ACCIDENT REPORT

Report on the investigation of a

fatal man overboard from the fishing vessel

Aquarius (BF 89)

east of Aberdeen

on 17 August 2015

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

VERY SERIOUS MARINE CASUALTY REPORT NO 18/2016 OCTOBER 2016

Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2012 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

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GLOSSARY OF ABBREVIATIONS, ACRONYMS AND TERMS

°C	-	degrees Celsius
CoSWP	-	Code of Safe Working Practices for Merchant Seamen
DSC	-	Digital Selective Calling
EPIRB	-	Emergency Position Indicating Radio Beacon
FISG	-	Fishing Industry Safety Group
GMDSS	-	Global Maritime Distress and Safety System
HF	-	High Frequency
IMO	-	International Maritime Organization
ISO	-	International Organization for Standardization
kg	-	kilogram
kt(s)	-	knot(s) (nautical mile(s) per hour)
kW	-	kilowatt
L	-	Length
LOA	-	Length Overall
LOLER	-	The Merchant Shipping & Fishing Vessel (Lifting Operations and Lifting Equipment) Regulations 2006
LSA	-	Life-Saving Appliance
m	-	metre
MCA	-	Maritime and Coastguard Agency
MF	-	Medium Frequency
MGN	-	Marine Guidance Note
mm	-	millimetre
MOB	-	Man Overboard
MSN	-	Merchant Shipping Notice
N	-	Newton
PFD	-	Personal Flotation Device
PPE	-	Personal Protective Equipment
PUWER	-	The Merchant Shipping & Fishing Vessel (Provision and Use of Work Equipment) Regulations 2006
RNLI	-	Royal National Lifeboat Institution

SAR	-	Search and Rescue
Seafish	-	Sea Fish Industry Authority
SFF	-	Scottish Fishermen's Federation
SIAS	-	Ship Inspection And Survey
SOLAS	-	International Convention for the Safety of Life at Sea 1974
t	-	tonne
VHF	-	Very High Frequency
VTS	-	Vessel Traffic Services
UKFVC	-	United Kingdom Fishing Vessel Certificate
UTC	-	Universal Co-ordinated Time

Terms

The Working Time Standards Code	-	The Fishing Industry Code of Practice on Working Time Standards
15-24m FV Code	-	Code of Safe Working Practice for the Construction and Use of 15 metre length overall (LOA) to less than 24 metre registered length (L) Fishing Vessels

TIMES: all times used in this report are UTC +1 unless otherwise stated

Image courtesy of Sean Boyce, MarineTraffic.com

Aquarius

SYNOPSIS

In the early hours of the morning on 17 August 2015, a fisherman on board the 20.8m twin rig trawler *Aquarius* was struck and thrown overboard violently by a steel wire trawl warp when a rope stopper parted. The vessel had just cleared the port of Aberdeen, Scotland, and its crew were attempting to re-mark the trawl warps when the accident happened. The skipper reacted quickly to stop the vessel, and the crew threw lifebuoys to the casualty. However, the recovery attempt was unsuccessful and the casualty sank out of view approximately 10 minutes later. Despite a search involving numerous vessels and a helicopter, the casualty's body was not recovered.

In order to mark the steel wire warp, the crew had streamed it over the stern. The stopper was used to take the strain of the trailing warp so that the crew could lower its inboard section on to the deck. The MAIB investigation established that:

- The stopper parted under tension because a man-made fibre rope had been used instead of a chain, and because the way it had been applied deviated from well-established good practice.

- The casualty was thrown overboard because he had positioned himself within the bight of the slackened trawl warp.

- The crew were unable to recover the casualty back on board because neither they, nor their vessel had been adequately prepared to deal with such emergency situations.

- The casualty's body was not recovered because he was not wearing a lifejacket or other type of personal flotation device while working on the open deck.

The Maritime and Coastguard Agency had surveyed and inspected *Aquarius* on numerous occasions during the previous 9 years. It had identified *Aquarius* as a poorly run vessel and issued it with 137 deficiencies; many of these related to safety management and were of a repetitive nature.

The underlying factors that contributed to this accident included: a total lack of proactive safety management; a poor level of onboard safety culture; and the crew suffering from tiredness and fatigue.

Recommendations have been made to the owners of *Aquarius*, the vessel's manning agency and the Maritime and Coastguard Agency. These are aimed at improving the levels of safety management and emergency preparedness on board *Aquarius*; the working conditions and hours of rest for non-UK nationals on board UK flagged fishing vessels; and the capability of the electronic systems used by the Maritime and Coastguard Agency to manage and monitor deficiencies and poor performing fishing vessels.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *AQUARIUS* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*Aquarius*
Flag	UK
Classification society	Not applicable
Fishing numbers	BF 89
Type	Stern trawler
Registered owner	MB Aquarius Ltd
Manager(s)	n/a
Construction	Steel
Year of build	1994
Length overall	20.80m
Gross tonnage	189t
Main engine power	600kW
Minimum safe manning	Not applicable
Authorised cargo	Fish
VOYAGE PARTICULARS	
Port of departure	Aberdeen
Intended port of arrival	Aberdeen
Type of voyage	Fishing
Manning	6
MARINE CASUALTY INFORMATION	
Date and time	17 August 2015 at about 0140
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	2 miles east of Aberdeen harbour
Place on board	Aft main deck
Injuries/fatalities	One fatality
Damage/environmental impact	None
Ship operation	Single rig trawling for squid
External & internal environment	Westerly wind at 10kts; calm to slight sea; visibility good (night); sea temperature 13.8°C.
Persons on board	6

1.2 NARRATIVE

Shortly after midnight on Monday 17 August 2015, the UK registered fishing vessel *Aquarius* entered Aberdeen harbour, Scotland, and berthed on the fish quay. Once secure alongside, the vessel's crew landed their catch of 47 boxes of squid. On completion, the skipper moved *Aquarius* to an adjacent quay to create space for another fishing vessel to come alongside.

Before departure from Aberdeen, the skipper gathered his five-man crew together and informed them that he needed to re-mark the vessel's steel wire trawl warps **(Figure 1)**. He explained that this would be done once the boat was clear of the harbour, and that he wanted the warps to be marked at 125 fathoms[1].

At about 0100, the crew let the mooring ropes go and the skipper manoeuvred *Aquarius* away from the quayside. As the boat was manoeuvred out of the harbour the crew secured the trawl doors to the stern gantry and disconnected the port side trawl warp **(Figures 2a** and **2b)**.

Once *Aquarius* was clear of the harbour entrance, the crew veered the port trawl warp winch drum, and lowered the warp over the stern and into the sea. The crew stopped the winch at the warp's 100 fathom marker and waited for the skipper to come aft and measure the additional 25 fathoms. The skipper was busy navigating the vessel clear of harbour traffic, and directed Annang Nuertey, one of the vessel's Ghanaian deck crew, to carry on and complete the job.

Under Annang's instruction, the warp was veered a further 25 fathoms and marked temporarily with adhesive tape. One of the crewmen then used a length of synthetic fibre rope to apply a stopper[2] to the tensioned steel wire warp **(Figures 3a** and **3b)**. The winch was again veered and the inboard section of the warp became slack as the strain transferred to the rope stopper.

With the weight of the streamed warp being taken by the rope stopper, the crew pulled the slackened section of warp inboard and laid it on the deck **(Figure 4)**. Annang knelt on the deck outboard of the slackened warp and began to open its wire strands with a marlin spike; his intention was to insert a fibre rope marker **(Figure 5)**. Another crew member knelt on the opposite side of the warp to assist in holding it securely. The three remaining crew members stood inboard of the warp towards the stern of the boat **(Figure 6)**. At the same time, the skipper was gradually altering the vessel's course to head south towards his intended fishing grounds, steaming at a speed over the ground of 5 to 6kts **(Figure 7)**.

At about 0140, the slackened warp suddenly snapped tight with a loud bang, striking Annang and catapulting him backwards over the boat's port side and into the water. On hearing the loud bang the skipper put the engine to stop and ran out of the wheelhouse towards the main fishing deck aft. On his way, the skipper met a crew member running in the opposite direction to fetch a lifebuoy. The crew member was shouting *"Annang overboard, Annang overboard".* The skipper passed a powerful torch to him with the instruction to shine it on Annang in the water. The skipper then returned to the wheelhouse and briefly put the boat's engine astern.

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[1] A fathom is a unit of length equal to 6 feet (1.8m), chiefly used in reference to depth of water.

[2] A stopper is a device that is used to temporarily take the weight off a rope that is under strain.

Image courtesy of Seafish

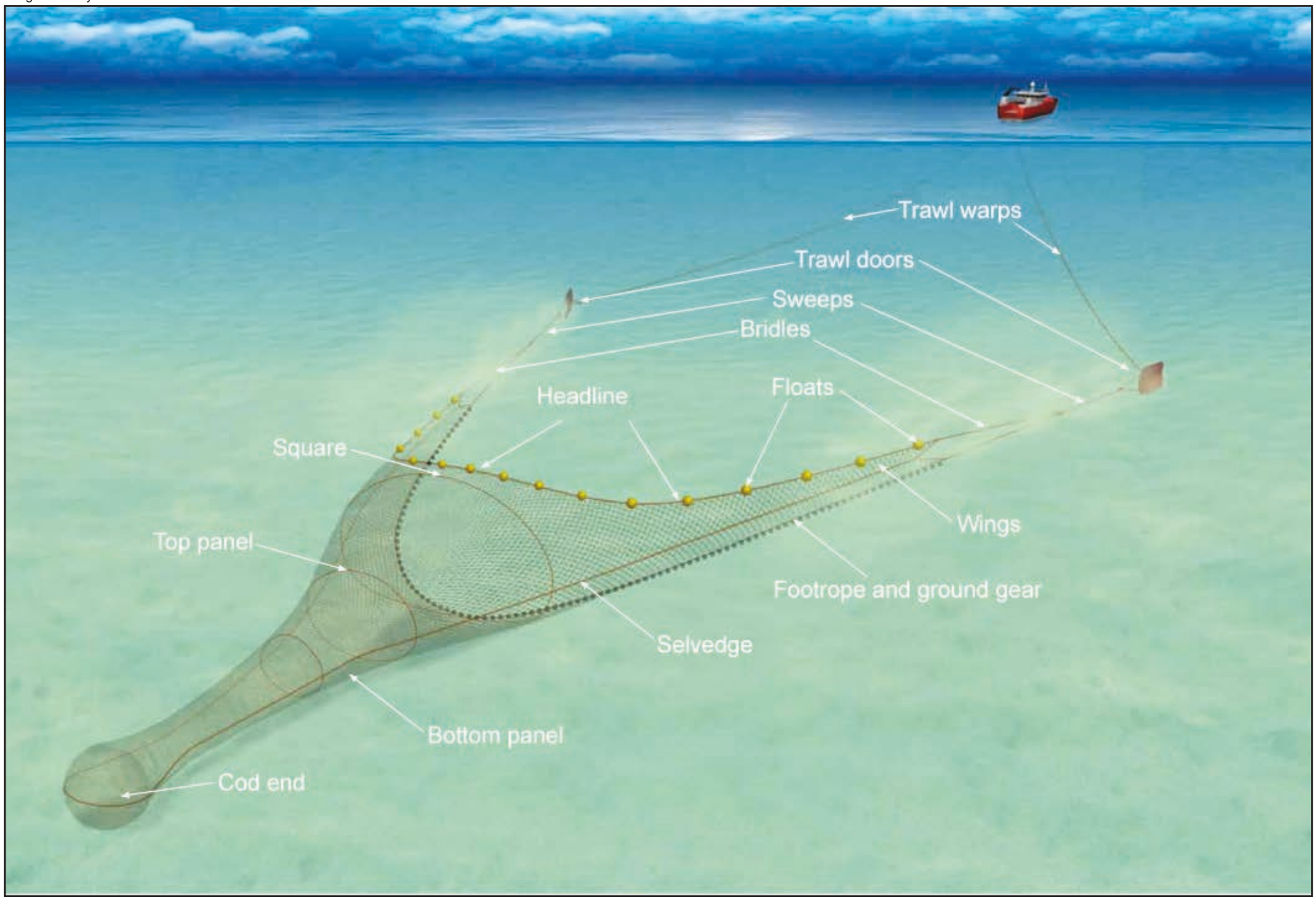

Figure 1: Demersal trawl net arrangment

Figure 2a: Stern view of *Aquarius*

Figure 2b: Port trawl warp

Figure 3a: Reconstruction of rope stopper applied

Figure 3b: Reconstruction of rope stopper trapped in block after warp slackened off

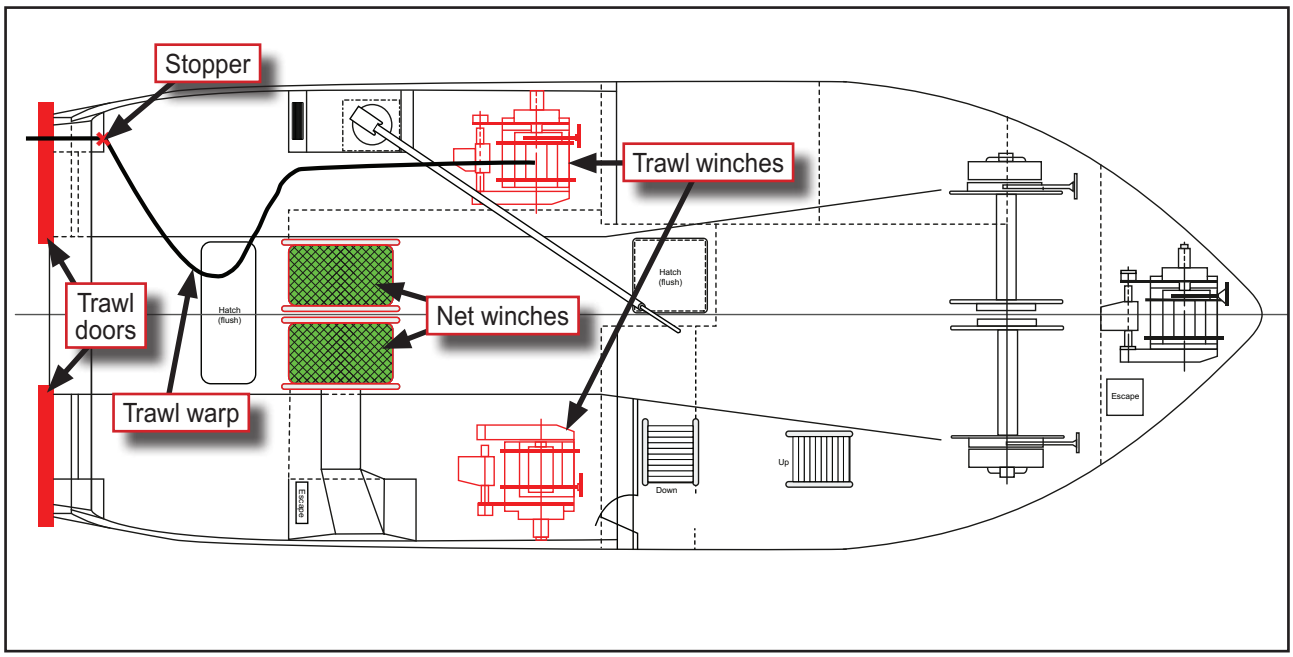

Figure 4: Plan view of deck with warp pulled inboard

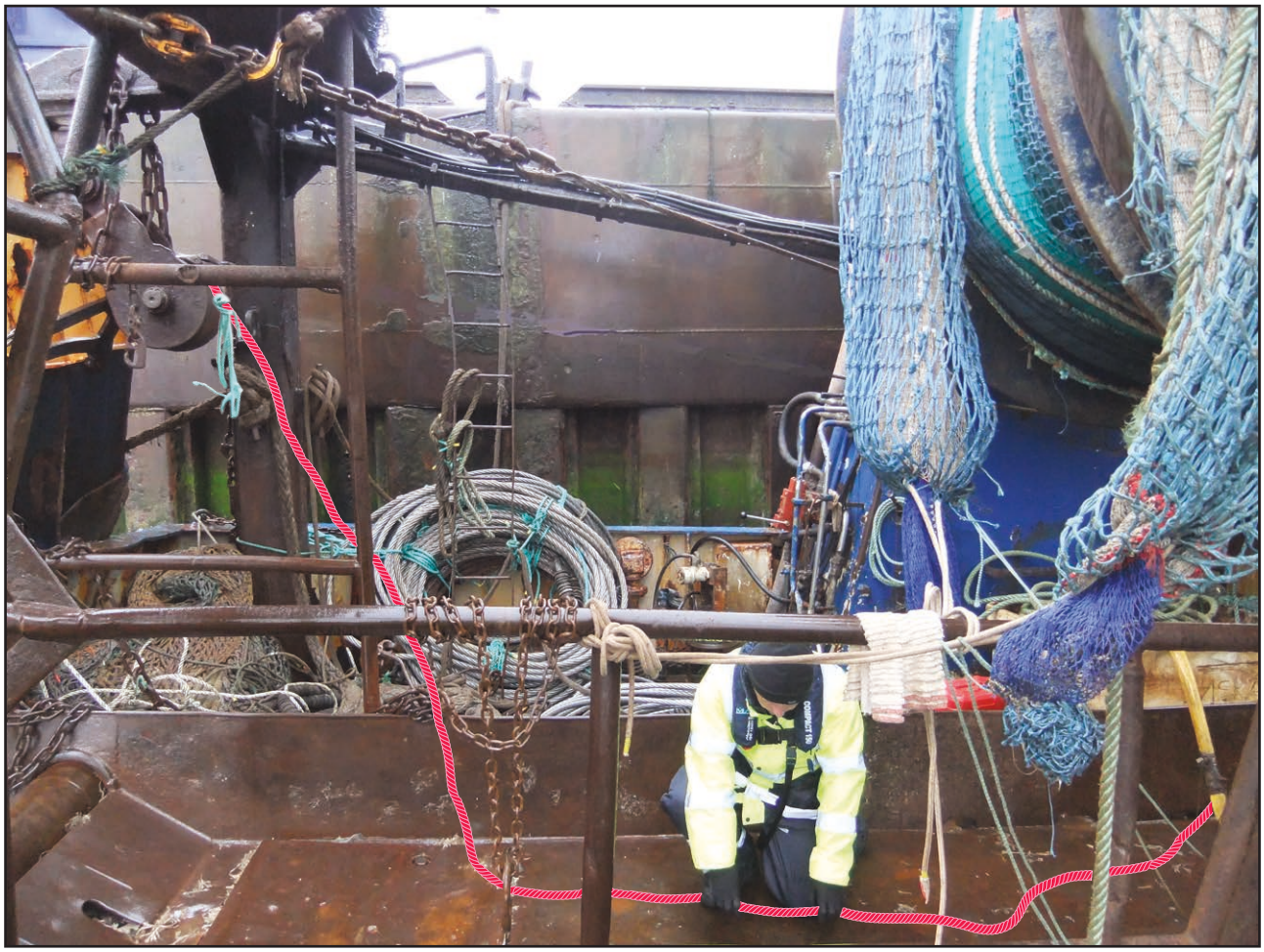

Figure 5: Reconstruction of marking the warp

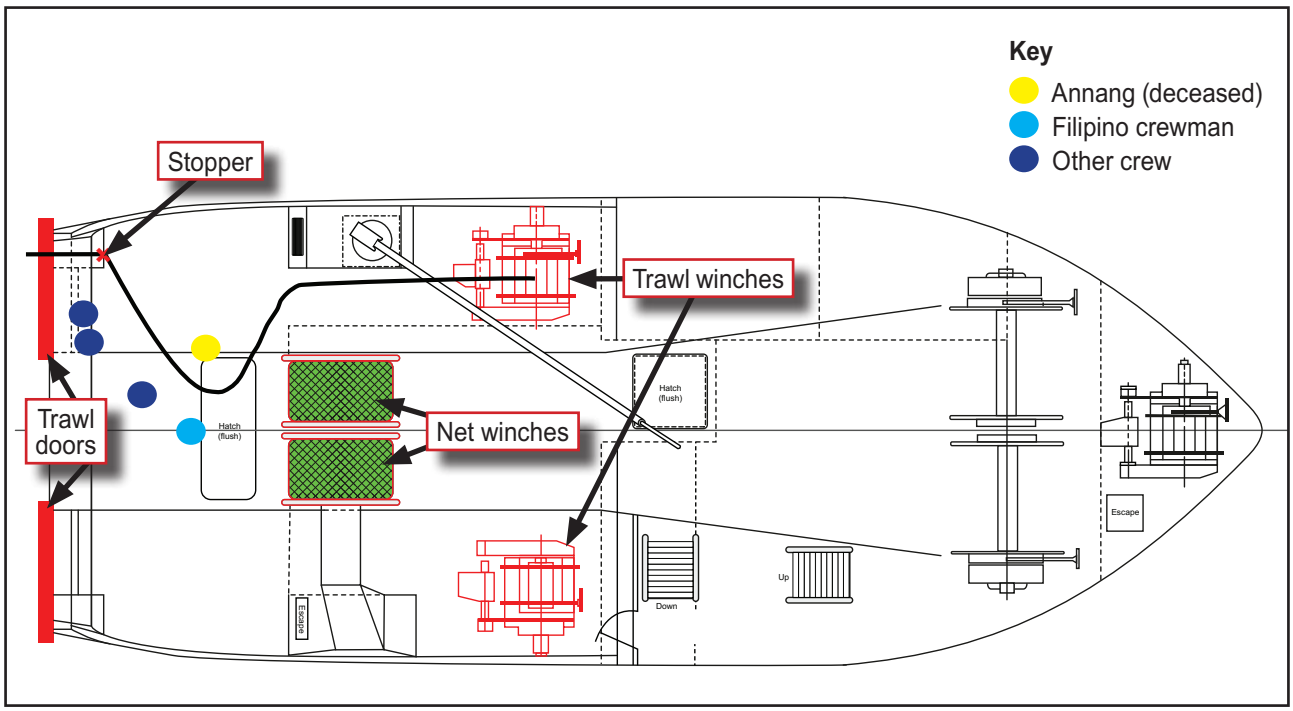

Figure 6: Positions of the deck crew when the stopper failed

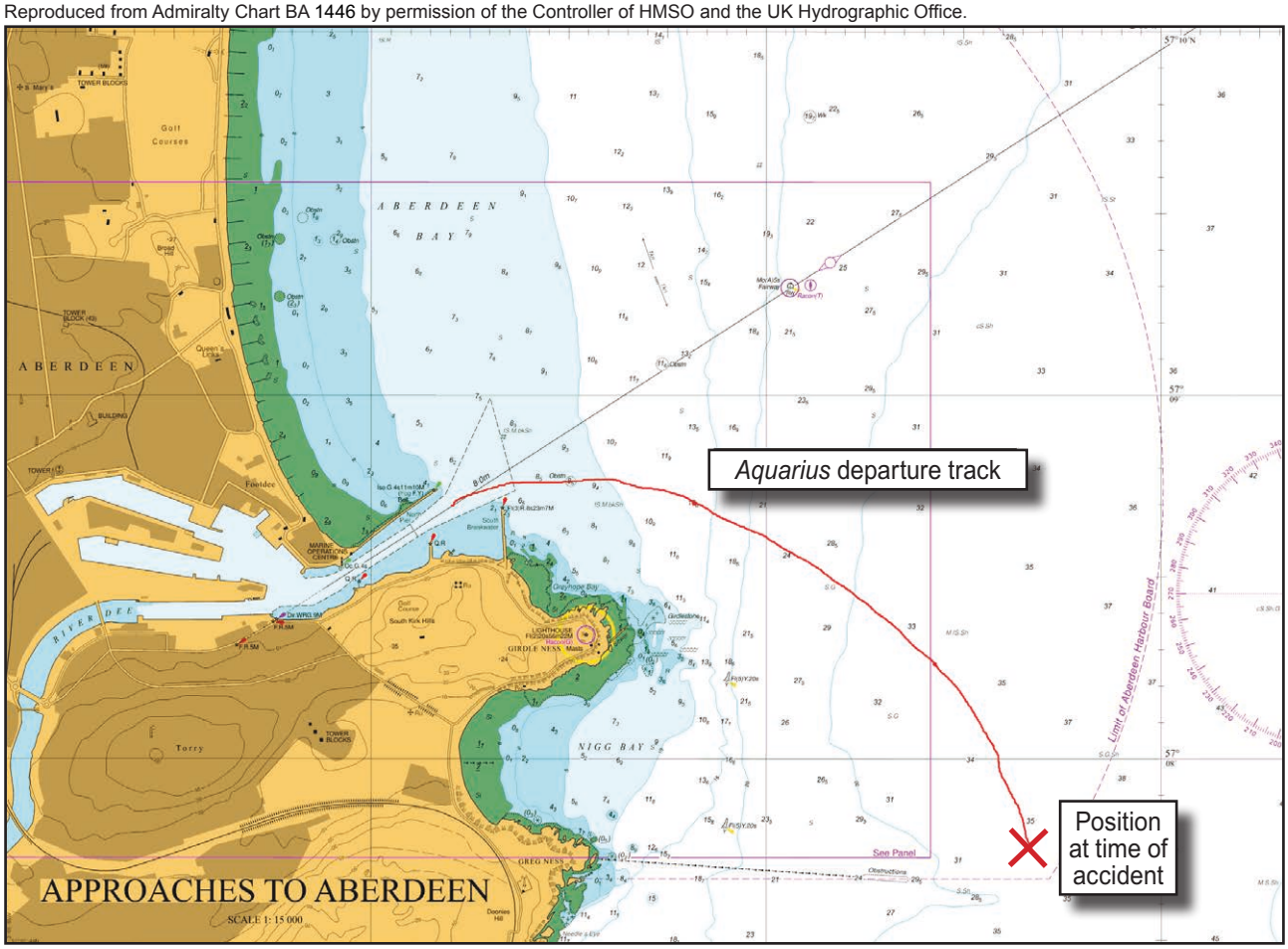

Figure 7: Track of *Aquarius* on departing Aberdeen

One of the crew threw a lifebuoy into the water, but it landed too far away from Annang for him to seize. At about 0143, the skipper manoeuvred *Aquarius* to place Annang directly astern, close to the vessel and within the area of sea illuminated by the vessel's floodlights. Another lifebuoy was thrown, and this landed about 3 to 4m away from Annang, but he was unable to swim to it. The crew shouted encouragement to Annang as he treaded water; Annang made noises but did not respond coherently. Shortly afterwards, the deck crew saw Annang sink below the surface. He did not reappear.

At 0155, the skipper called Aberdeen Vessel Traffic Services (VTS) on his mobile phone and reported that one of his crew had gone overboard. Aberdeen VTS then alerted the Aberdeen coastguard, which in turn transmitted a "Mayday" relay broadcast on very high frequency (VHF) radio channel 16.

The Royal National Lifeboat Institution's (RNLI) all-weather Severn Class lifeboat *Bon Accord,* and an inshore D Class lifeboat, were launched from Aberdeen at 0209. The search and rescue (SAR) helicopter *Bond 1* was also scrambled. The coastguard co-ordinated a systematic search of the area for Annang, with numerous fishing vessels and oil support ships in the vicinity tasked to assist.

At about 0400, the two lifebuoys thrown from *Aquarius* were recovered, along with one yellow Wellington boot of the type worn by Annang. Further searching proved unsuccessful, and the SAR effort was called off later that morning. Annang's body was not found.

1.3 ENVIRONMENTAL CONDITIONS

The accident occurred during the hours of darkness; the visibility was good and a light Westerly breeze was blowing at 10kts. The sea state was calm to slight and the sea temperature was recorded at 13.8°C.

The charted depth of water where the accident occurred was about 30m and the surface of the seabed was shown on the chart as sand and gravel.

1.4 CREW

Aquarius was certified to carry a crew of five, but was being operated with a crew of six at the time of the accident.

The skipper of *Aquarius* was a 46 year old UK national and was also part owner of the vessel. He was a career fisherman and had qualified as Deck Officer (Fishing Vessel) Class 2 in 1999. He also held an Engineer Officer (Fishing Vessel) Class 2 qualification.

Four of his five crew members were Ghanaian nationals; the fifth was Filipino. The Ghanaian crew were all supplied by the crewing agency PG Manning Ltd and employed on a seaman's contract of employment **(Annex A)**. The duration of the contract between the vessel and the crew members was 15 months (+/- 3 months on mutual consent). They lived on board *Aquarius* for the duration of their contract.

The crew members were all career fishermen and had completed the mandatory training[3] required to work on board a UK registered fishing vessel. In addition to their basic safety training, all crew had completed the Sea Fish Industry Authority (Seafish) safety awareness for experienced fishermen course, the syllabus of which included accident prevention and risk assessment. None of the crew, with the exception of the skipper, had any navigation, radio communications or watchkeeping qualifications.

Annang Nuertey was 47 years old. He had previously been employed in various fisheries around the world and had worked on several Scottish boats prior to joining *Aquarius* in January 2015. His command of the English language was above the local Ghanaian average.

The other three Ghanaian crewmen were aged between 37 and 46 years old. Two had been on board *Aquarius* for over 6 months, the third had joined the vessel 3 weeks before the accident. Although the least experienced on board *Aquarius*, the third Ghanaian crewman had completed two previous contracts on UK registered fishing vessels, and had known Annang in Ghana.

The Filipino crewman was 45 years old and had been working on *Aquarius* for 5 years. His command of the English language was good.

The skipper had not nominated a deck crew leader, but typically passed his instructions to Annang or the Filipino crewman as they had the most fishing experience and the best command of the English language.

1.5 *AQUARIUS*

1.5.1 General

Aquarius was a steel hulled stern trawler built in Buckie, Scotland, in 1994 and was originally named *Crystal River.* It was registered in Banff, Scotland, with the fishing vessel registration number BF 89, and its length overall (LOA) was 20.8m.

The vessel was owned by MB Aquarius Ltd, a company which had four shareholders, one of whom was the skipper at the time of the accident. United Fish Selling Ltd, based in Buckie, provided agency services to *Aquarius* and several other local fishing vessels. Its services included the procurement of spare parts, quota management, liaison with authorities and crewing management.

Aquarius carried a digital selective calling (DSC)[4] enabled ICOM GM651 VHF radio set and a Tron 30s MkII emergency position indicating radio beacon (EPIRB).

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[3] New entry fishermen must complete basic safety courses in sea survival; first-aid; fire-fighting and fire prevention; and health and safety. Fishermen with 2 years' experience must also complete a 1 day safety awareness and risk assessment course approved by Seafish, as required by the Maritime and Coastguard Agency.

[4] A DSC-enabled VHF radio allows the operator to transmit a substantial amount of critical information, including the vessel's position, to the coastguard and nearby vessels in an emergency by the pressing of a button and without the need for voice communication.

1.5.2 Fishing gear

Aquarius operated mainly as a twin rig demersal trawler and fished principally for white fish such as cod, monkfish and haddock. *Aquarius* had reached its annual quota for white fish the week before the accident, and the skipper had re-rigged the vessel to catch squid. The rig consisted of a single net, two sets of sweeps, bridles and warps, and a pair of trawl doors **(Figure 1)**. The length of the bridles/sweeps was shortened from 80 fathoms to 40 fathoms to fish in shallower waters, and the cod-end bag changed to a smaller mesh size.

The trawl warps were 22mm diameter, right-hand ordinary lay, galvanised steel wire ropes. Each steel wire warp was spooled on to its own separate winch, with one warp connected to each trawl door. The net was hauled and shot from its own independent drum winch.

1.6 CREW WORKING PATTERNS

Whenever possible, *Aquarius* was operated 24 hours a day, 7 days a week. Other than landing its catch, the vessel spent time in port only if it was under repair, weather-bound or unable to fish due to lack of available quota. The skipper shared a 10 day on and 10 day off working routine with a contracted skipper who had been working on *Aquarius* for a number of years. While the crew were on contract, there was no provision for them to take leave.

In the months leading up to the accident, *Aquarius* had been fishing for white fish around the coast of Scotland. A typical working period involved 1 day steaming to the fishing grounds, 5 or more days fishing, and 1 day steaming back to port to land the catch. The fishing routine was a continuous cycle of shooting the nets, towing the gear for about 5 hours, hauling in the nets and processing the catch.

The crew got broken rest periods while steaming to and from the fishing grounds. While fishing, the crew typically got 2 to 3 hours rest every 6 hours after processing the fish and before hauling in the next catch. When the skipper was resting, the deckhands would take turns to man the wheelhouse for periods of 2 hours.

When the skipper began to fish for squid, the crew's work routine changed. As squid was fished only during daylight hours and spoils quickly once caught, the working day was split between steaming to fishing grounds, repeatedly shooting/hauling nets, processing the catch, and steaming back to port to land the day's catch.

During the 24-hour period prior to the accident, the crew got 11 hours rest. This rest was split into multiple periods, most being about 1½ hours in duration, and none more than 4 hours in length.

1.7 MARKING THE TRAWL WARPS

When fishing, the mouth of the net is kept open by trawl doors. To ensure that the fishing gear is towed at its optimum efficiency it is necessary to know how far apart the trawl doors are. Electronic trawl monitoring systems are often fitted on vessels to determine and monitor door spread, but nonetheless many fishermen still prefer to use traditional measurement and calculation methods, particularly on board smaller fishing vessels.

Aquarius was fitted with an electronic Rapp Marine PTS Pentagon winch control system and a Simrad ITI acoustic trawl monitoring system. Both systems provided computer display readouts in the wheelhouse **(Figure 8)**. The skipper had limited confidence in his vessel's electronic systems and preferred to physically mark his warps to give a visual reference of how much wire had been payed out. The skipper used strands of man-made fibre rope to mark his warps. To do this, the crew used marlin spikes to open up the steel wire warps and wove the markers between the warps' steel wire strands.

Due to the effects of warp stretch and splice repairs, the skipper typically re-measured and, where necessary, re-marked his warps every 2 months. This periodic process was usually carried out in port, where the crew could haul the warps along the quay to measure and re-mark them.

During the 2-week period prior to the accident, the warps were measured and re-marked in a similar manner to that on the day of the accident, on three separate occasions with the vessel at sea. On the last occasion, 2 days before the accident, an additional mark was inserted into the warp at 100 fathoms in preparation to fish for squid. During one of the evolutions, the Filipino crewman raised safety concerns over the way in which the task was being conducted. However, his warnings were ignored and he was aggressively rebuked by his Ghanaian crew mates.

Figure 8: Wheelhouse electronic displays

1.8 THE ROPE STOPPER

The rope used by the crew to stopper the warp was a three stranded, 14mm diameter Polysteel™ man-made fibre rope. Its tensile strength[5] was 3.8t. The length of rope used for the task was cut from a new coil a few days earlier, and had been used as a stopper on two previous occasions. The manner in which the stopper was applied on those occasions was similar to that on the day of the accident.

Following the accident, remnants of the rope stopper were found on the gantry cleat. These were removed by the crew because they wanted to use the cleat to moor the vessel alongside. The remnants of the rope were subsequently disposed of overboard prior to the vessel's arrival back into Aberdeen.

During the MAIB inspectors' initial inspection of the accident site, the deck crew were asked to demonstrate how the stopper had been applied. It was observed that the crewman initially secured one end of the stopper rope to a cleat on the port side of the stern gantry **(Figure 9)**. He then looped the other end of the rope over the warp and around the cleat three times before tying it off around the warp with a series of half hitches. When the warp winch was veered, it was noted that the stopper hitch moved aft and entered the gantry block **(Figure 10)**. The steel wire warp was then seen to slip a short distance through the hitch before the stopper tightened and took the strain.

1.9 THE CODE OF SAFE WORKING PRACTICE FOR THE CONSTRUCTION AND USE OF 15 TO 24 METRE FISHING VESSELS

Aquarius was required to comply with the *Code of Safe Working Practice for the Construction and Use of 15 metre length overall (LOA) to less than 24 metre registered length (L) Fishing Vessels* (15-24m FV Code)[6]. The aim of the Code was to set standards of safety and protection for all staff on board fishing vessels. It set minimum standards for construction, machinery, equipment and also stability.

To comply with the 15-24m FV Code, the vessel owners were responsible for ensuring that the vessel:

- Was built, equipped, surveyed, certified and maintained and operated in accordance with the relevant provisions of the Code.
- Was subjected to annual self-certification inspections.
- Continued to comply with the requirements of the Code in service.
- Was operated by appropriately qualified and certificated crew who had completed mandatory training courses.
- Was not operated as a fishing vessel without a valid UK fishing vessel certificate being in force.

The full text of the 15-24m FV Code was set out by the Maritime and Coastguard Agency (MCA) in its Merchant Shipping Notice (MSN) 1770 (F)

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[5] The tensile strength is the load at which a new rope, tested under laboratory conditions, can be expected to break.

[6] The *Fishing Vessels (Safety of 15-24 Metre Vessels) Regulations 2002* gave statutory force to the *15-24m FV Code*.

Figure 9: Reconstruction of application of the stopper hitch from cleat on port side to the warp

Figure 10: Reconstruction of stopper trapped in the gantry block as warp is veered

1.10 SURVEYS AND INSPECTION REQUIREMENTS

1.10.1 Certification process for 15 to 24 metre fishing vessels

The MCA issues UK fishing vessel certificates that routinely are valid for 5 years. Before a certificate is issued or renewed, fishing vessels are surveyed by appointed surveyors to verify compliance with the 15-24m FV Code and applicable legislation. In order to verify ongoing compliance with the Code, an intermediate inspection by an appointed surveyor must be carried out between the 2nd and 3rd anniversary of the certificate issue/renewal date. Certificates may be issued for periods of less than 5 years if the surveyor considers that the standard of the vessel requires an enhanced level of scrutiny.

Fishing vessel owners are required to present their vessels for survey within the prescribed time frames or prior to undertaking any major repairs or modifications. *Aquarius*'s fishing vessel certificate had been renewed on 29 January 2013 and was valid until 18 December 2017. For the certificate to remain valid an intermediate inspection was required between 28 December 2014 and 28 December 2015. Although not overdue, this intermediate inspection had not been carried out prior to the accident.

The MCA's Marine Guidance Note (MGN) 430 (F) *Checks on Crew Certification and Drills* **(Annex B)** provided information to fishing vessel owners and skippers on the checks its surveyors will make regarding crew certification and the conduct of emergency drills during vessel surveys and inspections. The guidance explained that surveyors will:

- *ensure that the correct certificates of competency are held and safety training courses have been undertaken by skippers and crew;*
- *check that written health and safety policies are in place and completed risk assessments have been carried out;*
- *witness emergency drills as part of the renewal and intermediate surveys on the vessel or at any other time as deemed necessary by the MCA;*
- *confirm that emergency drills (fire, collision/grounding, man overboard, abandon ship, anchoring) are practiced monthly and when a new crew member joins the vessel;*
- *if practicable, and when there is no evidence that drills have been conducted and it is considered the crew are not trained for an emergency, ask vessels to proceed from the harbour to a safe anchorage to undertake anchoring drills. This increases the validity of the drill and provides a more challenging, realistic environment.*

1.10.2 Annual self-certification

In addition to the survey and inspection requirements detailed in paragraph 1.10.1, *Aquarius*'s owners or their delegated representative were required to check the vessel annually to ensure that:

i. all firefighting appliances, lifesaving appliances and safety equipment that are carried on board the vessel have been suitably maintained and are within date;

ii. the radio equipment is functioning correctly;

iii. the shipborne navigational equipment, nautical publications and lights, shapes and sound signal appliances, that are required for compliance with the Collision Regulations, are carried on board and are functioning correctly;

iv. the risk assessment remains appropriate to the vessel's fishing method and mode of operation;

v. no known alteration, damage or deterioration to the vessel or its equipment has occurred in service that would affect the vessel's compliance with the requirements of the Code or the vessel's stability;

vi. weathertight doors and hatches are functioning correctly; and

vii. crew training and certification are valid.

On completion of each annual check, owners were required to sign declarations confirming compliance with the mandated standards, and to retain them on board for subsequent inspections. Self-declaration forms **(Annex C)** were provided for use by fishing vessel owners in Annex 2 of MSN 1770 (F).

The skipper of *Aquarius* could not produce any self-declaration forms and there was no evidence that the annual verification checks had been carried out. This fact had been identified during the MCA's post-accident inspection of the vessel, and recorded as a safety-critical deficiency in the inspection report. MCA surveyors had also identified this omission during several previous surveys and inspections.

1.10.3 Offshore industry guard ship inspections

Guard ships are employed to patrol and protect valuable offshore assets in the North Sea. In particular, they are used to keep fishing vessels and, where applicable, other marine traffic clear of vulnerable offshore assets. In order to generate additional income, fishing vessel owners could apply for a guard ship contract.

Fishing vessels used for guard ship duties were required to hold a Load Line Exemption Certificate, and meet the safety specifications set out by SFF Services Ltd in its *Guard Vessel Inspection and Specification Document* **(Annex D)**. In order to achieve this, participating fishing vessels were required to be inspected annually.

Aquarius was presented annually for guard ship inspections between 2011 and 2013. The vessel was never contracted to conduct guard ship duties.

1.11 SURVEY AND INSPECTION PERFORMANCE RECORD

In the 9 years prior to the accident, *Aquarius* was surveyed and/or inspected by MCA surveyors on nine separate occasions. These were conducted for the maintenance of *Aquarius'*s fishing vessel certificate and verification of compliance with the guard ship safety specification. The MCA surveyors recorded 137 deficiencies during these nine surveys and inspections.

Of the deficiencies recorded, 65% were classified as safety-critical and needed to be rectified before the vessel's departure from the port of survey. During this period, the MCA's visiting surveyors held frequent discussions with the skipper concerning the repeated nature of many of the deficiencies identified, the lack of risk assessments and safety drills.

On 21 March 2013, the MCA conducted a targeted inspection that focused on crew certification and competency following concerns raised by the Scottish Fishery Protection Agency when it boarded the vessel at sea on 15 March 2013.

1.12 POST-ACCIDENT INSPECTION

On 18 August 2015, a targeted post-accident general inspection of *Aquarius* and its safety equipment was carried out in Aberdeen by an MCA surveyor. During the surveyor's initial sampling process he identified so many safety-critical deficiencies that he suspended the inspection and detained the vessel.

At the skipper's request, the surveyor returned to the vessel on 21 August to conduct a *release from detention* inspection. This was required in order that the vessel be allowed to proceed to the port of MacDuff for repairs. During that inspection, the surveyor recorded 23 deficiencies, two of which needed to be rectified before the vessel proceeded to sea, and 18 required action to be taken at the next port.

On 26 August 2015, an MCA surveyor carried out an intermediate fishing vessel certificate inspection in MacDuff. Following that inspection, *Aquarius* was put to sea without rectifying the safety-critical deficiencies identified by the MCA surveyor. The vessel was subsequently detained on its return to the harbour at the end of August.

1.13 MANAGEMENT OF DEFICIENCIES

On completion of each vessel survey or inspection the vessel details and the deficiencies identified were recorded by the MCA surveyor on a paper report form[7]; a copy of the report was passed to the vessel owner/skipper. The content of the inspection report form was later entered into the MCA's electronic *Ship Inspection And Survey* (SIAS) database.

When outstanding deficiencies were rectified, vessel owners were required to inform their local MCA marine office. The marine office staff would then update the information held within the SIAS database. For deficiencies identified on board *Aquarius*, the vessel's agent (United Fish Selling), assumed the responsibility of reporting to the regulator that they had been rectified.

The SIAS database could be interrogated to provide reports of outstanding deficiencies for individual vessels, but there was no facility within the database to alert surveyors when a deficiency had passed its required action date. The surveyors in the Aberdeen marine office typically monitored the status of deficiencies by reviewing the paper files of individual vessels. An attempt was made within the Aberdeen marine office to proactively identify fishing vessels with a poor safety record. The aim of this project was to concentrate the surveyor resources on a few targeted vessels to improve their safety management. The project had identified *Aquarius* as one of the top 10 vessels to be targeted in the region.

[7] MCA MSF 1602 and 1603 forms - *Report of Inspection and/or Survey of United Kingdom/ Dependent Territory/ Foreign Vessel*.

1.14 LIFE-SAVING APPLIANCES

The requirements for *Aquarius'*s life-saving appliances (LSA) were set out in Chapter 7 of the 15-24m FV Code. As a minimum, the vessel was required to carry:

- At least two liferafts[8].
- A lifejacket for each person on board, plus an additional two lifejackets.
- At least two lifebuoys, one of which should be provided with a self-igniting light and self-activating smoke signal, and the other provided with a buoyant line of at least 18m in length.
- A means of recovering a person from the water.
- A line-throwing appliance.
- Six red rocket parachute flares, two buoyant orange smoke signals and four red hand flares.
- One hand-held VHF radio.
- One float-free[9] satellite EPIRB.

Liferafts should be readily available for safe and rapid use in an emergency. They should also be stowed in such a manner that enables them to float free from their stowage, inflate and break free from the vessel in the event of its sinking. During the MCA's post-accident inspection on 18 August 2015, the port liferaft on board *Aquarius* was found to be rigged incorrectly and would not have deployed automatically as required.

For a crew of six, *Aquarius* should have carried eight emergency use lifejackets, but the MCA surveyor found only five on board during his post-accident inspection, two of which did not have the required lights.

There were three lifebuoys on board, one of which was fitted with a light and smoke signal, but they did not have the required standard of retroreflective tape and markings. The lifebuoy fitted with the self-igniting light and self-activating smoke signal was not easily accessible because a pilot ladder had been stowed and lashed down in front of it. This lifebuoy was not used during the manoverboard rescue attempt.

Aquarius did not carry a dedicated means of recovering a person from the water. The MCA's record of particulars for *Aquarius*, dated 29 January 2013, listed *Patching and Line* as the vessel's manoverboard recovery equipment. The skipper and his crew were unable to explain what was meant by *Patching and Line*.

Aquarius was equipped with the distress flares required by the 15-24m FV Code, however the inspection found that the service life had expired in July 2014 (13 months before the accident); the boat's medical kit was also out of date.

The vessel's Global Maritime Distress and Safety System (GMDSS) logbook had not been maintained as required. The EPIRB's hydrostatic release unit expired in September 2014, and its battery life expired 4 months before the accident. There were also no records to indicate that the EPIRB had been tested at monthly intervals.

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[8] The liferafts had to meet the requirements of SOLAS 1974 as amended.

[9] Float-free in relation to LSA means that the appliance is automatically released from a sinking vessel and is ready for use.

1.15 VESSEL SAFETY MANAGEMENT

1.15.1 General duties

In accordance with Regulation 5 of the *Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997*, an employer[10] has a general duty to:

> *'ensure the health and safety of workers[11] and other persons so far as is reasonably practicable'.*

In order to fulfil their general duties, the owners of *Aquarius* were required to endeavour to:

- Avoid or minimise risks
- Evaluate unavoidable risks and take actions to minimise them, and
- Adopt safe work patterns and procedures.

In practice, the day-to-day management of the shipboard operations and safety was under the control of the skipper.

1.15.2 Safety management system

Seafish provided safety management guidance for the UK fishing industry on its website, and reminded fishing vessel owners that:

> *Vessels are required to be operated in a safe manner, it is the responsibility of the owners/skippers of fishing vessels to ensure that they are compliant with the The Merchant Shipping and Fishing Vessels (Health and Safety at Work) regulations 1997.*

In order to help fishing vessel owners and skippers manage their vessels safely, and to comply with their regulatory obligations, Seafish created a structured safety management folder (safety folder). The safety folder was aimed at helping skippers/owners to produce a management system for their vessel and contained examples of risk assessments for different types of fishing operations, as well as a vessel safety policy template, and vessel safety checklists.

The safety folder was available in hard copy and was supplied to fishermen attending the Seafish safety awareness course. Alternatively, it could be completed and maintained online[12].

The safety folder included checklists, templates and forms for:

- Vessel safety policy statement
- Emergency procedures and drills
- Crew details and induction training
- Muster plan

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[10] *Employer* means a person by whom a worker is employed under a contract of employment.

[11] *Worker* means any person employed by an employer under a contract of employment, including trainees or apprentices.

[12] www.safetyfolder.co.uk

- Risk assessments
- Records of equipment inspections
- Stability.

A paper copy of the Seafish safety folder was carried on board *Aquarius*. The safety folder's initial entries were made in late 2012 and early 2013. These entries were coincident with the fishing vessel certificate renewal survey conducted on 29 January 2013.

The vessel owners' safety policy statement included their intent to comply with all relevant health and safety legislation. It also included a commitment to review the vessel's equipment registers, safety procedures and risk assessments every 12 months, or following a significant event. The folder and the vessel's risk assessments had not been reviewed or updated since their initial compilation, and there was no other safety management system in use on board.

1.15.3 Emergency procedures and drills

Section 8.1.2.1 of the 15-24m FV Code stated that:

> *The skipper should ensure that the crew are trained in the use of all lifesaving and fire appliances and equipment with which the vessel is provided and should ensure that all members of the crew know where the equipment is stowed. Such training should be carried out in drills, held in port or at sea, at intervals of not more than one month.*

For a vessel with a crew of five or more, a muster list is required containing clear instructions for each crew member to follow in the event of an emergency. There was no muster list posted on board *Aquarius.*

The emergency procedures listed in the Seafish safety folder included man overboard; location and recovery. The MCA provided generic guidance on the conduct of emergency drills on board fishing vessels for surveyors, skippers and crew in an annex to MGN 430 (F).[13] The guidance for manoverboard included:

> ***Crew general:***
>
> - *Sound crew alarm*
> - *Crew to muster stations with warm clothing and lifejackets donned correctly*
> - *Was the crewman seen to have fallen overboard? Yes / No*
> - *If yes, throw lifebuoy with smoke / light float attached to mark position*
> - *If no, note time and position and consider using smoke / light float anyway to mark a datum position. This will give a visual marker to searching vessels and aircraft as an indication of the tide and surface water movement in the search area from a given time.*

[13] MGN 430 (F) – Checks on Crew Certification and Drills **(see Annex D)**

Skipper:

- *Press MOB function on navigational aid, if fitted and crew alarm*
- *Inform ships mate with all details*
- *Send DSC alert and commence voice transmission on VHF, MF or HF as appropriate*
- *Inform Coastguard of any updated information and the description of missing person*
- *Haul fishing gear if fishing*
- *If not fishing and navigation allows commence Williamson turn*
- *Pass any additional information to the Coastguard and any other vessels assisting*
- *Keep all search units up to date by sending situation reports regularly.*

Mate:

- *Crew muster report to skipper, crewman missing? Yes / No*
- *Collect details of missing crewman and pass to skipper as soon as possible, time and place last seen, clothing type and colours, age and state of health*
- *Ensure crew are dressed appropriately*
- *Post lookouts forward, wing of the bridge port and starboard also on a high point aft*
- *Search vessel for missing crewman and prepare to launch rescue boat if carried*
- *Organise man overboard recovery system*
- *Organise dry clothing and first aid equipment, prepare to treat for hypothermia.*

Guidance regarding the use of the manoverboard recovery systems emphasized that crews should be well trained in their use, and appreciate the limitations of their use in poor weather conditions as well as fine weather.

*Aquarius'*s manoverboard recovery procedure **(Annex E)**, as stated in its safety folder, was:

> *Our procedure for a man overboard is to keep a visual on the man while the others prepare a ring and line. The best location for retrieving a man is on the stern where it's the lowest point and we have 2 winches to haul a person on board very easily.* [sic]

The vessel's safety folder also contained a log sheet to record the conduct of emergency drills at monthly intervals. These log sheets had not been used and there were no records of any emergency drills having been conducted within the vessel's logbook. The last recorded safety drill was carried out on board *Aquarius* during an MCA inspection in January 2013 **(Annex F)**.

The Ghanaian crew members' details had not been entered into the relevant pages in the safety folder, and there was no record of them having received their induction training. They had not carried out any manoverboard drills, or undertaken any structured emergency training since joining the vessel.

1.15.4 Risk assessments

The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 required that fishing vessel owners risk assess their vessels' working operations, and review the assessments at regular intervals.

MSN 1770 (F) incorporated this requirement and stated that:

> *'A health and safety risk assessment should be used to satisfy the obligation of providing information to crew members of the measures taken for their own protection.'*

The risk assessments contained within the safety folder on board *Aquarius* included one for general working on deck **(Annex G)**. The hazards identified for work activities on deck included handling fishing gear, falling overboard and sudden capsize or loss of vessel. The consequences of falling overboard and sudden capsize or loss of vessel were drowning and death, and the control measures prescribed in the risk assessment were:

- *When working with the risk of M/O wear safety harness* [sic]
- *Lifejackets worn when working on deck* [sic]

The crew were not familiar with the vessel's documented risk assessments, and there was no risk assessment or safety procedure for the task of marking the warps.

1.15.5 Work equipment inspections

The *Merchant Shipping & Fishing Vessel (Provision and Use of Work Equipment) Regulations 2006* (PUWER), and the *Merchant Shipping & Fishing Vessel (Lifting Operations and Lifting Equipment) Regulations 2006* (LOLER) apply to all UK registered fishing vessels.

All tools, machinery, and equipment used at work are covered by the requirements of PUWER. This includes everything from a trawl winch to a gutting knife. PUWER requires that work equipment is suitable for the work to be carried out, or is properly adapted for that purpose, and may be used by workers without impairment to their health or safety.

Work equipment that is also lifting equipment will additionally be subject to the requirements of LOLER. Both regulations require that equipment be identified, maintained and inspected. Equipment used for lifting under LOLER regulations is subject to mandatory inspection routines and examination.

The LOLER block accounting system contained in the Seafish safety management folder on *Aquarius* had not been updated for some considerable time **(Annex H)** and, along with the lack of crane wire certification, had been noted as deficiencies in previous MCA surveys.

1.15.6 Personal protective equipment and working lifejackets

The Merchant Shipping and Fishing Vessels Personal Protective Equipment Regulations 1999 require employers to provide personal protective equipment (PPE) for their workers when they are engaged in, or at risk from, a hazardous work activity on board a UK registered vessel.

Regulation 10 requires that:

> *"The employer shall take all reasonably practicable steps to ensure that any personal protective equipment provided to workers under regulation 6(1) is used as instructed."*

In circumstances where there is a foreseeable risk of crew falling overboard, the recognised PPE includes a safety harness and lanyard, a personal flotation device[14] (PFD), and possibly also the use of a thermally-insulated immersion suit as appropriate.

*Aquarius'*s owners had recently provided eight Parmaris 150N PFDs for use by the crew while working on deck. This was the direct result of lessons learned following a recent fatal man overboard incident on board another local fishing vessel, *Beryl* (see paragraph 1.18.2). These PFDs incorporated automatic and manual inflation, and complied with international safety standards[15].

Each member of the deck crew was given one of the PFDs and had received instruction on its use. The crew regularly wore their PFDs on deck during fishing operations, but on occasions the skipper had observed them working on deck without them. The skipper did not routinely enforce the requirement for the crew to wear PFDs when they were working on deck.

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[14] PFDs are divided into the following two main classes: those that provide face up in-water support to the user regardless of physical conditions (lifejackets); and those that require the user to make swimming and other postural movements to position their face out of the water (buoyancy aids). The selection of the appropriate PFD is dependent on the task undertaken and the environment in which it is conducted. PFDs that do not require intervention, such as auto-inflation lifejackets, are suited to activities where persons are likely to enter the water unexpectedly.

[15] ISO 12402-3:2006 – Personal flotation devices – Part 3: Lifejackets, performance level 150 – Safety requirements.

1.15.7 Stability

*Aquarius'*s stability booklet was originally approved by the MCA on 26 January 1999. On 29 January 2013 *Aquarius* underwent a lightship[16] stability check. During this process it was found that an additional 2.5t of fishing gear was carried on board. This caused the vessel to fail certain stability safety criteria.

Section 3.1.3.3 of the 15-24m FV Code stated:

> *The carriage of unnecessary spare gear, stores and parts, the accumulation of debris and the cumulative effects of minor modifications over time can adversely affect the vessel's lightship weight and centre of gravity. Attention should be made to limiting these effects if lightship growth and the possibility of adverse effects on the vessel's stability are to be avoided.*

To make the vessel safe, the skipper was required to remove the additional 2.5t of fishing gear immediately. This was confirmed in a declaration signed and dated on 22 December 2014, by the vessel's agent, as having being completed. During the MCA's post-accident survey an additional 2.5t of fishing gear was again found on board.

1.16 SAFE WORKING PRACTICES

1.16.1 General safety guidance

Chapter 6 of the 15-24m FV Code contained generic safety guidelines for the protection of the crew, but did not contain detailed guidance on safe working practices and general seamanship. In order to help inform fishing vessel owners and skippers of best practice, methods of mitigating hazards and reducing risks, the International Maritime Organization (IMO), the MCA and fishing industry bodies provided a variety of guidance and information.

1.16.2 Guidance provided by the International Maritime Organization

The IMO provided international guidance on safety and health practice for fishermen, and safety and health requirements for the construction and equipment of fishing vessels in its *Code of Safety for Fishermen and Fishing Vessels 2005.*

Although the IMO's Code of Safety did not specifically discuss the task being attempted on board *Aquarius* when the stopper failed and Annang was thrown overboard, it did give the following warnings:

- *During the handling of mooring lines or other wires or ropes, care should be taken not to stand in the bights*
- *Crew should pay special attention to ropes connected to the net such as bridles, false headlines, etc., when shooting. They should never stand in the bights of such ropes*

[16] Lightship is the weight of the vessel with no fuel, cargo, water, fishing gear or stores

1.16.3 The Fishermen's Safety Guide

The MCA's *Fishermen's Safety Guide*, originally written in 2008 and updated in May 2015, was endorsed by the UK Fishing Industry Safety Group (FISG). The guide provided a broad range of advice in respect of fishing safety, and its aim was to provide guidance and promote safety awareness to all.

Section 3 of the guide contained the following warning:

> *Do not stand on a slack warp laid on the deck; if the 'stopper' chain slips, it may suddenly become tight, throwing you up and perhaps overboard.*

The *Fishermen's Safety Guide* is freely available to download from the internet: *Aquarius* did not have a copy on board.

1.16.4 Marine Guidance Notes

The MCA's MGN 415 (F), *Fishing Vessels: The Hazards Associated with Trawling, Including Beam Trawling and Scallop Dredging* was published in 2010. The guidance provided did not directly relate to the task being conducted at the time of the accident although it did provide warnings, similar to those given by the IMO, about the danger of standing in the bights of ropes.

1.16.5 The Code of Safe Working Practices for Merchant Seamen

The MCA produced the *Code of Safe Working Practices for Merchant Seamen* (CoSWP)[17] primarily for the use of merchant seamen on United Kingdom registered vessels. Although not required to be carried on board fishing vessels, CoSWP is an internationally recognised standard of good seamanship practices and is freely available to download from the internet.

Chapters 21.17 and 26.3.18 of CoSWP provided guidance on the use of stoppers. Although much of the guidance referred specifically to mooring ropes, the same principles apply to stoppering any rope or wire under tension. The guidance stated that:

- *Natural fibre rope should be stoppered with natural fibre.*
- *Man-made fibre rope should be stoppered with man-made fibre stopper (but not polyamide).*
- *The 'West Country' method (double and reverse stoppering) is preferable for ropes.*
- *Wire moorings should be stoppered with chain, using two half-hitches in the form of a cow hitch, suitably spaced with the tail backed up against the lay of wire, to ensure that the chain neither jams nor opens up the lay of the wire.*

This information was repeated in MGN 308 (M+F) *Mooring, Towing or Hauling Equipment on all vessels – safe installation and safe operation*.

[17] The MCA issued a revised version of CoSWP on 4 September 2015 and renamed it *The Code of Safe Working Practices for Merchant Seafarers*. This revised version of CoSWP contained similar guidance.

An endless chain **(Figure 11)** for stoppering the trawl warps was carried on board *Aquarius* and had been used by the skipper and his crew on numerous occasions previously.

Figure 11: Endless chain available for use on *Aquarius*

1.17 HOURS OF WORK AND REST REQUIREMENTS

The Working Time: Sea Fishermen Regulations 2004 set out the working time limits and the amount of rest and annual leave to which workers on board UK registered fishing vessels were entitled. The MCA provided guidance on the application of the working time regulations in MSN 1786 (F)[18]. The regulations specified that:

- A worker's working time shall not exceed 48 hours per 7-day period averaged out over a year.
- A worker is entitled to adequate rest, and the total hours of rest should not be less than 10 hours in any 24-hour period and 77 hours in any 7-day period.
- A worker is entitled to paid annual leave of at least 4 weeks.
- A skipper can require a worker to work any hours in an emergency.

For objective or technical reasons, or for reasons having to do with the organisation of the work, the working time standards on board certain types of fishing vessels might be unachievable. In such cases, while the standards remain as the benchmark, exceptions to the limits may be allowed provided that the general

[18] MSN 1786 (F): *Application of the Fishing Vessels (Working Time: Sea-fishermen) Regulations 2004*

principles of the health and safety of the workers are respected. Such exceptions should take account of more frequent or longer leave periods or the granting of compensatory leave.

The Fishing Industry Code of Practice on Working Time Standards (Working Time Standards Code), which was contained as an annex to MSN 1786 (F), was a Government-approved exception that applied to certain types of fishing vessels. This exception applied to *Aquarius* as a white fish trawler provided that compensatory rest was given to the crew to offset those occasions when the standards set out in Clause 7 of the Working Time Standards Code were not met.

In order to comply with the working time regulations, employers were required to keep records that adequately demonstrated that employed sea-fishermen were receiving the minimum rest to which they were entitled. The regulations also required these records be retained for a period of 2 years and be made available for inspection. No records of rest were kept on board *Aquarius*.

The contract of employment **(Annex A)** drafted by PG Manning Ltd for the Ghanaian crew of *Aquarius*, was between the vessel and the crew member. It made no mention of the applicable working time regulations, maximum working hours, minimum rest periods, compensatory arrangements or the requirement for paid annual leave.

1.18 PREVIOUS INCIDENTS ON *AQUARIUS* AND SIMILAR ACCIDENTS

1.18.1 *Aquarius*

The MAIB accident information database contains records of seven incidents involving *Aquarius*. These include:

- July 2013, and again in February 2015, *Aquarius* was towed back to port following an engine failure.
- January 2010, *Aquarius* suffered a control system failure while crossing Lerwick harbour, and was towed alongside by the local lifeboat.
- October 2009, the vessel's wheelhouse was flooded when the windows were smashed by heavy seas.
- January 2008, the vessel suffered partial flooding in the engine room as a result of a leaking stern gland. This was due to poor maintenance after the gland had been repacked but not tightened. The vessel was towed into port at Scrabster.
- December 2005, *Aquarius* was towed into port by the lifeboat after a fuel tank valve failed, causing the vessel to run out of fuel.
- August 2005 *Aquarius* collided with another fishing vessel, *Fertile II,* while pair trawling; *Fertile II* sank. The Chief Inspector of Marine Accidents wrote to *Aquarius*'s skipper recommending that he improve the standard of lookout, communications and maintenance procedures on board his vessel.

In addition to the reported accidents recorded on the MAIB database, the following incidents occurred:

- October 2014, the skipper was fined for *'intentionally obstructing a sea fishery officer'.*
- August 2014, the vessel's stand-by skipper was fined for illegally landing fish and falsifying records.
- March 2013, the owners of *Aquarius* were issued with an improvement notice for their failure to have a qualified GMDSS operator on board.
- January 2013, the skipper was issued an official warning for operating *Aquarius* without a valid UK fishing vessel certificate.

1.18.2 UK fishing vessel fatal man overboard accidents

From the period 1992 up to and including this accident, there have been 117 fatal man overboard accidents on UK registered fishing vessels.

On 9 July 2015 the skipper of the twin rig stern trawler *Enterprise* fell overboard through one of the fishing net shooting ports when the vessel lurched in heavy seas. Although all of the other crew were wearing PFDs, he was not. It was estimated that he was in the water for 30 to 40 minutes before being recovered on board. Despite resuscitation efforts by the crew he did not survive.

On 10 February 2015 a crewman on board the 28m twin rig trawler *Beryl* was carried overboard by the vessel's port trawl net. The crewman was carried through the port shooting door and into the sea. He was conscious and managed to hold onto the net. The crewman was wearing a PFD and it inflated when he entered the water. *Beryl*'s crew spent almost 50 minutes trying to recover him back on board, but they were unsuccessful. The crewman was eventually recovered by a rescue craft launched from an offshore support vessel. He was transferred to a rescue helicopter and flown to hospital, but he did not survive.

On 29 January 2012 a crewman was swept overboard from the twin rig trawler *Zenith* while standing on top of the aft bulwark rail during hauling operations. The vessel was quickly manoeuvred to bring the casualty alongside, but the crew were unable to recover him back on board and he slipped from their reach and was lost. He was not wearing a PFD.

On 11 November 2009 a Filipino crewman was dragged into the sea from the deck of the fishing vessel *Osprey* by a net running over the side. Despite his crew mates' attempts to recover him using a line and a lifebuoy, the crewman disappeared from the surface after about 12 minutes and was never recovered. He was not wearing a PFD.

On 13 August 2008 a crewman was swept overboard from the twin rig trawler *New Dawn* by a towing chain while shooting gear. The skipper jumped into the sea to help the crewman but quickly began to succumb to the effects of the cold water. After some difficulty the skipper was recovered. Unfortunately, the crewman, who was not wearing a PFD, was not recovered.

On 3 September 2007 a crewman on board the stern trawler *Apollo* died after being dragged overboard by a trawl net during hauling. The vessel was quickly manoeuvred alongside the casualty, who grabbed hold of a life-ring thrown to him by his crew mates, and was pulled alongside. Once alongside he began to lose consciousness and, despite his crew mates' efforts, was unable to be revived when he was recovered to the deck. The casualty, who had not been wearing a PFD, was in the water for approximately 15 minutes before his final recovery to the deck. The Chief Inspector of Marine Accidents wrote to the Chief Executive of the MCA suggesting that he consider extending an initiative for MCA's surveyors to assist fishermen in their assessment of the risks encountered during fishing operations.

1.18.3 Annual self-certification

On 30 March 2014 the owner/skipper of the 10m scallop dredger *Ronan Orla* was fatally injured when he became entangled on the warping drum of the vessel's winch. One of the findings from the MAIB investigation was that self-certification, required to confirm the status of safety equipment, had not been carried out. A recommendation was made to the MCA regarding this within the report 12/2015:

2015/129 *Amend Marine Guidance Note 502(F) The Code of Practice for the Safety of Small Fishing Vessels to require owners of under 24m fishing vessels to submit copies of their annual self-certification declarations to the regulator.*

The MCA rejected this recommendation.

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 OVERVIEW

Ghanaian crewman, Annang Nuertey, was thrown overboard from the UK registered stern trawler *Aquarius* because he was kneeling within a bight of a trawl wire that suddenly came under tension when the stopper taking the weight of the wire failed.

The crew were unable to recover him because the vessel was not effectively equipped to recover a person from the water, its emergency procedures lacked detail, and the crew had not practised manoverboard recovery.

2.3 THE FAILURE OF THE ROPE STOPPER

The crew of *Aquarius* were attempting to mark the vessel's port trawl warp while underway at sea when the accident happened. In order to do this, the warp was streamed over the vessel's stern and towed along the seabed. The application of the stopper allowed the crew to slacken the inboard section of the warp and lay it onto the deck. The length of rope used for the stopper was cut from a coil of 3 stranded, 14mm diameter Polysteel™ rope, and had been used to conduct a similar evolution on at least two previous occasions. Remnants of the failed rope were found on board after the accident, but were thrown overboard prior to the vessel arriving back in port.

As the remnants of the stopper had been discarded prior to the vessel returning to port, the condition of the rope used to create the stopper and its failure mode could not be verified. However, taking into consideration the sudden nature of the stopper failure, the method used to apply it, and that the remnants were found attached to the gantry cleat after the failure, it was apparent that the rope must have parted. Given this, the investigation considered three main scenarios that could have caused the stopper rope to part. These were:

- Tensile overload due to the strain acting on the stopper exceeding the minimum breaking load of the Polysteel™ rope.
- Tensile failure due to loss of residual strength as a result of previous rope damage.
- Cutting of the man-made fibre rope by the steel wire warp following the failure of the stopper hitch.

Aquarius was making 5 to 6kts over the ground and the skipper was executing a slow turn to starboard when the stopper failed. About 210m of the 22mm diameter steel wire warp had been streamed over the stern, over 100m of which would have been dragging along the seabed. Calculations indicate that, had the stopper rope been in good condition, it should have had sufficient tensile strength to hold the weight of the streamed warp. However, despite the surface of the seabed being sand and gravel, the risk of the trailing warp becoming snagged would have been ever present. Regardless of the condition of the rope used to create the stopper, had the warp snagged on the seabed the sudden increase in tensile load would have been more than sufficient to cause the stopper to part.

When the crew demonstrated how they had applied the stopper **(Figure 9)** it was evident that the method used was not in accordance with the guidance for good practice set out in seamanship manuals and CoSWP. It was also noted that the stopper hitch entered the gantry block and the warp slipped a short distance through it before the hitch tightened and the stopper took the strain.

Polysteel™ rope is often used on board fishing vessels as it has good abrasion resistance and UV protection characteristics. It is about 40% stronger than equivalent diameter polypropylene and polyethylene ropes. Despite the rope only having been used to stopper the vessel's warps on a couple of previous occasions, it is highly likely that it would have suffered significant abrasion damage each time the steel wire warp slipped over it. This abrasion damage would have decreased the tensile strength of the rope, and therefore increased the risk of it parting under tension.

The manner in which the stopper was applied would also have presented a high risk of the stopper hitch failing. If the steel wire warp had suddenly started to slip through the stopper hitch, it would very quickly have cut through the man-made fibre rope. However, it is most likely that the stopper failed because the rope used to create it parted under tensile overload. It is also likely that the rope's residual strength had been significantly reduced due to previous abrasion damage. Whatever the failure mode, it is without doubt that the method used to stopper the warp contributed significantly to this accident.

2.4 WORKING PRACTICES ON BOARD *AQUARIUS*

2.4.1 Marking the trawl

The marking of *Aquarius*'s trawl warps, by opening up the steel wire strands and inserting lengths of man-made fibre rope, was an activity that the skipper and his crew carried out on a regular basis. The task was typically undertaken on the quayside when the vessel was in port. The reason for marking the warps was to allow the skipper to place the net on or near the sea bed, and also by varying the amount of wire veered to maintain the mouth of his net at its optimum width to catch fish. The electronic winch control and acoustic trawl monitoring systems fitted to *Aquarius* should have removed the need to mark the warps manually. However, the skipper had little confidence in the technology and it was apparent that the trawl monitoring system had not been set up for single net trawling **(Figure 8)**.

Having decided to rely on warp marks, it would have been much safer to have undertaken the task on the quayside in Aberdeen before sailing, where facilities were available by prior arrangement. If it was considered essential to conduct the task at sea, steps could easily have been taken to make the evolution much safer. For example, the warp could have been streamed once the vessel was clear of the harbour and marked while the vessel was drifting.

The crew had recent experience of marking the warps in a similar manner at sea with the vessel making way. The successful completion of the task on several previous occasions is likely to have influenced some of the crew's perception of risk, and led to them taking a complacent approach to their own safety. Nevertheless, the dangers associated with the task were obvious but had not been risk assessed, and there were no safe systems of work in place to follow. The activity undertaken was unnecessarily hazardous, and with proper planning the accident could easily have been avoided.

2.4.2 Standards of general seamanship

The standard of seamanship executed in the build-up to this accident fell well short of recognised good practice. The guidance and warnings contained in publications such as the *Fishermen's Safety Guide*, IMO's *Code of Safety for Fishermen and Fishing Vessels* and the MCA's MGNs and CoSWP appeared to have been ignored. Of note:

- A man-made fibre rope was used to stopper the steel wire rope.
- The way the stopper was applied increased the risk of slippage and failure.
- The casualty positioned himself in the bight of a rope.

It is a well-established seamanship practice to use chains or specially designed equipment when stoppering steel wire ropes. This should have been well understood by *Aquarius*'s crew, and man-made fibre rope should not have been considered suitable for use when stoppering the vessel's steel wire warps.

The hitch used to create the stopper, and the manner in which the stopper was applied, were not in accordance with the guidance provided in CoSWP or seamanship manuals **(Figure 12)**. The stopper should have been applied in such a way that it could take the strain before it entered the gantry block. The effect of crushing the stopper rope against the steel groove of the gantry block wheel would have caused further damage to the man-made fibre rope.

Standing in the bight of a rope is a hazard that all seafarers are taught to avoid during basic training. Furthermore, the subsequent dangers are constantly emphasised in seamanship manuals, safety posters and safety booklets. It is therefore difficult to understand why a seafarer as experienced as Annang would position himself in the bight of *Aquarius*'s slackened warp. This is especially so given the knowledge that an ad hoc stopper arrangement was being used to take the strain. It is equally difficult to understand why his fellow crew mates did not intervene and tell him to reposition himself. The space available on the deck, in which to conduct the work, was probably the dominant factor that led Annang to position himself in the danger zone.

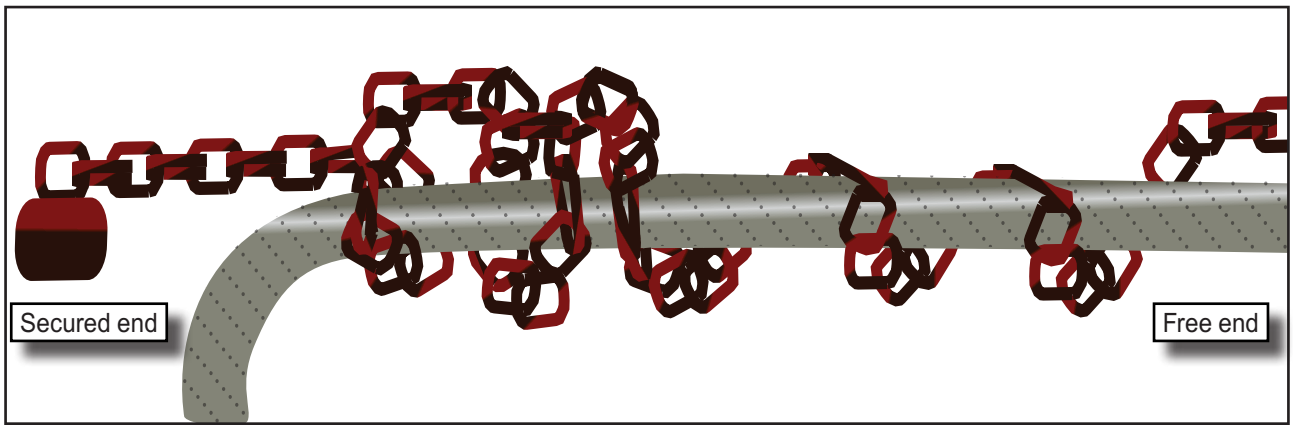

Figure 12: Chain stopper applied

2.4.3 Leadership and teamwork

The skipper did not formally appoint one of his crew to act as his first mate or to be the vessel's senior deckhand. He often oversaw deck activities himself and typically relayed his orders through Annang or the Filipino crewman. Being the oldest and most experienced fisherman, the Ghanaian crew members looked to Annang for leadership, but also accepted direction from their Filipino crew mate.

It was apparent that there had been a predominantly good working relationship among the deck crew, using English as the common language. However, this had recently been undermined when, a few days prior to the accident, the Ghanaian crew members reacted aggressively towards the Filipino crewman following his protests about their use of a fibre rope stopper, in a similar unsafe manner. Culturally, this would have brought shame upon the Filipino[19].

The lack of an appointed leader, the alienation of the Filipino crewman, and Annang's status among his Ghanaian crew mates almost certainly had an influence on the way the tasks were conducted on deck. Similarly, these factors probably resulted in an unwillingness among Annang's crew mates to challenge unsafe acts. This might explain why none of the other crew members intervened when Annang stood in the bight of the warp, and a fibre rope was used to stopper it.

2.5 MAN OVERBOARD

In preparation for the task, Annang had positioned himself in the bight of the slackened warp. He was kneeling on the deck and leaning over the warp, with a marlin spike in one hand and the wire rope in the other, when the stopper parted. A second crewman was positioned on the other side of the warp and was helping to hold it steady **(Figure 6)**.

When the stopper parted, the slackened warp snapped tight with considerable force. Given Annang's position within the bight of the warp, it is likely that it struck him across his chest and under his armpits as it snapped tight. The energy with which the crewman was lifted off the deck and catapulted overboard would almost certainly have severely stunned and disorientated him, and was probably sufficient to cause internal injuries. Nevertheless, Annang was alive when he entered the water and was able to keep himself afloat for several minutes without the aid of a PFD.

2.6 EMERGENCY RESPONSE

When the crew raised the alarm the skipper's initial reaction was to focus on monitoring Annang's position in the water, and manoeuvring *Aquarius* astern towards him. The crew threw lifebuoys towards their crew mate in the water and shouted encouragement, but despite these efforts Annang soon succumbed and sank below the surface of the water. About 15 minutes after the casualty entered the water, and having realised that the attempts to rescue him had failed, the skipper used his mobile phone to alert Aberdeen VTS.

[19] https://geert-hofstede.com/philippines.html

The initial steps taken by the skipper and his crew were broadly in line with those listed in the vessel's manoverboard recovery procedure; however, they fell well short of recognised good practice. Many of the key initial responses listed by the MCA in MGN 430 (F) were not carried out. In particular:

- A "Mayday" call was not transmitted.
- The crew did not use the lifebuoy that had been rigged with smoke and light signals to mark the position of the casualty.
- The skipper did not activate the manoverboard function on the vessel's navigation aids.

Alternative options for recovery of a person in the water were discussed within section 2.6 of the recent MAIB report 26/2015, into the fatal manoverboard from *Beryl* (BF 440). This included the consideration of deployment of a liferaft to provide either a temporary place of safety, or as a platform to aid recovery.

When the crew initially raised the alarm the skipper was under the misconception that he and his crew would be able to recover Annang quickly, and without the need for external support. This assessment was wrong, and the emergency response was ineffective.

2.7 EMERGENCY PREPAREDNESS

In order to minimize the consequences of marine accidents and incidents, fishermen and their vessels need to be prepared to deal with a variety of emergency situations. Fishermen are prepared through the delivery of training and the provision of guidance and procedures. Fishing vessels are prepared through design, the provision of LSA and other safety equipment. To ensure that training has been effective, emergency procedures are fully understood and safety equipment is suitable for its intended use, fishing vessel crews should conduct regular and realistic emergency response drills.

Aquarius did not carry all the LSA required for a fishing vessel of its size, and the majority of the safety equipment it did carry was not being properly maintained. Of particular note: the vessel did not carry a dedicated means of recovering a person from the water, or a sufficient number of lifejackets for all on board; one of the liferafts had not been properly rigged; access to one of the lifebuoys had been obstructed; and the distress flares and first-aid supplies were out of date. The lifebuoy that was obstructed was the one that had been rigged with smoke and light signals, and it was not used during the rescue attempt.

The vessel's documentation listed *patching and line* as the equipment to be used to recover a person from the water, but the vessel's manoverboard recovery procedure prescribed the use of a *ring and line*. No one on board knew what the term *patching and line* meant, and the limitations of relying on lifebuoys with lifelines to recover a person from the water became apparent as the emergency situation developed.

The crew on board *Aquarius* were all experienced fishermen; they had completed the UK's mandated sea survival and safety awareness courses, and should have had at least a basic understanding of what to do when Annang was thrown overboard. However, the vessel's manoverboard procedure contained little or no detail on the fundamental steps to take in such an emergency situation, and indicated that it would be easy to recover a person from the water over the

vessel's stern. As the crew did not conduct regular emergency drills, the vessel's manoverboard procedure was not properly challenged, and the crew were denied the opportunity to practise and hone their skills.

The MAIB has investigated numerous similar fishing vessel accidents (paragraph 1.18.2) and has repeatedly highlighted the dangers of falling overboard while working on deck, and the difficulty of recovering a person from the water. The MCA, fishing industry federations, and UK maritime safety organisations have also made great efforts to highlight these issues. However, it was clear that the skipper and owners had seriously underestimated the dangers associated with such an event.

The response to the crewman falling overboard should have been instinctive to all on board; in particular, the alarm should have been raised immediately by activating the DSC function on the vessel's VHF radio. It was clear that *Aquarius* and its crew had not been properly prepared to deal with the situation. Had the vessel been adequately equipped, its safety equipment properly maintained, and its crew regularly drilled, Annang's chances of survival would have been increased considerably.

2.8 THE USE OF PERSONAL FLOTATION DEVICES ON DECK

The risk assessments contained in *Aquarius*'s safety folder identified falling overboard as a hazard to persons working on deck, and recognised that the consequences of such an event could be fatal. In order to reduce the likelihood of a man overboard drowning, the control measures listed in the risk assessment for working on deck included the wearing of PFDs. In order to implement this control measure, the owners of *Aquarius* had provided each crewman with a 150N automatic inflation PFD. However, the crew did not wear their PFDs when they attempted to mark the trawl warps; the skipper did not have a PFD.

When a person enters cold sea water after falling or being thrown overboard they often die swiftly due to the effects of cold water shock, or over a period of time due to the intake of water in turbulent seas. It is difficult to estimate with any accuracy the likely survival times for people immersed in water as there are many uncertainties. The temperature of the sea water, and the physiological attributes and health of the person immersed are key factors that can influence survival times. An uninjured person may be able to survive for several hours immersed in sea temperatures of 13.8°C.[20] However, without the buoyant support of a PFD, a person's survival time is often measured in minutes and seconds, rather than hours.

The extent of injuries suffered, and the effect of cold water immersion when Annang was thrown overboard, are unknown. However, he was alive and treading water for several minutes before he sank out of sight. As the weather at the time of the accident was benign, it is almost certain that Annang would have been recovered had he been wearing his PFD. This was particularly so given the proximity of other vessels and shore-based rescue craft.

The wearing of a PFD not only increases the chances of survival for a person who unexpectedly enters the water, but it also increases the likelihood of them being recovered back on board[21]. The procurement of the PFDs and their distribution to

[20] Golden. F. Tipton M (2002). Essentials of Sea Survival pp129-139.

[21] In the case of a person lost at sea, it can take up to 7 years under current UK legislation for them to be declared dead. This can cause years of financial and administrative problems for the family.

the crew on board *Aquarius* is to be applauded; however the failure to ensure that they wore them at all times when working was a significant factor in their inability to recover Annang once he fell into the water.

2.9 EFFECTS OF TIREDNESS AND FATIGUE

When working, *Aquarius* was operated 24 hours a day, 7 days a week, by two skippers who shared a 10-day on / 10-day off work routine. The deck crew were all foreign nationals and were employed on 15-month contracts through manning agencies. The crew lived on board for the duration of their contracts and worked continuously without leave breaks. During the 24-hour period prior to the accident, the crew worked a total of 13 hours, but their rest periods were broken, with none lasting longer than 4 hours.

It was apparent that *Aquarius* and its crew were being worked extremely hard for prolonged periods of time; therefore the risk of crew fatigue was high. This risk might have been heightened by the recent change to the vessel's operating routine, as the switch to day running to fish for squid would have had an impact on their sleeping patterns.

Sleep deprivation has a cumulative and negative effect on an individual's health, and after several sleepless nights the mental effects become more serious. Under such circumstances, an individual's ability to concentrate and make sound decisions will be impaired and, as a result, the risk of injury and accidents increases. Even if the crew were not feeling the chronic effects associated with long working hours and continuous periods of broken rest, tiredness and a desire to complete the job quickly so that they could sleep ahead of another busy day, almost certainly influenced their approach to the task of marking the warps.

2.10 HOURS OF WORK AND REST

MSN 1786 (F) provided clear guidance on the application of the UK's working time regulations for sea-fishermen employed on UK registered fishing vessels. The purpose of the regulations was to ensure that fishermen receive adequate rest and not less than a set minimum period of annual leave. In order to assess compliance, employers were required to keep records of each individual crew member's hours of rest. The aim of this requirement was to ensure employers had the information necessary to monitor their crews' work and rest patterns, and take steps to minimise the risk to their health and safety arising from fatigue.

The difficulties in applying strict working time standards across a complex and diverse fishing industry were acknowledged in MSN 1786 (F), and allowance was made in the regulations for the application of exceptions to the mandated limits. The fishermen's Working Time Standards Code provided a set of government-approved generic exceptions for certain classes of fishing vessel; *Aquarius* was subject to these exceptions. Nevertheless, the core requirements set out in the Working Time Standards Code were similar to those in the regulations. In circumstances where crew are expected to exceed the mandated working time limits, employers were required to ensure they were given more frequent and longer leave periods, or received compensatory rest.

The crew members on board *Aquarius* were not afforded the minimum standards required by UK legislation; of particular note:

- Their hours of rest were not recorded
- They continually worked in excess of 48 hours per week
- They did not receive 4 weeks' annual leave or compensatory leave; and
- They did not get a 6-hour rest period during the 24 hours leading up to the accident.

The Ghanaian crew members' contracts of employment, issued by a UK manning agency, made no reference to the fishermen's working time regulations, and did not include maximum hours of work, or annual and compensatory leave entitlements. The vessel's British skippers took regular 10-day breaks, but the foreign nationals were expected to work and live on board *Aquarius* without any opportunity to take periods of compensatory leave.

2.11 VESSEL SAFETY MANAGEMENT

2.11.1 Vessel's safety management system

In accordance with the Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997, the owners and skippers of *Aquarius* had a general duty to ensure, as far as was reasonably practicable, the health and safety of their crew. In order to do this, they were required to evaluate unavoidable risks and take actions to minimise them. This included the adoption of safe working patterns and procedures. These requirements, along with a set of prescriptive safety standards, were repeated in the 15-24m Fishing Vessel Code.

The owners and skippers of *Aquarius* used a paper copy of the Seafish safety folder to document the vessel's risk assessments, procedures and equipment registers. However, it had been compiled prior to its fishing vessel certificate renewal survey in January 2013, and had not been amended or reviewed since. When reviewed, the safety folder was found to contain a minimal amount of vessel-specific information, its documented procedures lacked detail, and it was apparent that it had been hastily compiled in order to maintain the vessel's UK fishing vessel certification.

*Aquarius'*s poor safety inspection record, and the material condition of the vessel's safety equipment at the time of the accident indicated that the skipper and owners had adopted a reactive approach to safety management, and took action to meet mandated safety standards only when prompted by deficiencies identified by MCA surveyors. In effect, the owners and skipper were using the MCA as a superintendence and safety management service.

2.11.2 Risk assessment

The lack of risk assessments had been raised as deficiencies by MCA surveyors in four out of five inspections that took place on board between January 2011 and January 2013, and had been discussed with the skipper at the time. When the vessel's safety folder was compiled, the owners relied solely on the generic risk assessments produced by Seafish.

Relevant to this accident, the task of marking the trawl was conducted on a regular basis, but a documented risk assessment had not been produced. The method used to mark the trawl warps at sea was unnecessarily hazardous, and the failure of the stopper and subsequent loss of a crewman overboard were entirely foreseeable. This specific risk was documented in *The Fishermen's Safety Guide* (paragraph 1.16.3), which contained the following warning:

> *Do not stand on a slack warp laid on the deck; if the 'stopper' chain slips, it may suddenly become tight, throwing you up and perhaps overboard.*

Had the task of re-marking the trawl warps at sea been subject to a risk assessment process, the difficulties of working with a lack of space, the danger zone within the bight of the warp, the application of an appropriate stopper, and the need to wear a PFD could have been identified. This might have prompted the skipper to avoid the risk and do the job before leaving port, or put plans in place to do the task in a much safer manner at sea.

2.11.3 Safety culture and its effect on behaviours

The safety culture on board a vessel is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the crew's commitment to health and safety management. The prevailing level of safety culture achieved on board a vessel will have a significant effect on the way tasks are done on board, and on what the crew do when no one is watching.

In order to achieve a strong safety culture on board a fishing vessel, the skipper must demonstrate his commitment to safety management, and vigorously promote safe systems of work. If a skipper has a natural, unconscious bias for production over safety, or a tendency to focus on the short-term and on being highly reactive, a poor level of safety culture will prevail. Symptoms of poor cultural factors can include:

- Widespread, routine procedural violations
- Failure to comply with the vessel's safety management system; and
- Management decisions that appear to consistently prioritise the catching of fish over safety.

On *Aquarius,* all three of these indicators had been present for a prolonged period of time, and it was evident that an extremely low level of safety culture existed on board. Safety management should not be considered an unnecessary burden; it should be a natural function of good vessel management. Boats with a strong safety culture are those that are well run, well maintained and employ well-trained crew. As a result, they typically have fewer deficiencies identified, fewer accidents and less resultant downtime.

2.12 CERTIFICATION PROCESS AND EQUIPMENT MAINTENANCE

2.12.1 Vessel owner's annual self-certification process

The owners of *Aquarius* were responsible for ensuring that the vessel was equipped, surveyed, certified, maintained and operated in accordance with the relevant provisions of the 15-24m Fishing Vessel Code. To assure themselves that the vessel continued to comply with the Code throughout its service, the owners or their

appointed representative were required to check the vessel annually. On completion of each annual check the owners should sign a declaration confirming compliance; this should be held on board the vessel for subsequent inspection.

The annual self-certification process is fundamental to the UK's approach to the certification of non-SOLAS (under 24m LOA) fishing vessels. However, no self-declaration forms were found on board *Aquarius* during its post-accident inspection. This shortcoming is not uncommon and, as highlighted in previous reports, MAIB inspectors often discover that annual self-certifications have either not been completed, or are not available for inspection. Following the *Ronan Orla* accident (paragraph 1.18.3), the MAIB recommended that the MCA requires vessel owners to submit copies of their self-declaration forms to the MCA for monitoring scrutiny. This recommendation was rejected by the MCA because it did not align with the agency's 10 year strategy, which was to encourage fishermen to take more responsibility for their own safety. Notwithstanding this aspiration, at the time of this investigation it is evident that the annual inspection and self-certification process was not achieving its designed aim.

2.12.2 Regulatory oversight and the management of deficiencies

In the 9 years prior to the accident, *Aquarius* was surveyed and/or inspected by MCA surveyors on nine separate occasions, the last being a targeted inspection on 21 March 2013. In total, 137 deficiencies were raised during this time, of which 65% were classed as safety-critical. Many of the deficiencies the MCA raised related to the management of safety, with similar problems being highlighted on a regular basis. The local MCA marine office had identified *Aquarius* as a problem vessel, and its surveyors had spent time explaining to the skipper the nature of the shortcomings they were finding. Despite these efforts, the guidance offered was not heeded and the longstanding safety management shortfalls were again evident during the MCA's post-accident surveys.

Deficiencies identified during surveys were recorded in the MCA's electronic SIAS system. The closure of non-critical deficiencies relied largely on the honesty and integrity of vessel owners' reports that rectification action had been completed. In the case of *Aquarius*, it was apparent that some of the deficiencies raised by the MCA were not properly addressed, but had been reported by the vessel's agent as being rectified.

The SIAS database could not automatically identify poor performers or alert surveyors when outstanding deficiencies had reached their time-bound limit. In order for a marine office to monitor a particular vessel, or fleet of vessels, a surveyor had to manually interrogate the SIAS database and/or review the paper files. Notwithstanding the MCA's objective of encouraging fishermen to take responsibility for their own safety, it must have a robust system for following up on deficiencies raised during survey and inspection if it is to deal effectively with consistently sub-standard vessels.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMENDATIONS

1. The casualty was thrown overboard when a rope stopper that had been applied to a steel wire warp suddenly failed. [2.2]

2. It is likely that the rope used to create the stopper parted under tensile overload; the material condition of the rope used to create the stopper, and the method used to apply it were significant contributing factors. [2.3]

3. The casualty was thrown overboard because he had positioned himself within the bight of the slackened warp. [2.5]

4. The actions taken by the skipper and his crew to recover the casualty were not in line with the guidance provided by the MCA for a manoverboard situation, and fell well short of standard responses taught on training courses. Of particular note, the alarm was not raised until after the crewman had sunk below the surface of the water. [2.6]

5. *Aquarius* and its crew were not properly prepared to deal with the emergency situation. The vessel was not effectively equipped to recover a person from the sea, its safety equipment was not properly maintained, its emergency procedures lacked detail, and its crew had not practised manoverboard recovery. [2.7]

3.2 SAFETY ISSUES NOT DIRECTLY CONTRIBUTING TO THE ACCIDENT THAT HAVE BEEN ADDRESSED OR RESULTED IN RECOMMENDATIONS

1. Marking a trawl warp by streaming it over the stern of the vessel while underway was unnecessarily hazardous. With proper planning, a safer way of achieving the task could have been identified and the accident could easily have been avoided. [2.4.1]

2. The crew were all experienced fishermen, but the standard of basic seamanship demonstrated by them was extremely low. The material used to create the stopper and the way it was applied increased the risk of its failure. [2.4.2]

3. The casualty sank and his body was not recovered because he was not wearing a lifejacket or other type of PFD when he entered the water. [2.8]

4. *Aquarius'*s crew were being worked extremely hard for prolonged periods of time. Tiredness and a desire to rest ahead of a busy day's fishing almost certainly influenced the crew's approach to the task of marking the trawl warps. [2.9]

5. *Aquarius*'s British skipper's took regular 10-day breaks, but the foreign nationals employed as crew were expected to live and work on board the vessel without any opportunity to take periods of compensatory leave. [2.10]

6. The skipper and owners of *Aquarius* adopted a reactive approach to safety management, and took action to meet mandated safety standards only when prompted by deficiencies identified by MCA surveyors. [2.11.1]

7. The accident could have been avoided if the risks of undertaking this task had been properly assessed, and the danger zone formed by the bight of the warp had been identified. [2.11.2]

8. The skipper and owners of *Aquarius* consistently prioritised the catching of fish over the safety of the vessel and its crew. This resulted in the promotion of a poor safety culture. [2.11.3]

9. The skipper and owners had not completed annual self-assessment declarations. Previous investigations have identified that this regulatory shortcoming is endemic across the UK's under 24m fishing vessel fleet. [2.12.1]

10. The MCA's database does not facilitate the identification and targeting of higher risk fishing vessels of under 24m for inspections. Nor does it alert surveyors to outstanding deficiencies to ensure their timely closure. [2.12.2]

SECTION 4 - ACTIONS TAKEN

4.1 MAIB ACTIONS

The **Marine Accident Investigation Branch** has:

1. Published a Safety Flyer **(Annex I)** to disseminate the main lessons from this accident to the fishing industry

4.2 ACTIONS TAKEN BY OTHER ORGANISATIONS

MB Aquarius Ltd has:

1. Purchased a manoverboard recovery cage and undertaken in-harbour drills and discussions with crew on its deployment and use.

2. Commenced recording of hours of work and rest for the vessel's staff.

3. Amended the work pattern of *Aquarius* to 10-days on and 5-days off routine.

4. Changed the work contracts for the deckhands to facilitate back-to-back rota.

5. Appointed a mate and senior deck hand.

6. Implemented the use of the SFF safety management system to help improve safety management on board.

7. Reviewed and updated its risk assessments and recorded such in the Seafish Safety Folder.

8. Implemented mandatory wearing of PFDs when working on deck.

The **Maritime and Coastguard Agency** has:

1. Begun to transfer its electronic files, including survey reports and deficiency records to the Single Vessel Database section of the Consolidated European Reporting System. On completion its SIAS database will be discontinued.

SECTION 5 – RECOMMENDATIONS

The **Maritime and Coastguard Agency** is recommended to:

2016/139 Develop the capability within its new Consolidated European Reporting System/Single Vessel Database to automate the management of inspection and survey deficiency records so that consistently sub-standard vessels can be quickly identified and targeted, and marine offices are alerted if deficiencies are not rectified within stipulated time frames.

2016/140 Review its monitoring and enforcement of "The Working Time: Sea Fishermen Regulations 2004" to ensure that fishermen, and in particular foreign fishermen living on board their vessels, are achieving the statutory levels of rest and annual leave.

The owners of *Aquarius* are recommended to:

2016/141 Conduct a thorough review of the vessel's safety management system and take robust actions to improve the safety culture on board *Aquarius* and any other vessels they might own or operate. Particular attention should be given to ensuring compliance with all appropriate health and safety regulations, the 15-24m FV Code and the hours of work and rest regulations.

2016/142 Ensure that *Aquarius* and its crew are properly prepared to deal with emergency situations through the conduct of regular and realistic emergency drills.

PG Manning Ltd is recommended to:

2016/143 Amend its fishermen's contracts of employment to include reference to *The Working Time: Sea fishermen Regulations 2004* and the employees' hours of rest and leave entitlements.

Safety recommendations shall in no case create a presumption of blame or liability

Marine Accident Report

INVESTORS IN PEOPLE