MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

ACCIDENT REPORT

VERY SERIOUS MARINE CASUALTY | REPORT NO 5/2017 | MARCH 2017

Fatal man overboard accident from the scallop dredger *King Challenger* (BA 87) south-west of Scalloway, Shetland Islands 23 June 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 such 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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SUMMARY

At about 0940 on 23 June 2016, Scott Rennie, a deckhand on the scallop dredger *King Challenger* **(Figure 1)**, fell overboard from a scallop tipping door. He was not wearing a lifejacket. The vessel was 12 nautical miles south-west of Scalloway, Shetland Islands and the sea temperature was 10.5ºC.

Scott was recovered back on board in less than 10 minutes. He was unconscious and showed no signs of life. The crew were unable to resuscitate him and, despite quick evacuation by air to a nearby hospital, he did not survive.

During the course of the investigation, the MAIB identified that:

- The crew regularly worked on open tipping doors without securing themselves with a lifeline or wearing a lifejacket.
- Scott, a strong swimmer, was incapacitated within 4 minutes of falling into the cold water.
- The crew were unprepared for the rescue of an unconscious casualty from the water.

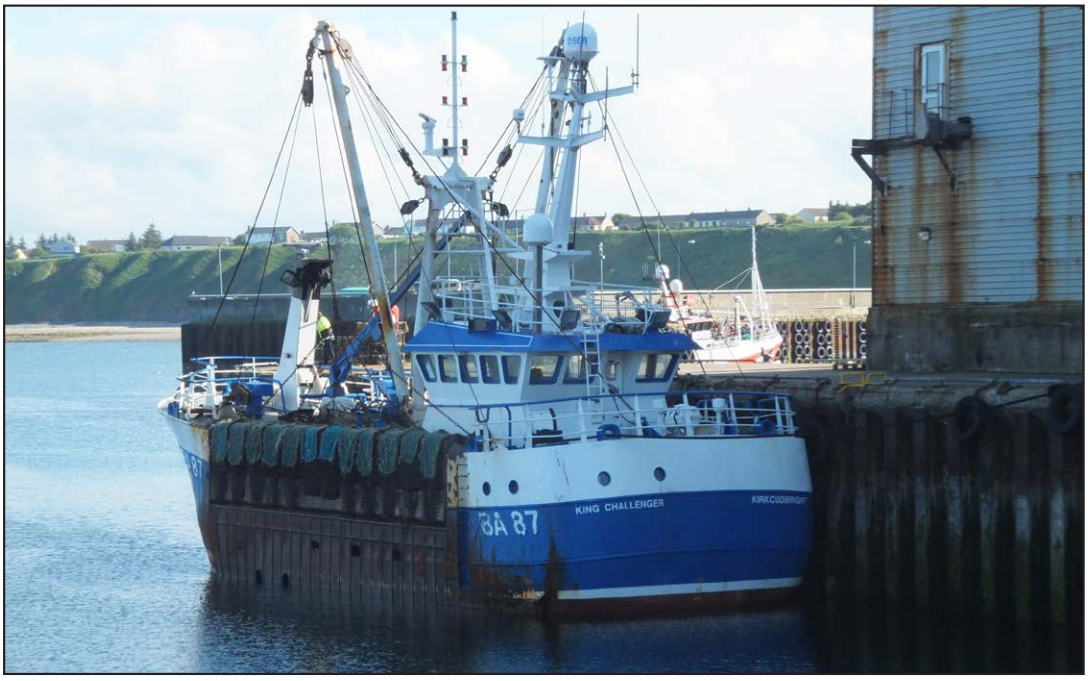

Figure 1: Fishing vessel *King Challenger*

Following the accident, the owners of *King Challenger* prohibited their crews from climbing onto tipping doors without the use of a harness and lifeline. The owners have been recommended to review the risk assessments for all their vessels, paying particular attention to the risks associated with maintenance tasks.

FACTUAL INFORMATION

Background

King Challenger was fitted with hydraulically activated tipping doors **(Figure 2)** for emptying the scallop dredges when it was built in 2006. The tipping door is a rotating bulwark that is used to invert the dredge bags to empty the catch. Steel rings at the bottom of the dredge bags hook on to teeth on the end of the door **(Figure 3)**. In operation the door has three positions: vertically down, horizontal and vertically up. The doors are controlled from the bridge, so the crew can remain clear of the moving equipment.

While being trawled along the seabed the bottom part of a dredge bag, known as the belly, wears and can become holed. It is therefore a routine task for the crew to repair the bags to prevent the catch from being lost.

Narrative

On 22 June, at around 0900, *King Challenger* sailed from Scalloway, Shetland Islands **(Figure 4)**, with its crew of seven comprising the skipper, mate and five deckhands. They started fishing for queen scallops at around noon that day. Each tow took about 1 hour to complete. The stowage of the catch, in the cold storage located two decks below the shelter deck, took a further 30 minutes.

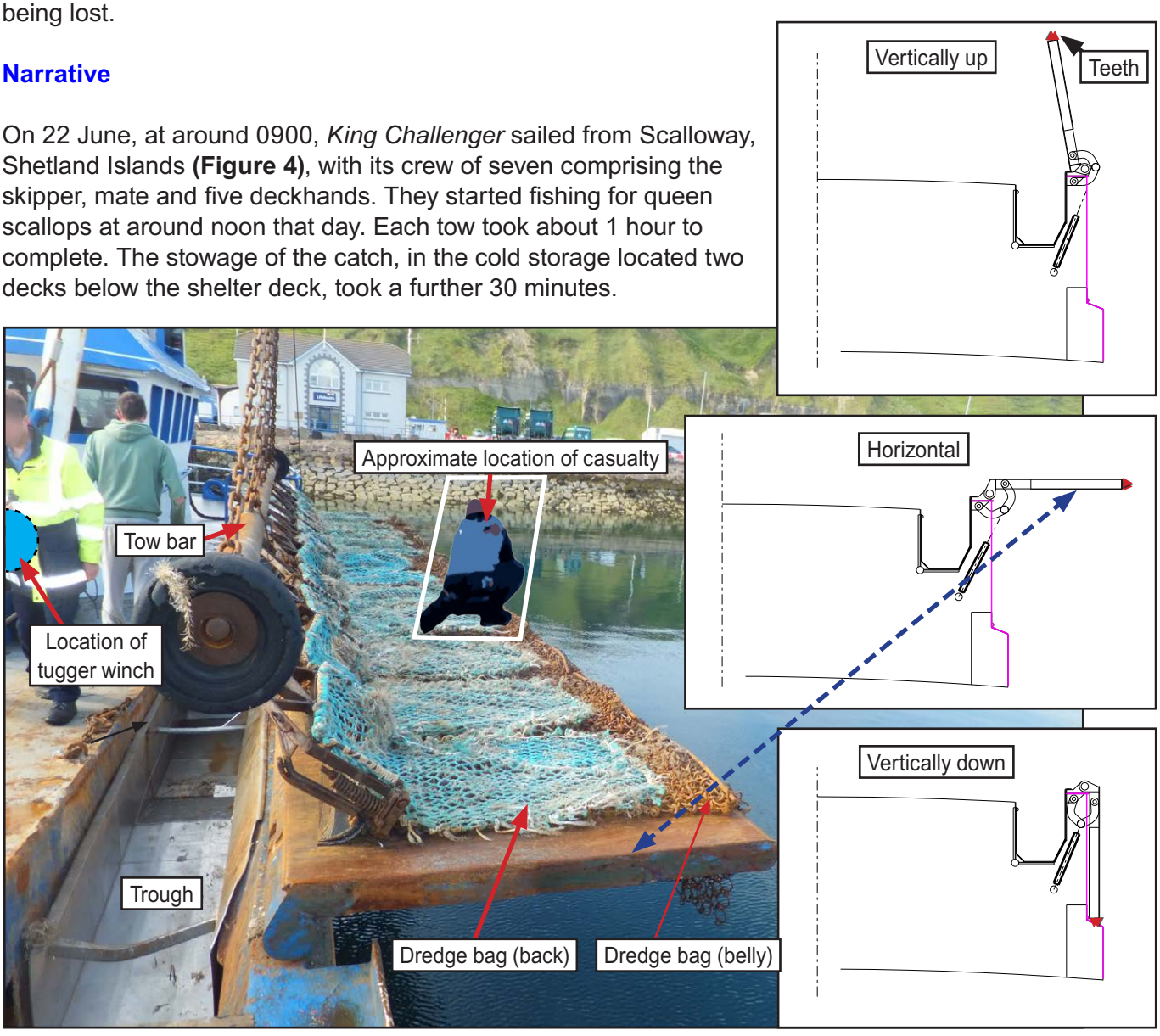

Figure 2: Hydraulically activated tipping doors in the horizontal position (**inset:** door working positions)

Figure 3: Dredge bag shown 'vertically up'

The vessel was fishing and maintaining a south-easterly course and a speed over the ground of 2.3kts[1] when, at around 0830 on 23 June, Scott went up to the wheelhouse and chatted to the mate, who was on watch at the time. On the mate's instructions he went below and asked the crew to be ready to haul in the tow by 0930.

The crew started hauling in the tows on both sides at 0930. Scott was responsible for handling the port side fishing gear. Another deckhand worked the starboard side and a third helped on either side as required. All the crew on deck were wearing oil skins and wellington boots. None of them was wearing a lifejacket or any other buoyancy aids.

In the wheelhouse, the senior deckhand and the mate controlled the port and starboard towing winches respectively. As the port dredges came up, the senior deckhand noticed a hole in the belly of the fifth dredge bag. He spoke to Scott through the open porthole in the wheelhouse and they agreed that the bag needed to be repaired before the next tow.

The tipping doors were brought to the vertically up position to empty the dredge bags into the troughs on deck. Scott and the third deckhand shook the upturned dredge bags to speed up the process. Once the bags were empty, the senior deckhand in the wheelhouse brought the port side tipping doors to the horizontal position **(Figure 2)**. The starboard side bags were still being emptied.

Scott used the tugger winch to pull on the tow bar in order to prevent it from swinging. He then climbed onto the tipping door from the forward end and walked aft towards the damaged bag. At approximately 0940, as he bent down to unhook the bag, the vessel took a gentle roll and Scott fell overboard.

Recovery

The crew shouted "*man overboard*" and the mate immediately put the engine to neutral and activated the vessel's general alarm before going on deck to assist. Scott was seen approximately 20m directly astern of the vessel, trying to swim towards it. One of the crew members threw a lifebuoy towards Scott but he was unable to reach it.

The vessel continued to drift away from Scott and the mate ran back to the wheelhouse and put the engine astern. At this time, the skipper arrived in the wheelhouse and took charge of the vessel. The crewmen on the aft deck shouted to the skipper to stop the vessel when they saw Scott very close to the stern on the port side. One of the crew members went to get the Moby manoverboard recovery harness **(Figure 5)**, but by the time he returned, Scott had disappeared from view. After a few seconds, Scott was seen on the surface, just off the vessel's port shoulder.

The five crew on deck ran forward. One of them threw a lifebuoy with an attached lifeline and smoke float, another threw the Moby towards him. Scott, by then visibly exhausted and unable to swim or talk, got hold of the 'Moby' harness, but let go again almost immediately. At 0944, the skipper called a "Mayday" on channel 16 of the vessel's VHF[2] radio and brought the vessel's bow closer to Scott using the bow thruster.

One of the deckhands donned a lifejacket, inflated it and, with the reluctant permission of the skipper, jumped into the water holding the Moby lifeline. He managed to put the harness around Scott, who was

[1] Nautical miles per hour.

[2] Very High Frequency.

Reproduced from Admiralty Chart BA 1119 by permission of the Controller of HMSO and the UK Hydrographic Office

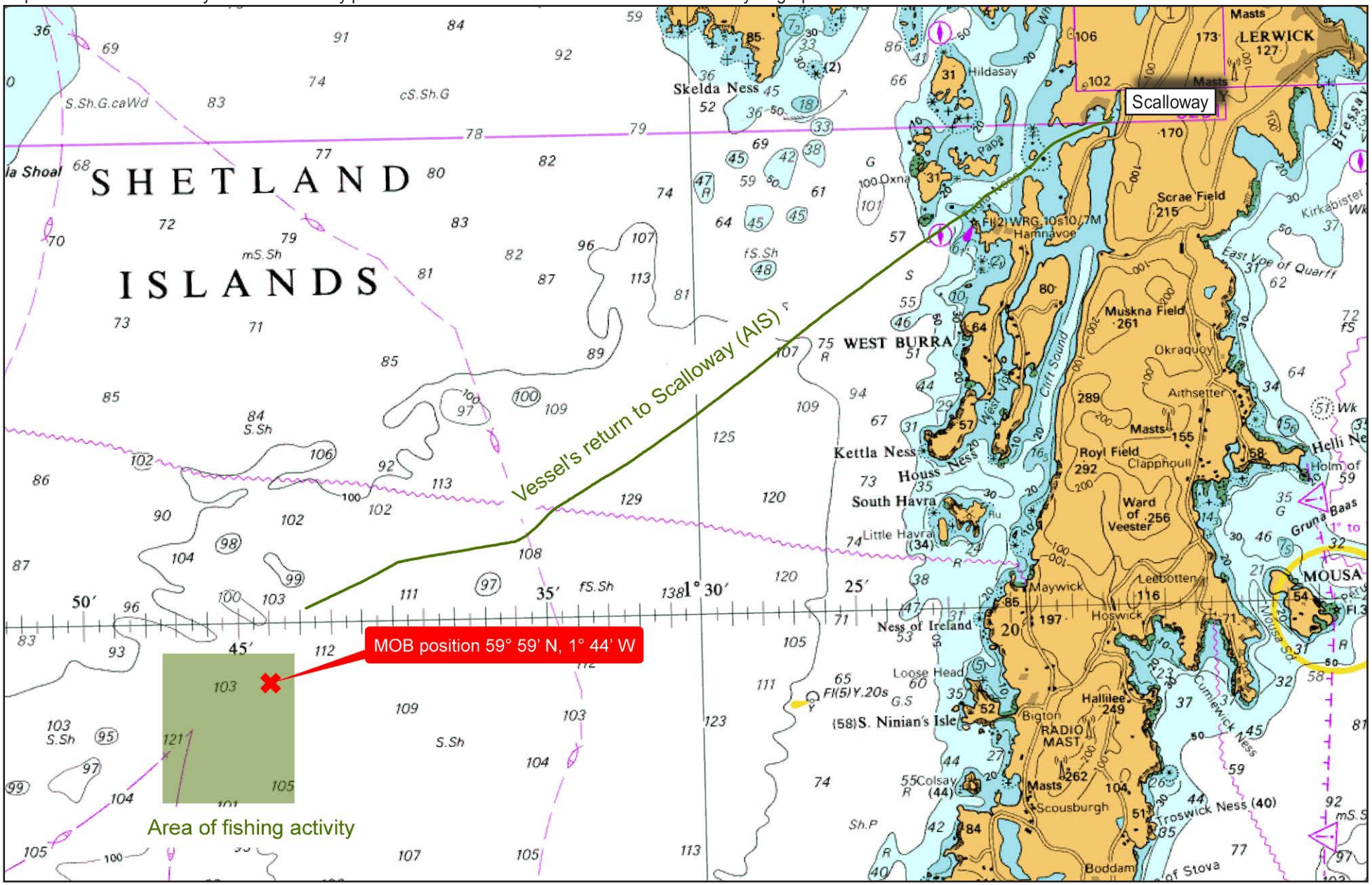

Figure 4: Route of *King Challenger* and location of accident

Figure 5: 'Moby' manoverboard recovery harness

now floating on his back, apparently unconscious, to starboard of the vessel's bow. At 0947 the crew lifted Scott onto the deck. The deckhand then swam aft and re-boarded the vessel using the ladder built into the vessel's hull.

The crew laid Scott on the deck and took turns to give him chest compressions. He was not breathing, his lips were blue, his eyes were fixed open and he was frothing at the mouth. Rescue helicopter R900 arrived at the scene at 1007, and by 1015 a winchman had landed on board. Scott was airlifted to Lerwick from where he was transferred by road to Gilbert Bain Hospital. He did not recover consciousness and was declared deceased at 1100.

Postmortem and toxicology tests results

The postmortem examination report stated that Scott died as a result of drowning. Toxicology tests revealed traces of recreational drugs, paracetamol and codeine. MAIB sought the professional opinion of a forensic pharmacologist[3] to understand the implication of these findings. The pharmacologist's opinion was that Scott's judgment would not have been impaired at the time of the accident and that his survivability would not have been affected by the drugs in his system.

Tipping doors

Tipping door systems of the type installed on *King Challenger* had been installed on 35 to 40 other scallop dredgers registered in the UK. They eliminate the need for a tipping bar and gilson to invert the dredge bags when emptying them of catch.

An MAIB report published in 2010[4] included the following statement with regard to the tipping door (or rail) system:

> *The tipping rail system is a recent innovation, and it is possible that as the industry gains experience of its use it will find new hazards which have not yet been identified.*

Handling the catch

With the tipping doors in a vertically down position, the tow bar is hauled up and inboard, causing the dredge bags to lie with their bellies against the doors. The doors are then rotated, causing the chain rings at the bottom of the bags to engage with the teeth on the ends of the doors. The rotation of the doors is

[3] Dr Edward Anthony Bliss, BSc (Hons; Pharm), PhD, CMS, CHE, MRPharmS, MIPI, MABI.

[4] MAIB Report 6/2010, Person overboard accidents from scallop dredger *Korenbloem*, stern trawler *Osprey III* and creeler *Optik* with loss of 3 lives.

continued until they are in a vertically up position and the bags are hanging inverted from the teeth, over the troughs on the deck **(Figure 2)**. The catch falls into the troughs below and the deckhands shake each bag vigorously to ensure that they are fully emptied.

The troughs pivot at one end and are emptied by being lifted at the other end such that the catch and debris slide down the trough, through an opening in the deck and onto the deck below. Here the catch is processed by the crew and placed into cold storage. The troughs are hydraulically activated and controlled from the wheelhouse.

Dredge bags

King Challenger was equipped with 12 dredge bags on each side. Each bag consisted of a lower half, called the belly, constructed of interlinked steel rings, and an upper half of polypropylene net known as the 'back' **(Figure 3)**.

The most common damage to the bags was the breaking of one of the metal rings that makes up the belly. The loss of a single ring would result in an opening on the bag nearly 15cm in diameter, and cause most of the catch to fall out of the bag. Consequently, it was the usual practice on board to repair any such damage before the next trawl. The repair was carried out by crimping a new steel ring in place using a special tool **(Figure 6)**.

The belly steel rings wore out as they got older, and fishing in areas where the seabed was rocky and rough accelerated the wear and tear. During the days leading up to the accident, dredge bag repairs were being carried out, on an average, twice a day.

Dredge bags were normally replaced when the amount of time spent repairing them was considered commercially unviable. All 24 bags on board *King Challenger* had been renewed in November 2015. A further complete replacement of bags had been planned for the week after the accident date, at Kirkcudbright. This was completed on 4 July 2016 after a total of 1597 tows since November 2015.

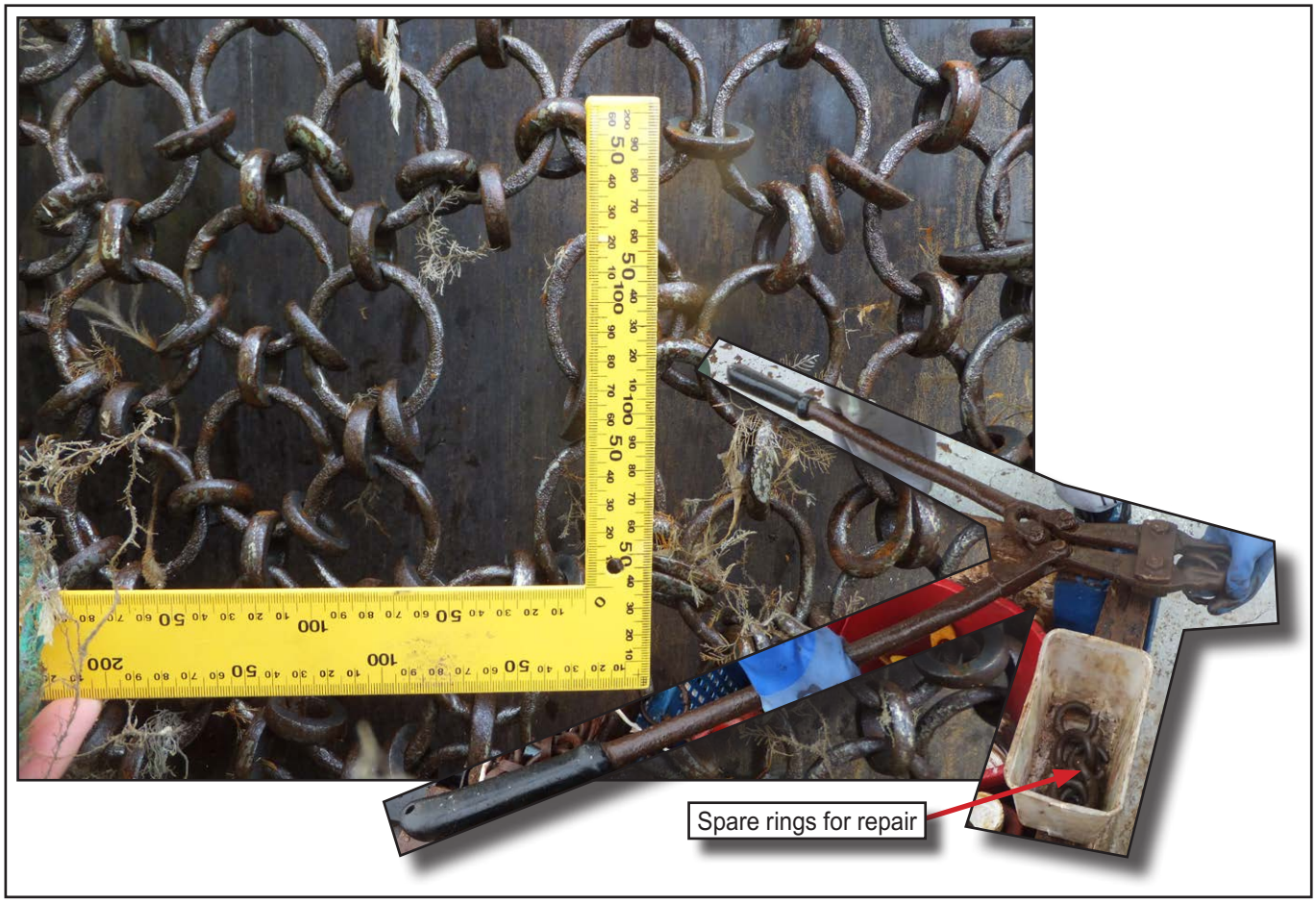

Figure 6: Damaged bag (**inset:** Repair tool and spare rings)

Gaining access to the belly

The usual method on board *King Challenger* for accessing a damaged belly was for a crew member to climb on the tipping door after it had been placed in the horizontal position. They would then unhook the damaged bag from the teeth on the end of the tipping door and climb back down to the deck. The door would then be rotated to the vertically up position, causing the unhooked bag to drop down onto the deck, allowing access to the belly for repair. All the vessels belonging to the owners, West Coast Sea Products, followed this procedure.

Following Scott's accident, *King Challenger*'s owners prohibited all their vessels' crews from climbing on the tipping doors at any time, unless they were wearing a lifeline. They also introduced a new method for repairing the bags in which the defective bag was hauled onto the deck for repair with the doors being left in the vertically down position throughout.

Other owners of vessels fitted with tipping doors had developed their own methods for repairing the bags. One such method involved inverting the bags as usual and then employing a tool developed for the purpose to unhook the damaged bag manually from the vertical position, allowing it to fall to the deck for repair. This had the advantage of allowing the repair to be carried out safely behind the bulwark formed by the vertical tipping door.

The owners

West Coast Sea Products, established in 1971 at Kirkcudbright, owned and operated four scallop dredgers, including *King Challenger,* at the time of the accident. The company also owned and operated a scallop processing plant employing 150 people.

An ex-skipper of *King Challenger* provided technical oversight for all the vessels including the management of the fleet's onboard risk assessments. A pool of 40 share fishermen crewed the vessels in the fleet.

Skipper and other crewmen

The skipper was 51 years old and had worked as the mate on *King Challenger* from 2007 to 2011 and as skipper from 2012. He held a Class 2 Deck Officer Certificate of Competency (Fishing Vessel), which allowed him to skipper a vessel over 16.5m in length.

The mate held an under 16.5m skipper's certificate[5] issued by Seafish[6]. He joined *King Challenger* in 2008 and had been working as a mate on board the vessel since 2015.

Besides Scott Rennie, there were four other deckhands on board, one of whom was the senior deckhand who operated the port side winch controls. The 22-year old deckhand who jumped into the water and put the Moby harness around Scott was the youngest on board.

Deckhand Scott Rennie

Scott Rennie was 31 years old, 180cm tall and weighed 82kgs. He started working on *King Challenger* on a temporary basis from December 2015 and was given a permanent position in May 2016. He had completed all the mandatory Seafish courses and was a strong swimmer. During his time on board *King Challenger*, Scott's duties had always required him to be on deck during shooting and hauling of the fishing gear.

[5] The under 16.5m skippers' certificate is a voluntary qualification administered by Seafish, aimed at increasing the navigational and engineering knowledge of skippers and watchkeepers on small fishing vessels.

[6] Sea Fish Industry Authority.

Work and rest routines

The skipper and mate were in charge of navigating the vessel at sea and the control of the tow winches during fishing operations. They followed an approximate 6 hours on/6 hours off watch pattern.

During fishing operations, the five deckhands had two resting periods of 4 hours each in a 24-hour period. In addition, during the hours of darkness they got extra rest between hauls by clearing the catch from the troughs on alternate hauls.

Risk assessment on board, regulations and guidance

The vessel's written risk assessment was on board in the 'Fishing Vessel Safety Folder' issued by Seafish. It identified the risk of falling overboard in the context of four different activities. The risk mitigation strategy for falling overboard was consistently indicated as *the wearing of safety harness*. Neither the repair of dredge bags nor the task of climbing on the tipping door to unhook them (or for any other purpose) was mentioned. The risk assessment stated that the hazardous activity of reaching out to grab the dredge becket had been eliminated by the tipping doors.

The guidance in the Fishing Vessel Safety Folder and MGN 415(F), Fishing Vessels: The Hazards Associated with Trawling, including Beam Trawling and Scallop Dredging, do not discuss tipping doors or the risks associated with repairing dredges. The MCA's[7] Fishermen's Safety Guide makes no mention of damage specific to scallop dredgers, although the use of safety lines during outboard and exposed work is considered.

Surveys and drills

The MCA carried out an inspection of *King Challenger* at the end of March 2016 and issued the fishing vessel certificate. The attending surveyor remarked in his survey report that there was no evidence of emergency drills having been carried out on board and a table-top manoverboard drill was completed in his presence. However, the recovery of an unconscious casualty from the water was not discussed.

Immersion in cold water

Sudden immersion in cold water (water under 15ºC) can be fatal in a number of ways[8]:

a. Cold shock response

On immersion in cold water the sudden lowering of skin temperature causes a rapid rise in heart rate, and therefore blood pressure, accompanied by a gasp reflex followed by uncontrollable rapid breathing.

The onset of cold shock occurs and peaks within 30 seconds and lasts for 2-3 minutes. If the head goes underwater during this stage, the inability to hold breath will often lead to water entering the lungs in quantities sufficient to cause death. Cold shock is considered to be the cause of the majority of drowning deaths.

b. Cold incapacitation

Cold incapacitation usually occurs within 2-15 minutes of entering cold water. The blood vessels are constricted as the body tries to preserve heat and protect the vital organs. This results in the blood flow to the extremities being restricted, causing cooling and consequent deterioration in the functioning of muscles and nerve ends. Useful movement is lost in hands and feet, progressively leading to the incapacitation of arms and legs. Unless a lifejacket is worn, death by drowning occurs as a result of impaired swimming.

[7] Maritime and Coastguard Agency.

[8] Golden, F and Tipton, M (2002). Essentials of Sea Survival. Human Kinetics: Leeds, UK.

c. Hypothermia

Hypothermia occurs when the human body's core temperature drops below 35ºC (it is normally about 37ºC). Depending on circumstances, this can occur after 30 minutes. The body's core temperature can continue to drop even after the casualty has been recovered from the water if the re-warming efforts are not effective.

Similar accidents

In February 2009, a deckhand on board the UK registered scallop dredger, *Maggie Ann*[9], fell overboard as he was emptying a dredge bag. He had been standing on the port dredge beam, which was suspended and almost level with the gunwale, when the dredge bag lifting becket parted, causing him to fall. He was never found.

In November 2009, a deckhand on board the scallop dredger *Korenbloem*[5] fell overboard while the vessel was preparing to shoot the scalloping gear. He had been standing on top of the catch in the scallop tray, which was almost the same height as the bulwark. He later died as a result of his injuries.

ANALYSIS

Accident mechanism

Scott had climbed onto the horizontal tipping door to unhook the damaged dredge bag from the end of the door. His wellington boots would not have offered much traction against the wet polypropylene back of the bags, and it is possible that when the vessel rolled, he lost his footing and fell overboard. He was not secured to the vessel by a safety line and, as there was nothing within his reach to grab hold of when he slipped, it is not surprising that he was unable to prevent the fall.

Scott was following the accepted procedure for bag repair as practised on board. His chances of survival in the cold water were severely diminished because he was not wearing a lifejacket. Having lost consciousness due to the debilitating effect of the cold water, the remaining crewmen's attempts to recover him back on board were ad-hoc and unpractised. However, Scott was recovered back on board the vessel after less than 10 minutes, but despite the crew's best efforts and a very quick air evacuation, he could not be resuscitated.

Unsafe working practices

This accident occurred as a result of Scott following an unsafe procedure that had become standard practice on board *King Challenger*. Tipping doors are a relatively new innovation, fitted on a small proportion of the UK's scallop dredgers, and currently there is little available guidance on the risks associated with them. Neither the Seafish generic risk assessment nor the guidance from the MCA discuss the risk of falling overboard from tipping doors. However, it is likely that those responsible for developing these documents were unaware that fishermen were occasionally proceeding on to the doors to work.

The risk assessment document on board *King Challenger* did not refer to the activities involved in the repair of dredge bags. As these repairs were not a part of the fishing procedure, their omission was unlikely to be noticed during survey. The procedure followed by the crews of all West Coast Sea Products-owned vessels was perhaps perceived by them to be safe, since it had not led to any previous man overboard incidents.

[9] MAIB Investigation report 19/2009, Report on the investigation of a manoverboard accident on FV Maggie Ann, Cardigan Bay on 12 February 2009 resulting in one fatality.

The different procedures being followed by other companies when repairing the bags on scallop dredgers fitted with tipping doors demonstrate that there are alternative, practical ways of achieving this task safely. Indeed, immediately after the accident, the owners of *King Challenger* instructed the crews of its fleet to adopt a method of bag repair which did not require them to climb onto the tipping doors. The obvious risk to crew safety of walking on the tipping doors should have been captured when the vessel's risk assessment was compiled, which in turn would have provided an opportunity to identify safe alternative working practices.

Survivability in cold water

Scott was a strong swimmer, and initially was able to swim towards the vessel. However, after only 4 minutes in the cold water, he lost the ability to keep hold of the Moby harness and, soon afterwards, became unresponsive.

Analysis of this and previous similar accidents reported to the MAIB since 2007 shows that survival time for a person in cold water, who is not wearing a lifejacket or personal flotation aid, rarely exceeds 12 minutes[10]. However, many fishermen appear to be unaware[11] that suddenly entering cold water has immediate debilitating effects on the human body, and that in man overboard situations the casualties can become incapable of helping themselves within a very few minutes.

Although the cold shock response and cold incapacitation will still occur if a lifejacket is worn, the likelihood of the wearer surviving is greatly improved. This is because a lifejacket will keep the casualty's head above water as they regain control of their breathing, and reduce the need for them to expend energy swimming, which reduces the load on their heart. Given the speed with which Scott was recovered from the water, it is likely that he would have been recovered alive had he been wearing a lifejacket.

Between 1992 and 2006, only one of the 65 fishermen who lost their lives as a result of going overboard at sea was known to have been wearing a lifejacket at the time. Since then, campaigns to promote the wearing of personal flotation aids, including providing them to fishermen free of charge or at a significantly reduced cost, have largely been unsuccessful[12]. The MAIB has therefore recommended[13] that the MCA introduce legislation to mandate the wearing of PFDs on the working decks of fishing vessels.

Recovery of unconscious casualty

During the last survey of *King Challenger* in March 2016, the surveyor remarked on the absence of emergency drills on board. The crew then carried out a table-top manoverboard drill. However, the recovery of an unconscious person from the water was not discussed during this exercise.

Although regular drills were not carried out on *King Challenger*, the crew were able to recover Scott from the water within 10 minutes. This was only achieved by allowing a deckhand to enter the water and put Scott into the Moby harness. The young deckhand who entered the water did wear a lifejacket, but he did not don an immersion suit and so had to withstand the effects of cold water immersion. This was especially hazardous since, having attached the Moby harness to Scott, he had to swim the length of the vessel and climb up the built-in ladder on the hull without a lifeline. It was extremely fortunate that he was able to return safely to the vessel and did not become a casualty himself.

[10]Fatal man overboard from *Apollo* (INS 179) 30nm north-west of the Orkney Islands 18 April 2016.

[11]Turner S, et al (2009) MCA Lifejacket Wear – Behavioural Change.

[12]MAIB report 21/2016 Report on the investigation of a man overboard from the creel fishing vessel *Annie T* (CY1) with the loss of one life, in the Sound of Mingulay, Scotland on 4 October 2015.

[13]Ibid, MAIB Recommendation 2016/14.

The deckhand's actions in the circumstances were highly courageous. However, had prior consideration been given to use of a rescue swimmer to recover an incapacitated person from the water, an appropriate immersion suit could have been provided and the procedure exercised. Unless all contingencies are considered and appropriate drills carried out, the crew's reaction to an emergency situation is bound to be *ad hoc*, potentially resulting in further casualties.

CONCLUSIONS

- Scott Rennie slipped and fell overboard from the tipping door while following the accepted procedure on board for repairing dredge bags.

- The vessel's risk assessment should have recognised that the practise of walking on the tipping doors was unsafe and identified safe alternative working practices.

- Scott succumbed to the debilitating effects of cold water incapacitation within approximately 4 minutes of falling into the water.

- Had Scott been wearing a lifejacket when he entered the water, it is likely that he would have been recovered alive.

- Unless appropriate, realistic manoverboard drills are carried out, the crew's reaction will be *ad hoc*, not only risking delays in recovering a casualty but potentially resulting in additional casualties.

ACTION TAKEN

MAIB actions

The **Marine Accident Investigation Branch** has:

- Published a safety flyer to disseminate the key lessons of this accident within the fishing industry.

Actions taken by other organisations

West Coast Sea Products has:

- Prohibited the crew on its vessels from climbing on the tipping door without the use of a harness and lifeline.

- Instructed all its skippers to conduct manoverboard drills on a monthly basis.

- Purchased specialist equipment and implemented fleet-wide procedures for the recovery of an unconscious casualty from the water.

RECOMMENDATIONS

West Coast Sea Products is recommended to:

2017/106 Review the risk assessment for all the vessels in its fleet, paying particular attention to the risks associated with maintenance tasks.

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

SHIP PARTICULARS	
Vessel's name	*King Challenger*
Flag	United Kingdom
Classification society	Not applicable
Fishing registration/RSS number	BA 87/C18580
Type	Scallop beam trawler
Registered owner	West Coast Sea Products Ltd, UK
Manager(s)	West Coast Sea Products Ltd, UK
Construction	Steel
Year of build	2006
Length overall	21.3m
Registered length	19.85m
Gross tonnage	192
Maximum permissible persons on board	8
Authorised cargo	Scallops
VOYAGE PARTICULARS	
Port of departure	Scalloway, Shetland Islands
Port of arrival	Scalloway, Shetland Islands
Type of voyage	Coastal
Cargo information	Queen scallops
Manning	7
MARINE CASUALTY INFORMATION	
Date and time	23 June 2016, approximately 0940
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	59°59'.00 N, 1°44'.00 W
Place on board	Port tipping door
Fatalities	One
Damage/environmental impact	None
Ship operation	Fishing
Voyage segment	Mid-water
External and internal environment	Dry, south-easterly breeze at 7 knots, calm seas with 1.5m swell, sea water temperature 10.5ºC, south-south-easterly tidal stream.
Persons on board	7