate the lessons learnt from this accident.

7. Submission

7.1 A copy of the draft investigation report, in its entirety, was sent to the company and the Master of the vessel for comments.

7.2 By the end of the consultation, there was no comment received from the above-mentioned parties.