ACCIDENT REPORT

Report on the investigation of

a person overboard from the

fishing vessel

Beryl (BF 440)

with the loss of one life

west of the Shetlands Islands

10 February 2015

MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

VERY SERIOUS MARINE CASUALTY REPORT NO 26/2015 DECEMBER 2015

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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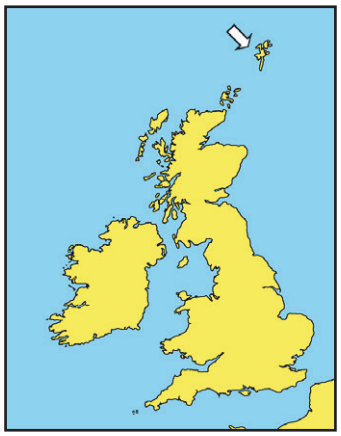
GLOSSARY OF ABBREVIATIONS AND ACRONYMS

ARRC	-	Autonomous Rescue and Recovery Craft
cm	-	centimetre
CPR	-	Cardiopulmonary Resuscitation
DSC	-	digital selective calling
FISG	-	Fishing Industry Safety Group
kg	-	kilogramme
LOA	-	Length Overall
LR	-	Lloyd's Register
LSA	-	Life Saving Appliances
m	-	metre
MCA	-	Maritime and Coastguard Agency
MGN	-	Marine Guidance Note
MOB	-	Manoverboard
MSN	-	Merchant Shipping Notice
N	-	Newton
NFFO	-	National Federation of Fishermen's Organisations
OAN	-	Operational Advice Note
PFD	-	Personal Flotation Device
SAR	-	Search and Rescue
Seafish	-	Sea Fish Industry Authority
SFF	-	Scottish Fishermen's Federation
SI	-	Statutory Instrument
SOLAS	-	International Convention for the Safety of Life at Sea, 1974, as amended
STCW	-	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended (STCW Convention)
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency

Times: all times used in this report are UTC unless otherwise stated

SYNOPSIS



On 10 February 2015, a fisherman was carried overboard by a net from the twin rig stern trawler *Beryl* during routine shooting operations 21 nautical miles west-north-west of the Shetland Islands. The crewman was conscious, wearing a lifejacket and was quickly brought alongside the vessel. However, the crew's attempts to recover the casualty on board were unsuccessful. The crewman spent approximately 49 minutes in the water and was unresponsive when eventually recovered onto a rescue craft launched from a nearby offshore support vessel.

The accident occurred because the crewman was standing in an unsafe position. It is one of a number of recent accidents in which fishermen have died after falling or being carried or swept overboard while trawling when the vessels' crews have been unable to recover them back on board. In this case, *Beryl*'s crew had not completed a practical manoverboard drill during their time on board and they were unfamiliar with the manoverboard recovery system carried.

Recommendations have been made to the Maritime and Coastguard Agency, Scottish Fishermen's Federation, National Federation of Fishermen's Organisations and the Sea Fish Industry Authority. These are aimed at identifying initiatives to encourage fishermen to conduct practical emergency drills and to use risk assessments as a catalyst for behavioural change. The recommendations are also intended to improve the likelihood of recovering persons from the water by ensuring that the recovery systems carried by fishing vessels are suitable and that sufficient and realistic manoverboard drills are carried out on board.

A recommendation has also been made to *Beryl*'s owner, which seeks to improve the overall safety of its crews, and their ability to respond to emergencies.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *BERYL* AND ACCIDENT

SHIP PARTICULARS	
Vessel's name	*Beryl*
Flag	UK
Classification society	Not applicable
Fishing numbers	BF 440
Type	Trawler
Registered owner	JCJM Ltd
Manager(s)	JCJM Ltd
Construction	Steel
Year of build	1998
Length overall	27.85
Registered length	23.95
Gross tonnage	331
Minimum safe manning	Not applicable
Authorised cargo	Fish
VOYAGE PARTICULARS	
Port of departure	Scalloway, Shetland Islands
Port of arrival	Scalloway, Shetland Islands
Type of voyage	Fishing
Cargo information	Fish
Manning	6
MARINE CASUALTY INFORMATION	
Date and time	10 February 2015 at 0910
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	60° 25' 09N 002° 22' 79W. 21nm WNW of the Shetland Islands
Place on board	Aft main deck
Injuries/fatalities	1 fatality
Damage/environmental impact	None
Ship operation	Shooting nets
Voyage segment	Mid water
External & internal environment	Wind: south-westerly Beaufort force 6-7 Sea: rough to very rough (4m wave heights) Sea temperature: 8°C
Persons on board	6

Image courtesy of Ian Leask at www.marinetraffic.com

Beryl (BF440)

1.2 NARRATIVE

1.2.1 The accident

At 2200 on 6 February 2015, the stern trawler *Beryl* sailed from Scalloway, Shetland Islands for passage to fishing grounds to the north-west of Foula **(Figure 1)**. Between 7 February and the early morning of 10 February, the vessel fished using trawl nets stowed on the top deck that were intended for use on fine ground. *Beryl* then moved fishing grounds and the skipper decided to use trawl nets stowed on the main deck that were intended for use on rough ground.

At 0900 on 10 February, *Beryl*'s crew were preparing to shoot the trawl nets on the main deck. The nets had not been used for several weeks and were lashed in tracks[1] **(Figure 2)**. Approximately half of the lashings were removed in readiness for shooting. The leading deckhand, Joshua Aryeetey, intended that the remaining lashings would be removed after the cod end and the 'bag' **(Figure 3)** had been deployed through the 'shooting doors' at the stern **(Figure 4)**.

Beryl was heading down-sea at a speed of 5kts. The sea was rough to very rough with wave heights of up to 4m and the wind was from the south-west between Beaufort Force 5 and 8. The skipper was in the wheelhouse, four crew were on the main deck and the engineer was on the top deck operating the power block. On the main deck **(Figure 5)**, the leading deckhand stood between two tracks that contained the trawl nets, one deckhand stood outboard of the port track, one deckhand stood outboard of the starboard track, and the remaining deckhand was at the net drum controls. Communication between the skipper in the wheelhouse and the crew on deck was via a two-way intercom system.

To start shooting the nets, the power block pulled the port trawl net's cod end through the port shooting door. As soon as the cod end entered the water and streamed astern, the net remaining in the track started to run out. Shortly afterwards, a float attached to the net snagged on one of the lashings used to secure the nets inside the track **(Figures 2** and **6)**. The net stopped running out and the crewman at the net drum controls shouted to the leading deckhand to cut the lashing.

At about 0910, the leading deckhand stepped into the port track to release the snagged float. As he stood on the net facing aft **(Figure 7)**, the float suddenly released and the net again ran out astern. The leading deckhand was carried by the net through the port trawl door and into the rough seas astern.

The leading deckhand's lifejacket automatically inflated. He was conscious and holding onto the cod end **(Figure 8)**. The engineer on the top deck immediately alerted the skipper, who reduced *Beryl*'s speed. At 0916 the skipper also pressed the 'event mark' on the electronic chart plotter to record the vessel's position.

1.2.2 The recovery

The engineer used the power block to pick up the cod end's 'choker rope'[2] **(Figure 3)**. He then hauled the cod end towards *Beryl*'s stern. As the cod end reached the transom, the skipper told the engineer to stop hauling and the crew lowered a

[1] Tracks – There is no known specific term to describe these areas. In this report 'track' refers to the channel on deck which is fitted with barriers to separate the moving net from the crew.

[2] The choker rope is a rope connected to the midpoint of the cod end and runs to the head of the trawl. It is used to recover the cod end and lift its contents on board when the trawl is hauled.

Reproduced from Admiralty Chart BA 0219 - 0 by permission of the Controller of HMSO and the UK Hydrographic Office.

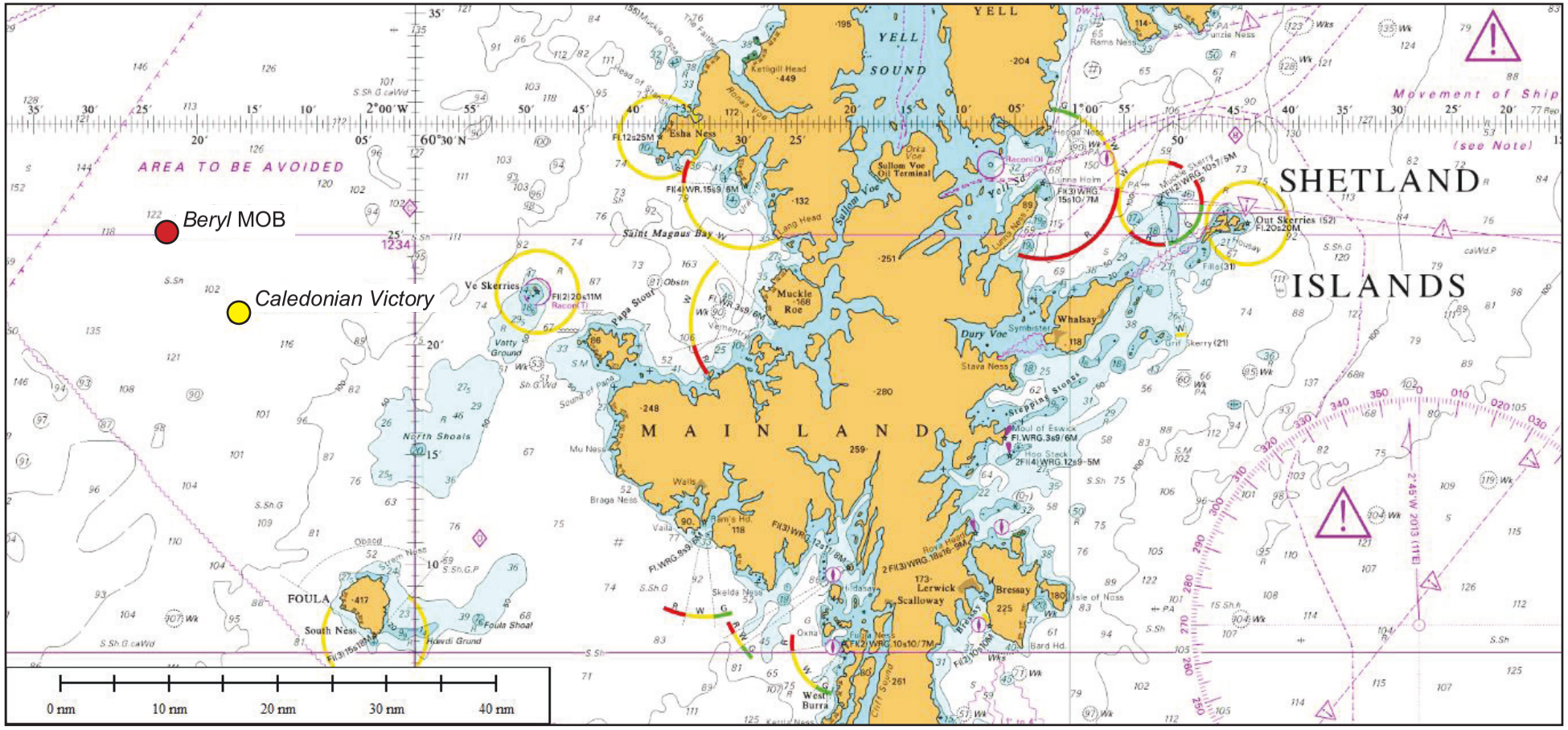


Figure 1: Position of FV *Beryl* and *Caledonian Victory* at time of MOB

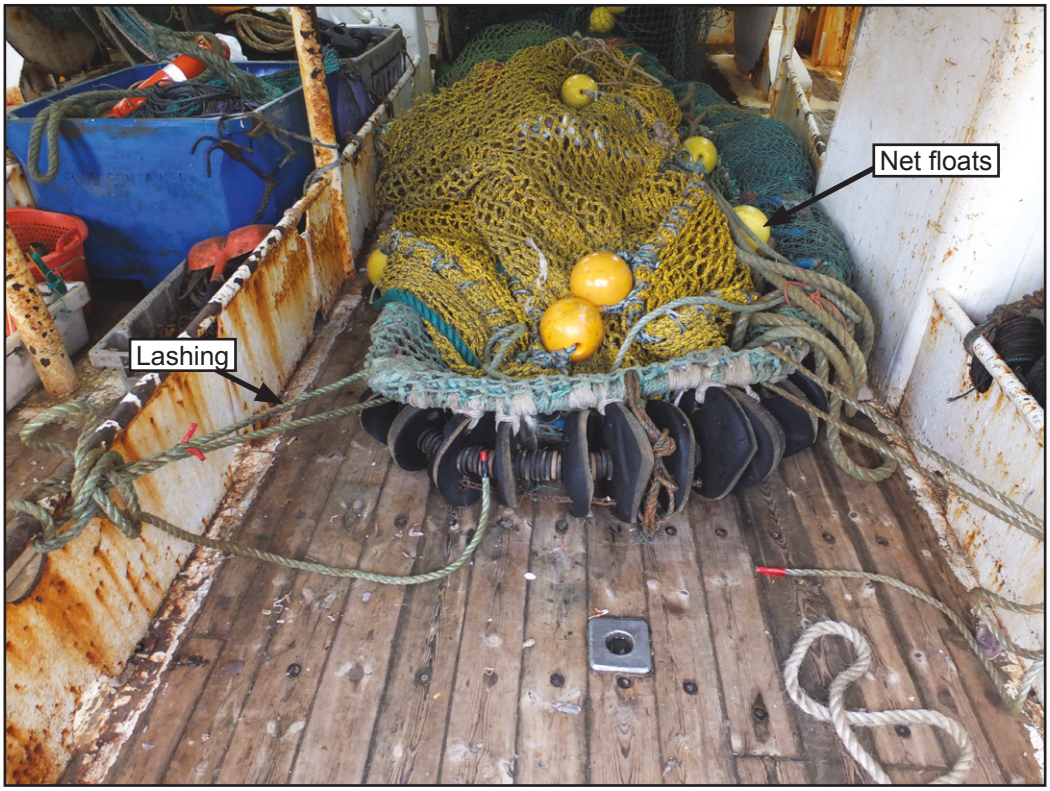


Figure 2: Starboard trawl ground gear lashed into the track

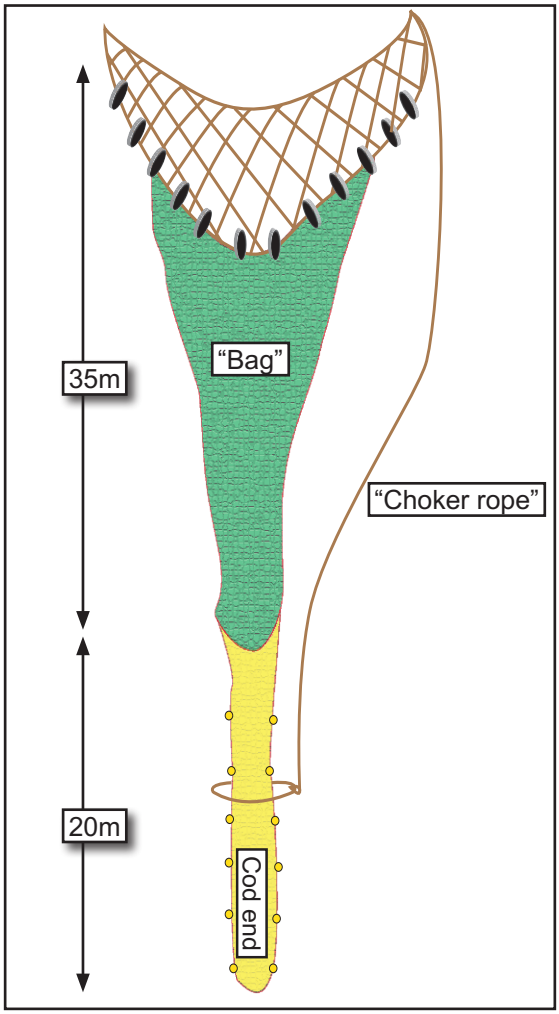


Figure 3: Plan and dimensions of a trawl

Figure 4: *Beryl*'s stern showing the shooting doors and power block

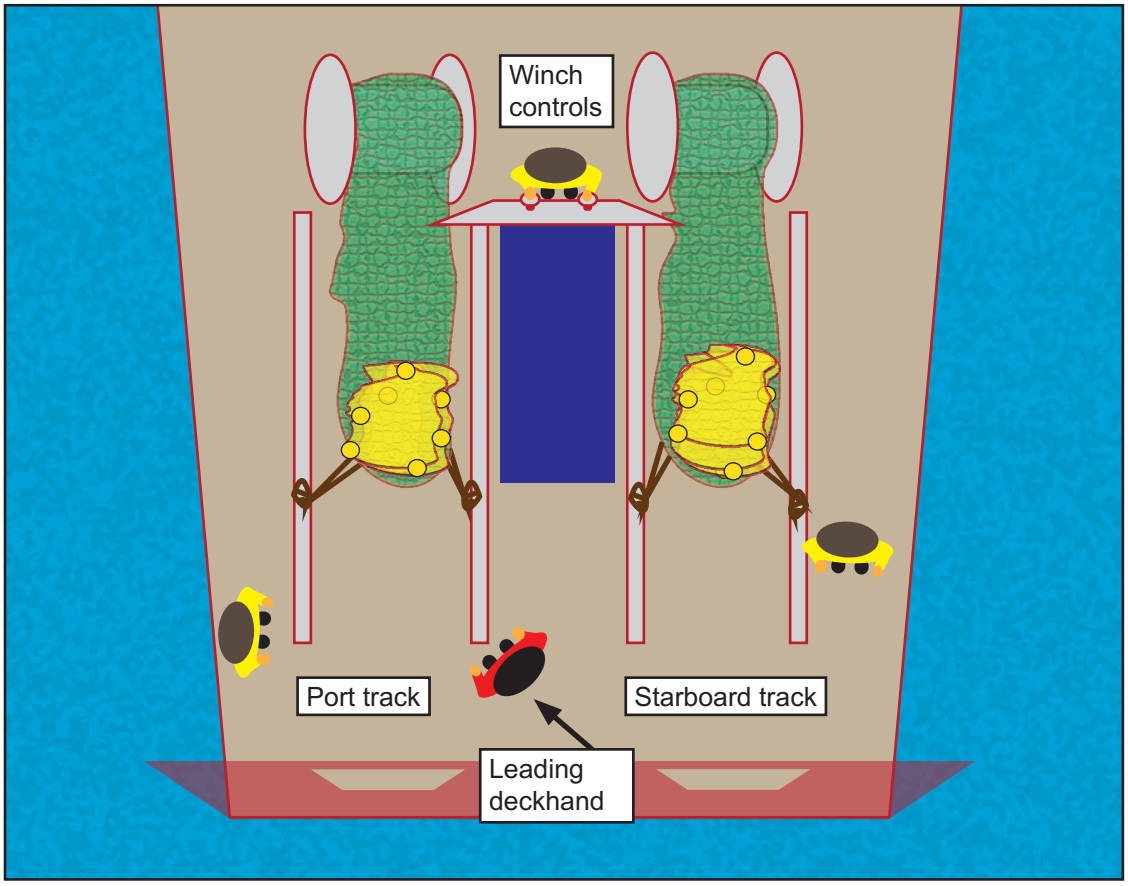


Figure 5: Diagram showing the positions of *Beryl*'s crew on the main deck

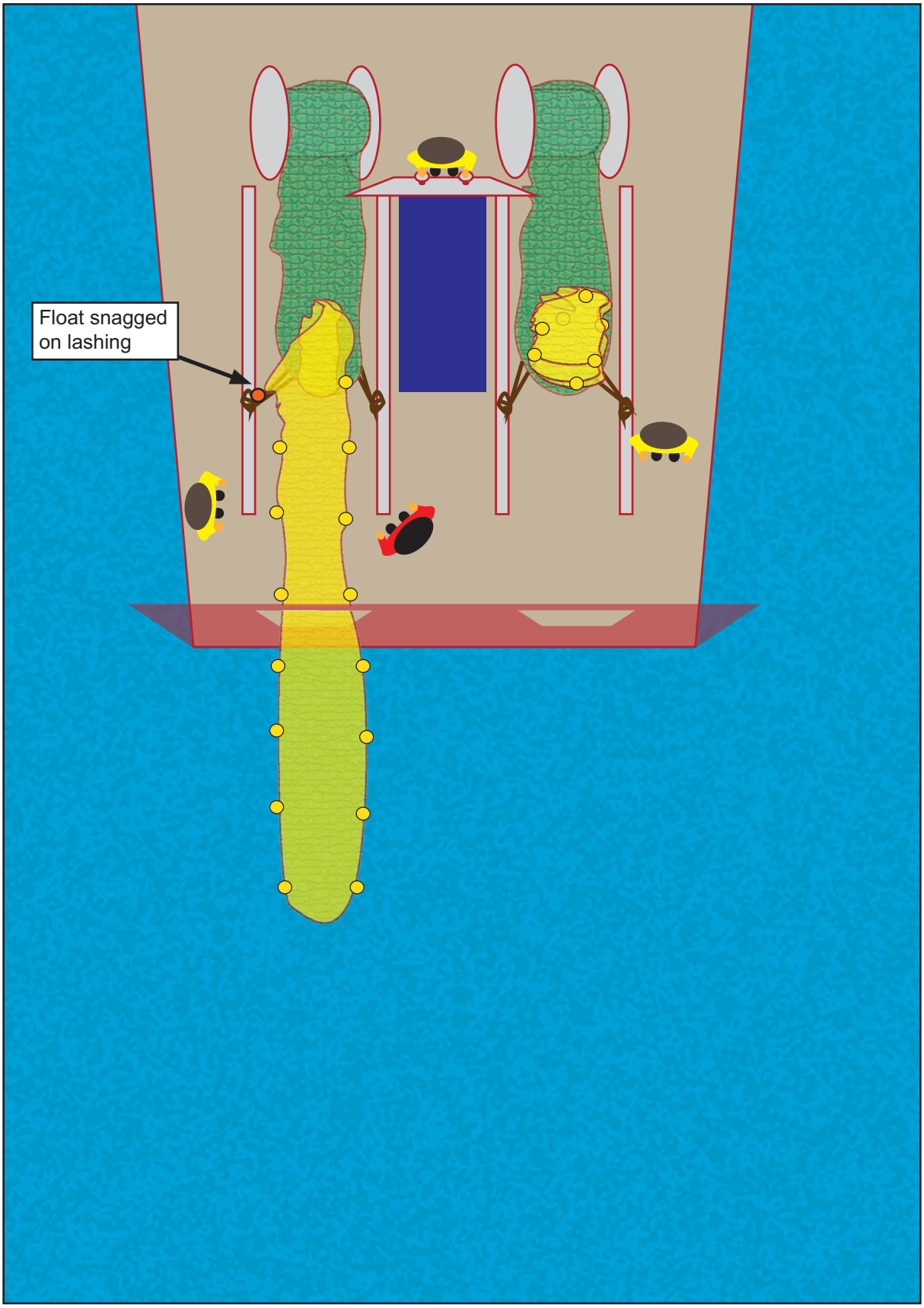


Figure 6: Illustration of the net float snagged on the lashing

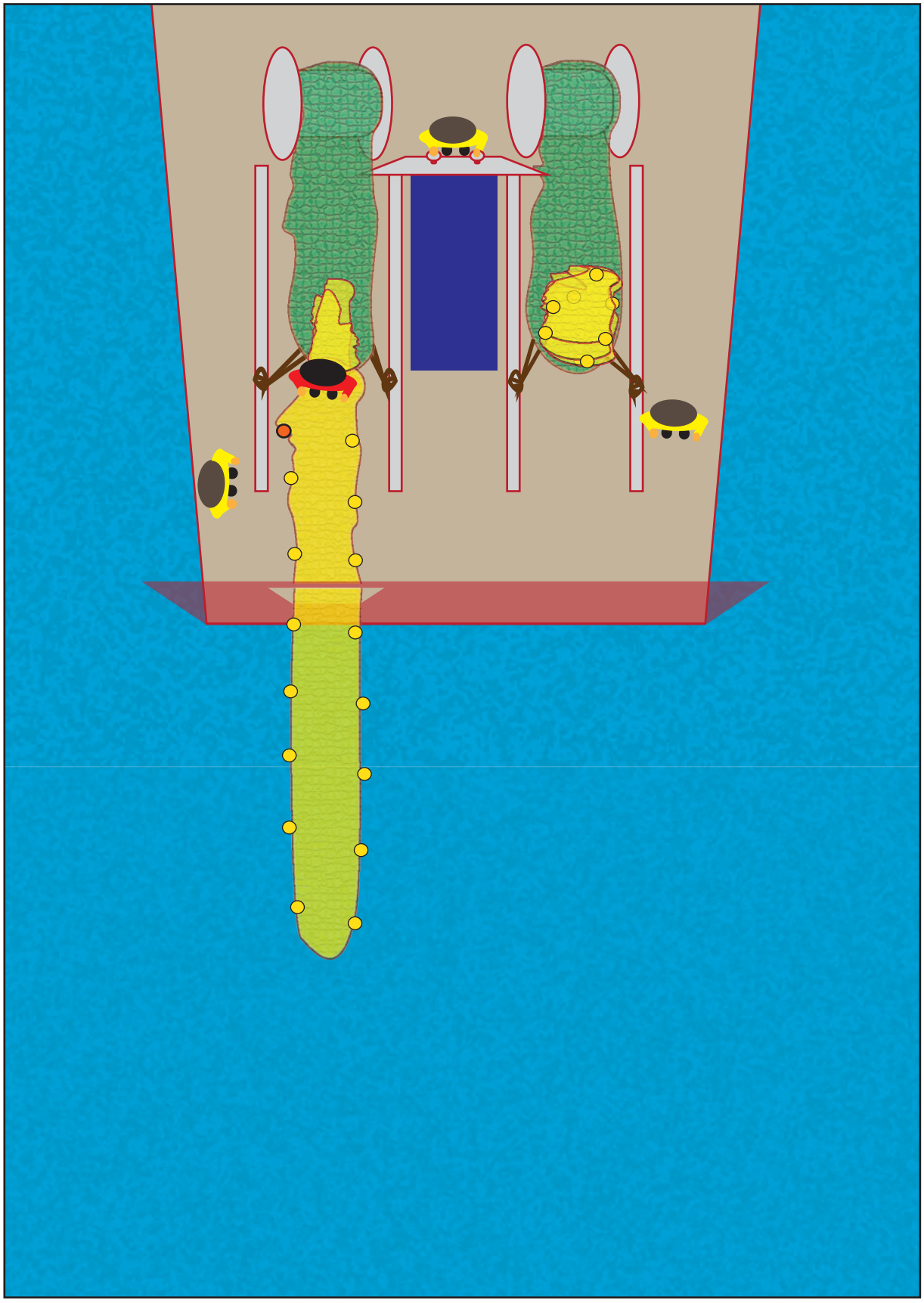


Figure 7: Illustration of the leading deckhand standing on the net

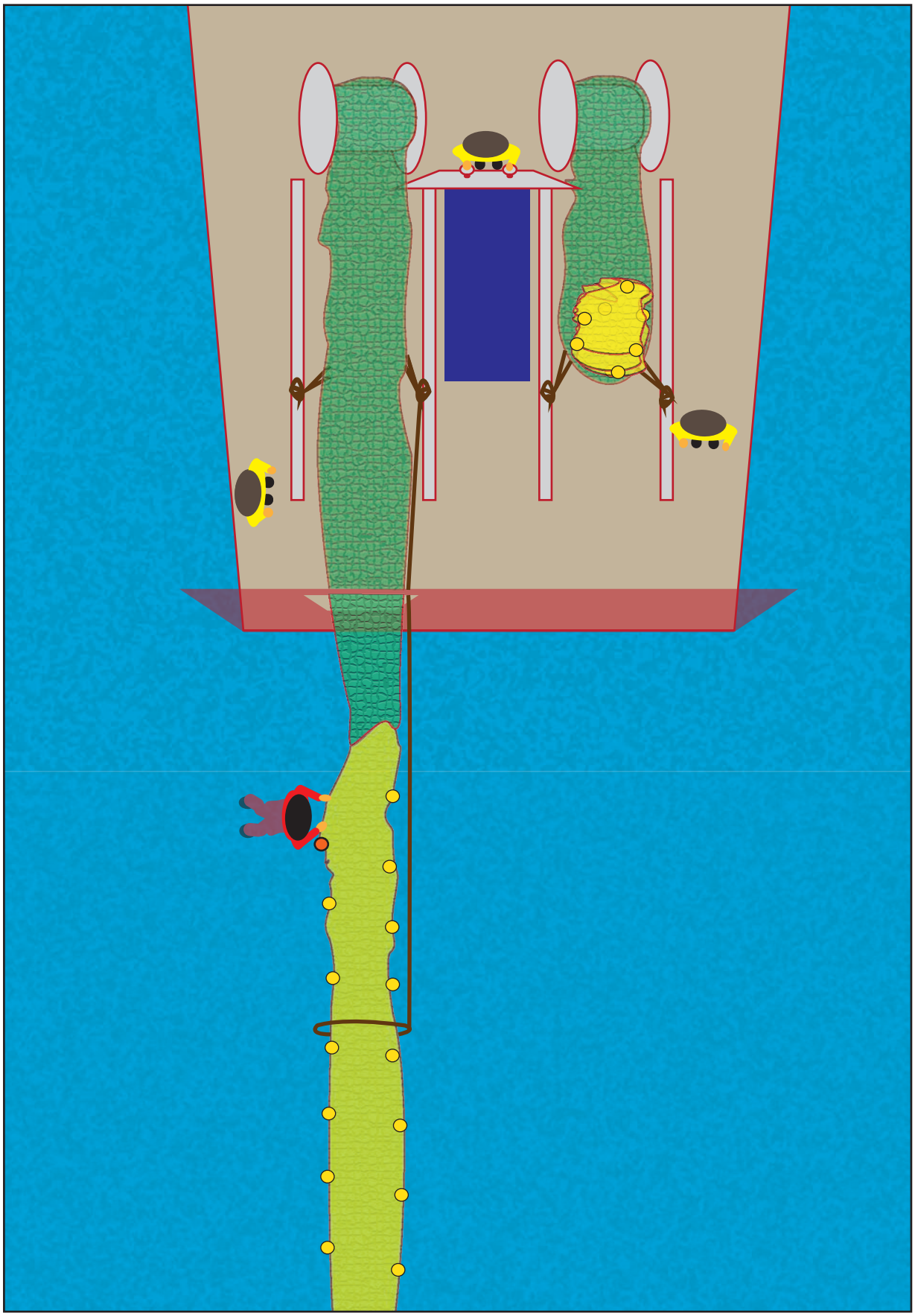


Figure 8: Illustration of the leading deckhand's position after entering the water

life ring to the leading deckhand. The leading deckhand put his right arm through the life-ring but his inflated lifejacket prevented him from donning it further and he appeared to be losing strength.

At 0923, *Beryl*'s skipper used very high frequency (VHF) radio channel 16 to request assistance from *Caledonian Victory*, an oil rig support vessel that was 6nm south-east of *Beryl*. *Caledonian Victory*'s master immediately arranged for an autonomous rescue and recovery craft (ARRC)[3] **(Figure 9)** to be readied for launch and turned the support vessel towards *Beryl* at best speed. At 0926, the master also informed Shetland Coastguard of the situation after he heard *Beryl*'s skipper trying to contact the station without success, possibly due to the combination of distance and aerial height.

Image courtesy of www.trawlerpictures.net

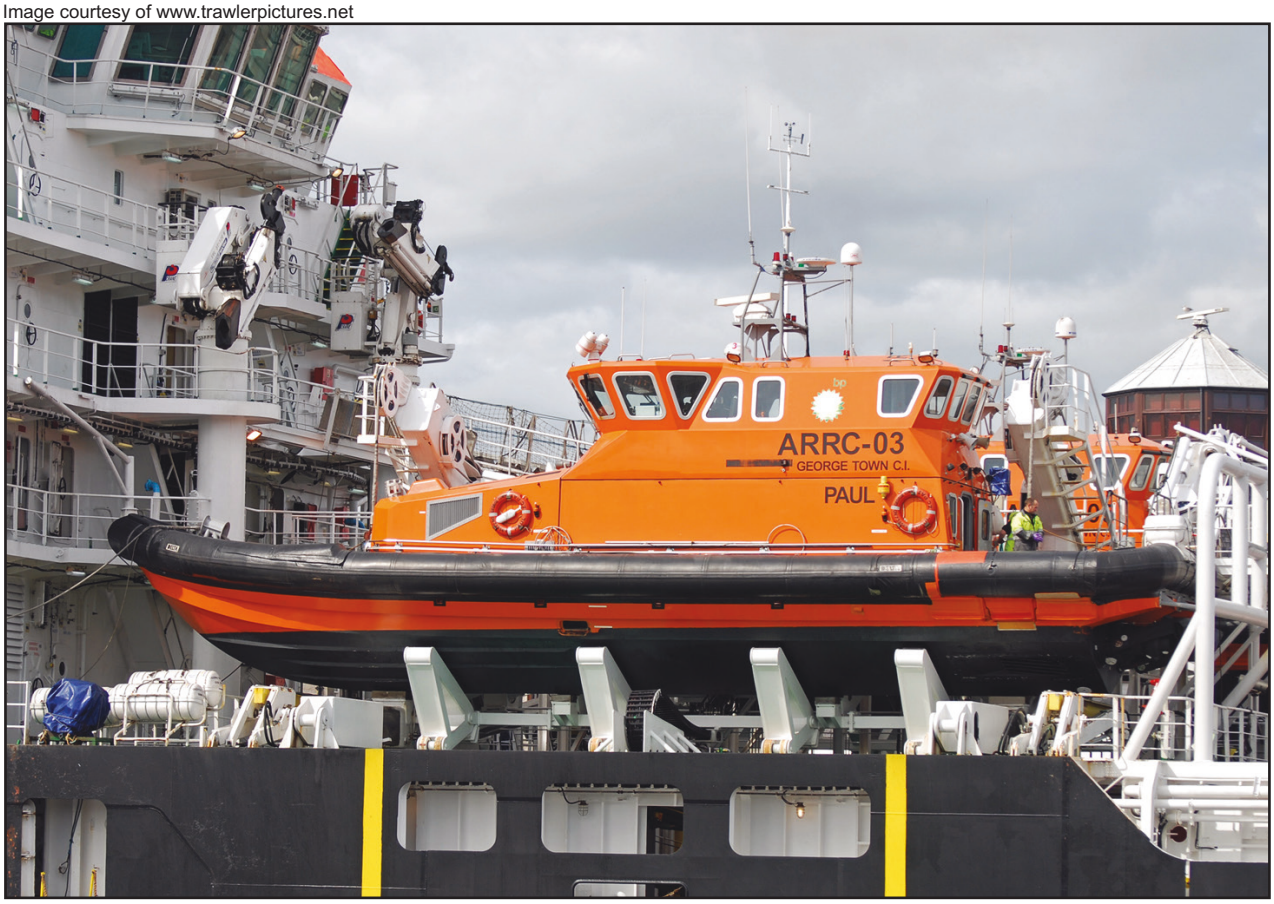


Figure 9: *Caledonian Victory*'s autonomous rescue and recovery craft

Meanwhile, *Beryl* had stopped with its port beam to the sea and wind. The leading deckhand was by now floating close to the bottom of the vertical ladder on the trawler's port side **(Figure 10)**. He managed to grab the ladder but was unable to hold on due to the vessel's violent rolling motion. Waves were washing over the leading deckhand's head and he started to vomit. The leading deckhand was becoming unresponsive.

[3] *Caledonian Victory* was equipped with two purpose-built 19m ARRC's.

Image courtesy of Ian Leask at www.marinetraffic.com

Figure 10: Vertical ladder built into *Beryl*'s side plating (note - an identical ladder was sited on the vessel's port side)

At 0938, *Caledonian Victory*'s ARRC, with six crew on board, was launched 5.3nm from *Beryl*. At the same time, Shetland Coastguard passed the details of the incident to the Royal Air Force base at Kinloss, the UK's Aeronautical Rescue Co-ordination Centre. In response, rescue helicopter R100 was diverted from a training flight to assist. The estimated flight time to *Beryl* was 1 hour.

Beryl's crew continued to try and recover the leading deckhand from the water. They deployed the Markusnet manoverboard (MOB) recovery system **(Figure 11)** but had difficulty deploying the device into the wind and were unable to catch the leading deckhand, who was unable to help himself, in its net. Grapple hooks were then lowered to try and snag the leading deckhand's clothing or lifejacket webbing. The skipper and the engineer also took turns to climb down the ladder to try and grab hold of him. Neither was wearing a lifejacket or a lifeline.

By this time, the leading deckhand appeared lifeless and was starting to drift away from *Beryl,* so the crew recovered the port cod end on board and the skipper manoeuvred *Beryl* back towards him. At about 0953, *Caledonian Victory*'s ARRC arrived on scene and the leading deckhand was recovered from the water onto its aft deck 6 minutes later.

1.2.3 Post-recovery actions

The ARRC's medic immediately began cardiopulmonary resuscitation (CPR) on the leading deckhand and also administered adrenaline. The ARRC and *Caledonian Victory* headed to the south-west to close R100 but the vessels could only make good a speed of between 2kts and 5kts into the rough seas.

Image courtesy of Markusnet.com

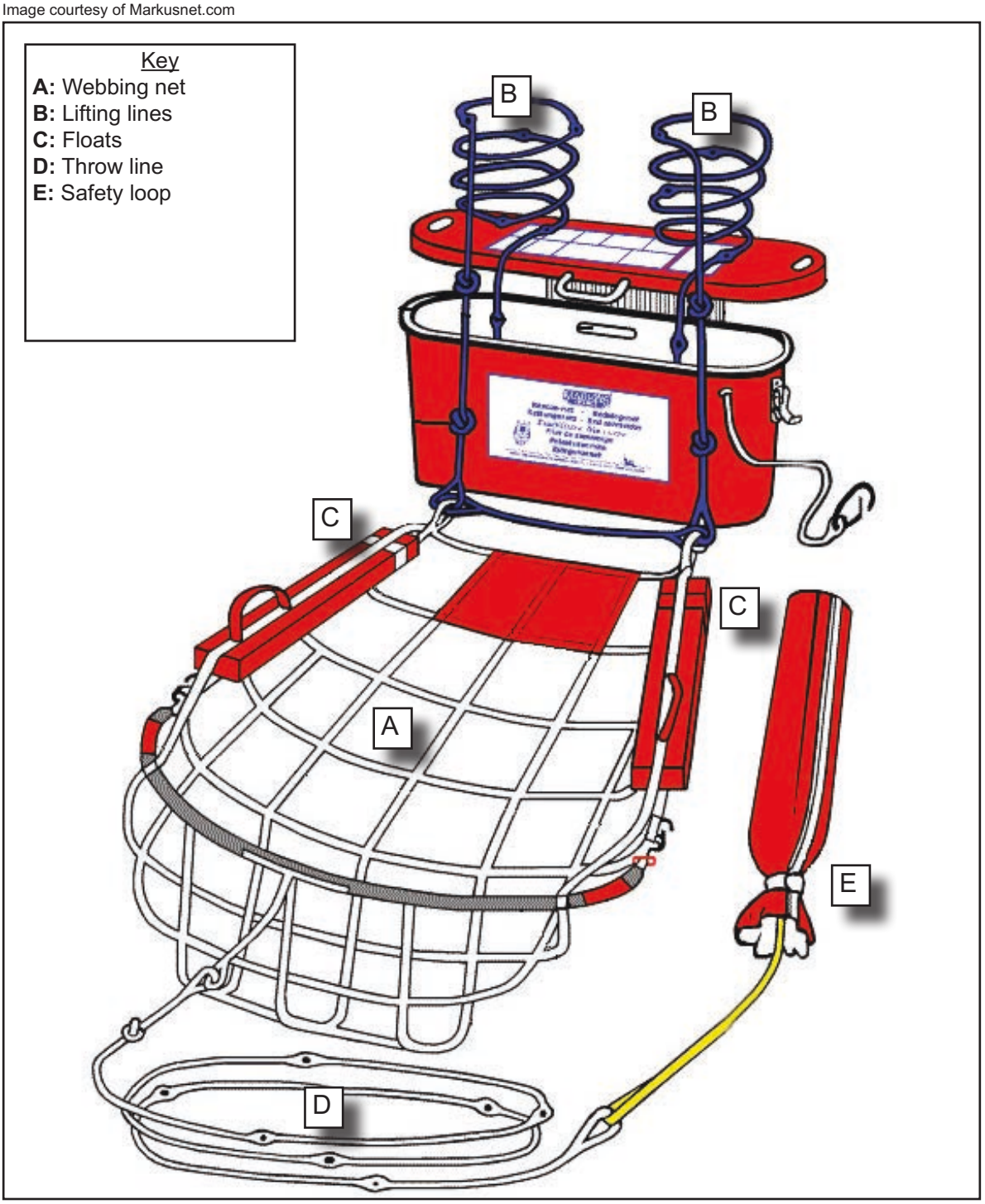


Figure 11: Markusnet manoverboard recovery system

R100 intercepted the ARRC at 1044 and the leading deckhand was winched on board 9 minutes later. He was then flown to Sumburgh, Shetland Islands, where he was transferred to another rescue helicopter that took him to Gilbert Bain hospital in Lerwick, Shetland Islands. CPR was continued throughout the flights and the leading deckhand also received further doses of adrenaline. The leading deckhand arrived at Gilbert Bain hospital at 1132; his core temperature was 27.3°C. The leading deckhand was pronounced life extinct at 1148.

1.3 POSTMORTEM EXAMINATION

A postmortem examination carried out in Aberdeen on 16 February 2015 concluded that Joshua Aryeetey "*died of immersion in sea water as a result of an incident occurring whilst he was working aboard a fishing vessel."* The examination did not find convincing evidence of recent injury.

1.4 THE CREW

1.4.1 General

Beryl's six crew comprised two UK nationals, one Filipino, one Latvian and two Ghanaians. All of the crew had completed the mandatory training required to serve on a UK registered fishing vessel[4]. The foreign nationals had been employed by the vessel's owners for several years. When fishing, the crew usually shot the nets between every 4 and 5 hours and were able to rest for approximately 2 hours between hauls.

1.4.2 The skipper

Beryl's skipper was a 37 year old UK national. He was a career fisherman and had held a Deck Officer (Fishing Vessel) Class II Certificate of Competency since 1999. The skipper and his cousin co-owned the vessel, trading as JCJM Ltd. The co-owners took turns to skipper the vessel, working a routine of two trips on followed by two trips off.

1.4.3 Leading deckhand

Joshua Aryeetey was a 47 year old Ghanaian national who had completed STCW[5] courses in personal survival techniques, fire-fighting and first-aid at the Regional Maritime University, Accra, Ghana. He had also completed the Seafish safety awareness course in Fraserburgh, Scotland, in June 2010.

Joshua had worked on Scottish-based fishing vessels for a number of years and had been employed on *Beryl* since February 2013. As an experienced and well-respected deckhand, *Beryl*'s crew looked to the leading deckhand to organise and control the work on deck. His contract of employment was flexible but he normally worked on board for between 6 and 7 months, followed by between 2 and 3 months in Ghana. He was due to leave the vessel in March 2015.

Joshua was well built and was physically fit. When he was dragged overboard he was wearing jogging bottoms, three layers on his upper body, bib and brace oilskin bottoms, wellington boots and a lifejacket[6].

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[4] New entry fishermen must complete basic safety courses in sea survival, elementary first-aid; fire-fighting and health and safety. Fishermen with two years' experience must also complete a one day mandatory safety awareness course run by the Sea Fish Industry Authority (Seafish).

[5] International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended (STCW Convention)

[6] All of the deckhands wore Mullion Compact 150N lifejackets (see paragraph 1.6.1)

1.5 *BERYL*

1.5.1 History and ownership

Beryl was built in 1998 in Navia, Spain. Previously named *Harvest Moon IV* and *Norlantean*, the vessel was re-named *Beryl* when it was bought by JCJM Ltd in 2013. After an extensive refit in April 2013, the vessel fished as a twin rig trawler around Scotland, primarily for megrim and monkfish.

1.5.2 Fishing gear

Beryl was fitted with two pairs of net drums. One pair of net drums was on the top deck and these were used to store the trawl nets for fine grounds. The second pair of net drums was on the main deck and was used to store the trawl nets used for rougher grounds.

The trawl nets were identical, each comprising a 20m 'cod end' and a 35m 'bag' attached to ground gear **(Figure 3)**. Hard, moulded plastic floats were secured to the cod end at 2m intervals.

When shooting the trawls, the cod end and the bag were streamed through the stern doors. The lashings holding the ground gear were then removed and the trawls veered from the net drum.

1.5.3 Safety management

Beryl was registered with the Scottish Fishermen's Federation (SFF) onboard support scheme and the vessel's skippers had completed a hard copy of the Seafish Safety Folder[7]. Both the SFF scheme and the Seafish Safety Folder were intended to assist skippers and owners to develop a safety management system on board their vessels.

The Seafish fishing vessel safety folder and its associated risk assessments were completed on board *Beryl* in April 2013. The risk assessments did not include control measures for snagged gear. A review of the risk assessments was due in May 2014 but was not completed.

On 26 July 2014, an SFF representative visited *Beryl* to introduce the onboard support scheme. During the visit, the representative discussed various hazards, including jammed and tangled equipment. The resulting risk assessment for this hazard was recorded under *'Abnormal conditions'* and the safety measure agreed with the crew, including the leading deckhand, was:

'The crew MUST stand back until the skipper assesses the situation and gives instructions'.

1.5.4 Drills

Following *Beryl*'s change of ownership in 2013, 14 drills were recorded in the vessel's official logbook. Twelve drills were connected with fire, flood and abandon ship. The remaining two drills were discussions on MOB procedures, the last of which took place on 1 May 2014.

[7] See paragraph 1.8.1

1.5.5 Survey and inspection

Beryl was surveyed by the Maritime and Coastguard Agency (MCA) in Fraserburgh in April 2013 for the renewal of its United Kingdom Fishing Vessel Certificate, which was required on change of ownership. Fire and abandon ship drills were conducted during the survey.

Beryl was next surveyed in March 2014, also in Fraserburgh. During the survey, the attending surveyor identified that monthly drills were not being recorded in the vessel's official logbook. He witnessed a fire drill and a crew discussion on emergency procedures.

The MCA also conducted an intermediate survey on board *Beryl* in Scalloway on 11 February 2015 following the leading deckhand's death. The attending surveyor again noted that monthly drills were not being recorded in the vessel's official logbook. He also noted that the vessel's muster list was not posted. No drills were carried out during the intermediate survey.

1.6 LIFEJACKET AND MOB RECOVERY EQUIPMENT

1.6.1 Lifejackets

When working on the trawl deck, *Beryl's* crew wore Mullion Compact 150N lifejackets issued through an SFF initiative to supply all eligible Scottish fishermen with a personal flotation device (PFD)[8]. The lifejacket incorporated automatic and manual inflation and complied with ISO 12402[9].

A 25cm fibre lifting loop was attached to the right-hand side of the lifejacket to assist with the manual recovery of a person from the water. The loop was load-tested to 3200N (362kg) and was contained within the lifejacket valise; it was only exposed once the lifejacket was inflated or the valise was manually unzipped.

1.6.2 Manoverboard recovery equipment

A Markusnet MS 10 (Markusnet) was carried on board *Beryl* to assist the recovery of a person from the water. The MS 10 designation meant the equipment was designed to be used on board vessels with a freeboard of up to 10m and enabled a casualty to be hoisted from the water by two persons or a crane while the casualty was sitting, standing or lying horizontal.

The Markusnet was developed and tested by several organizations, including the Icelandic Lifesaving Association, the Danish Coastguard and the Netherlands Royal Navy. The system was type approved by Lloyd's Register (LR)[10].

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[8] Other organisations involved in initiatives to provide UK fishermen with lifejackets include Seafish, the MCA, the Fishing Industry Safety Group (FISG) the Royal National Lifeboat Institution (RNLI) and the Royal National Mission to Deep Sea Fishermen (RNMDSF).

[9] ISO - International Organization for Standardization

[10] A Type Approval by LR demonstrates that a product conforms to recognised industry quality standards, International Conventions and/or the LR Rules, through a process of independent design review, sample testing and verification of production controls. In this case, Type Approval did not include that the Markusnet met a performance standard.

The Markusnet weighed 4kgs and comprised a webbing net, lifting lines, floats and a throw line with a rescue/safety loop attached **(Figure 11)**. The device was housed in a moveable storage container and was capable of being deployed by one person.

The instructions for deployment and use of the Markusnet **(Annex A)** included:

1. *Release hasp, lift lid handle and grasp the container handle as the container falls forward.*

2. *Release the attachment snap hook and bring the unit to the rescue spot.*

3. *Open velcro band release outer lifting lines overboard and throw line allowing for crosswind.*

4a. *Pull the man overboard towards you and at the same time release the net into the sea and allow it to drift to the casualty or 4b. Allow the man overboard to pull the net out to him and enter the net structure.* [sic]

Beryl's crew had never used the Markusnet.

1.7 REGULATIONS

1.7.1 Risk assessment

The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 (1997, SI. 2962[11]*)* require that fishing vessel owners risk assess their vessels' working operations and review the assessments at regular intervals. The Fishing Vessel 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 (Merchant Shipping Notice (MSN) 1770 (F)) incorporates this requirement and states:

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 assessment process applies certain principles, including:

- the avoidance of risks;
- the evaluation of unavoidable risks;
- taking action to reduce identified risks.

Advice on the practical implementation of these regulations is contained in Marine Guidance Note (MGN) 20 (M+F)[12].

[11] SI – Statutory Instrument

[12] MGN 20 (M+F) Implementation of EC Directive 89/391 Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997

1.7.2 Means of recovery

MSN 1770 (F) section 7.1.2.1, iv, requires fishing vessels to carry a means of recovering a person from the water. However, it does not require the equipment to be type approved. Although not applicable to fishing vessels, SOLAS III[13] Regulation 17.1 states:

All ships shall have ship-specific plans and procedures for recovery of persons from the water, taking into account the guidelines developed by the Organization. The plans and procedures shall identify the equipment intended to be used for recovery purposes and measures to be taken to minimize the risk to shipboard personnel involved in recovery operations.

Despite this requirement, SOLAS does not stipulate a performance standard for manoverboard recovery systems.

1.7.3 Training and drills

MSN 1770 (F) stipulates the type, objective and the frequency of emergency drills to be conducted and recorded. In particular:

8.1.2.1 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.

8.1.2.2 The drills referred to in section 8.1.2.1 should ensure that the crew thoroughly understand and are exercised in the duties which they have to perform with respect to the handling and operation of all life-saving, fire fighting and survival equipment. Flooding drills should also be incorporated.

8.1.2.3 If a vessel carries 5 or more crew, a muster list should be provided with clear instructions for each member of the crew, which should be followed in case of emergency.

8.1.2.4 The times, dates and particulars of inspections and drills should be recorded and available for future inspection.

The *Merchant Shipping (Official Log Books) (Fishing Vessels) Regulations 1981*, requires that onboard training and drills are recorded and witnessed in the official logbook. It also requires that the logbook be submitted to an MCA marine office every 6 months for inspection. The MCA does not usually enforce this requirement.

[13] SOLAS – International Convention for the Safety of Life at Sea, 1974, as amended.

1.8 GUIDANCE

1.8.1 Safety management

Seafish fishing vessel safety folder

Seafish provides a Fishing Vessel Safety Folder to help fishing vessel owners and skippers to safely manage their vessels. The folder includes checklists, templates and forms for:

- inspections
- emergency drills
- crew details and induction
- muster plan
- risk assessments
- records of equipment inspections
- stability.

The folder is available in hard copy and can be supplied by Seafish to fishermen following completion of safety awareness training. Alternatively, it can be completed and maintained online[14].

SFF onboard support scheme

The SFF onboard support scheme assists owners and skippers to record safety-critical issues relating to the operation of their vessels, including: expiry dates of life-saving apparatus, lifting equipment details and crew certification. Fishing vessels enrolled on the scheme are visited by an SFF representative to engage all crew in the risk assessment process.

1.8.2 Emergency drills

MGN 430 (F)[15] **(Annex B)** provides guidance on the checks that MCA surveyors will make regarding crew certification and drills. In summary, during surveys, 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.*

[14] The www.safetyfolder.co.uk website was developed and is maintained by Rockall Marine, which is responsible for its operation and content. The website facilitates the completion of the Seafish safety folder online and helps fishing vessels comply with UK and European Maritime laws. Email is used to remind vessel owners of routine tasks and equipment services, which is particularly useful for small vessels.

[15] MGN 430 (F) Fishing Vessels: Checks on Crew Certification and Drills

- *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.*

MGN 430 (F) also provides guidance on how drills should be conducted and what should be demonstrated. With regard to the use of MOB recovery systems, it states:

There are several "man overboard" recovery systems in use on board fishing vessels at this time, Jason's Cradle and Markus Net to name just two. These systems are permitted to replace rescue boats only when an exemption has been applied for and granted. Crews should be well trained in the use of these systems and appreciate the limitations of the use of these recovery systems in poor weather conditions as well as fine.

The key issues are:

- *system inspected and serviced;*

- *crew well trained in the use of the system carried;*

- *system deployed correctly;*

- *first aid requirements anticipated; and*

- *system re-stowed and readied for immediate use.*[sic]

Since MGN 430 (F) was published in January 2011, the requirements placed on vessel crews with regard to emergency drills during survey have varied in the different regions around the UK and between individual surveyors. In most cases, surveyors have generally not requested a MOB drill to be conducted in which an object has been recovered from the water.

1.8.3 Recovery of a person in the water

A wide range of guidance is available relating to the actions to be taken in the event of a person falling overboard. The actions are included in the Annexes to MGN 430 (F). Man overboard recovery is also included in the Seafish safety awareness course, but the depth and detail covered is left to the discretion of individual instructors.

1.9 IMMERSION IN COLD WATER

It is commonly recognised that there are four stages that the human body experiences after sudden immersion in cold water:

Phase 1: Cold shock response

On initial immersion an individual often takes a large gasp of air, the breathing rate increases dramatically and hyperventilation occurs. Along with this, there is a large increase in heart rate and blood pressure. The increased cardiac load may prove fatal, particularly in older, less healthy people. There are many cases of death in this initial period particularly when the individual is not wearing a lifejacket.

Phase 2: Short-Term Immersion and Loss of Performance

During the first 30 minutes of immersion significant cooling of peripheral tissues occurs, especially in the extremities. This cooling has a direct adverse effect on neuromuscular activity. This effect is especially significant in the hands, where blood circulation is negligible, leading to finger stiffness, poor co-ordination of gross and fine motor activity, and loss of power. The loss of motor control makes it difficult, if not impossible, to complete essential survival procedures such as opening a flare, donning survival equipment or grasping a rescue line or hoist.

Phase 3: Hypothermia

Hypothermia is described as a body core temperature of 35°C or lower. As the core temperature falls, unconsciousness occurs. Death may occur in two ways: drowning through inability to keep airways clear of the water, and cardiac arrest as the body core temperature continues to fall below approximately 24°C.

Phase 4: Post-rescue collapse

Death occurs during or shortly after rescue. The fundamental cause of death is a collapse of blood pressure, usually when the individual is lifted from the water in a vertical position.

1.10 OTHER ACCIDENTS

1.10.1 Previously owned vessels

Beryl's owners had previously owned two other vessels that have been Total or Constructive Total Losses. *Beryl* (BF411) and *Onward* (BF440):

- *Beryl* (BF411) was a 20m stern trawler that foundered after flooding on 22 May 2011. The flooding was possibly due to a failure of the main engine cooling water pipework. The crew transferred to *Onward* BF440 before the vessel sank.

- *Onward* (BF440) was a 21m stern trawler that had a major fire on board on 11 April 2012. The fire, which probably started in the engine room, was firmly established before the crew were alerted. The crew abandoned to a liferaft before the vessel sank.

The MAIB investigation report[16] into the fire on board *Onward* included a recommendation to the vessel's owners to:

2012/150 *Ensure that the crews on board any vessels it may own in the future are fully prepared to effectively deal with emergency situations, taking into account, inter alia:*

- *The requirement to conduct periodic emergency drills and the importance of emergency drills to a vessel's safety.*
- *The need for all early warning devices such as fire detection systems and bilge alarms to be properly maintained and tested, and that crews fully understand their operation.*
- *The need for crews to have a good knowledge of all onboard safety-related systems and equipment, and that routine safety precautions such as the closing of fire doors are taken at all times*.

1.10.2 Man overboard – stern trawlers

From 1992 to February 2015 there have been 115 fatalities as a result of persons falling overboard from UK fishing vessels.[17] Recent accidents involving stern trawlers include:

Apollo

On 3 September 2007, a deckhand on board the stern trawler *Apollo* died after being dragged overboard by a trawl net during routine hauling operations. The vessel was quickly manoeuvred alongside the casualty, who was then able to grab and hold a lifebuoy. However, the casualty lost consciousness and, despite the efforts of the crew, he could not be revived when he was recovered to the deck. The casualty was not wearing a PFD and was in the water for approximately 15 minutes.

Following the accident, the Chief Inspector of Marine Accidents wrote to the Chief Executive of the MCA suggesting that he consider extending an initiative for the MCA's surveyors to assist fishermen in their assessment of the risks encountered during fishing operations.

New Dawn

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

The actions of the vessel's owner as a result of the accident included:

- Reviewing working practices and modifying shooting procedures.
- Making the wearing of inflatable lifejackets compulsory for all crew during shooting and hauling operations.

[16] MAIB Report No 27/2012

[17] This number excludes persons overboard following a casualty to a vessel, such as a capsize.

- Establishing procedures to ensure that all crew are in positions of safety before the load from trawl warps is transferred to the towing chains.

The Deputy Chief Inspector of Marine Accidents wrote to the vessel's owner to acknowledge the actions, and the valiant attempt made by the skipper to rescue his colleague overboard. However, the Deputy Chief Inspector also recognised the personal danger in which the skipper placed himself while attempting this rescue. He suggested the owner review the equipment available on board the vessel, and procedures which may be adopted to better facilitate the recovery of a person from the sea.

Osprey III

On 11 November 2009, a deckhand was dragged into the sea by a net running over the side of the stern trawler *Osprey III*[18]. The vessel was quickly manoeuvred to recover the crewman, but attempts to recover him with a lifebuoy and line were unsuccessful. The deckhand disappeared from view after about 12 minutes; he was not wearing a lifejacket.

Zenith

On 29 January 2012, a fisherman 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 back 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 lifejacket.

The MAIB investigation report[19] identified that:

The accident was a consequence of the unsafe practice of crew standing on the aft bulwark top rail during initial net hauling, which had become customary in favourable sea conditions. The vessel's owners had not carried out a safety evaluation of their working operations nor had they carried out emergency drills. Therefore, neither the dangers associated with standing on top rails, nor the crew's unpreparedness for rescuing incapacitated persons from the sea was fully recognised.

The report included a recommendation to Seafish to:

2013/113 *Work with the Fishing Industry Safety Group (FISG) to identify how the type of assistance with risk assessment offered by the Scottish Fishermen's Federation and the Anglo Northern Irish Fish Producers' Organisation to their members can be provided across the industry.*

The report also recommended the MCA to:

2013/114 *Strengthen its survey and inspection regime to ensure that effective emergency drills and crew training certificates are observed during renewal and intermediate surveys, as required by its internal guidance to surveyors and MGN 430.*

Both of these recommendations were accepted.

[18] MAIB report 6/2010

[19] MAIB report 4/2013

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 ENTANGLEMENT IN GEAR

The arrangement of the tracks on *Beryl*'s main deck provided a physical barrier between the trawl nets and the deckhands **(Figures 2** and **5)**. As a result, the risk of the deckhands being inadvertently entangled in the gear as it was shot away was reduced significantly. A risk of entanglement existed if the crew had to free jammed or snagged equipment. However, this hazard had been addressed during the assessment of the vessel's operations undertaken in July 2014, when the crew agreed that they should stand back and await instructions from the skipper.

However, when the net float snagged on the track lashing on 10 February 2015, the leading deckhand moved into the track to try and free it. By standing on the net, which was held only by the snagged float, he put himself into an extremely dangerous position. *Beryl*'s speed was 5kts, so when the float unexpectedly freed from the lashing, the net would have run out quickly, soon reaching a rate of approximately 2.5m per second. Therefore, it is not surprising that the leading deckhand could not prevent himself from being carried overboard when the net started to move.

2.3 CHANGING BEHAVIOURS

It is not known why the leading deckhand removed only half the lashings before shooting the port trawl net or why he attempted to free the snagged float from inside the track. The lashings were an identifiable snagging hazard and standing on the net was a dangerous short-cut. If the leading deckhand had properly assessed the risks of shooting the nets secured on the main deck or informed the skipper when the net float snagged, in accordance with the vessel's risk assessment, the accident could have been avoided.

Although all of *Beryl*'s crew participated in the risk assessment process in July 2014, it is not clear how well the deckhands understood its purpose. The crew all wore lifejackets when working on deck, which was a positive safety-oriented behaviour. However, the leading deckhand's movement into the track and that his colleagues did not challenge his action indicate that the safety culture among the deckhands was only embryonic. The leading deckhand's 'can do' attitude and the other deckhands' deference to him as the 'deck boss' seem to have been the major influences on their behaviour. These are, of course, normal, indeed often desirable traits. However, a more imbedded safety culture would have provided the other crew members with the confidence and authority to voice concern and prevent an unsafe working practice before the leading hand placed himself at risk.

Risk assessments have been required on board fishing vessels since 1998. Since then, for many years the majority of fishermen did not recognise their relevance or importance to crew and vessel safety. However, more recently, fishermen have become better engaged in the process of risk assessment, largely due to the safety

management initiatives such as the Seafish fishing vessel safety folder and the SFF onboard support scheme. Nonetheless, it is clear from the circumstances of this, and many other similar accidents (paragraph 1.10), that more needs to be done to convince fishermen that risk assessments are a tool for changing behaviours rather than just a paperwork exercise. If risk assessments are to contribute to saving and protecting lives, they must be used to develop safe systems of work, best practice and, ultimately, a robust culture of safety on board fishing vessels.

2.4 ATTEMPTED RECOVERY AND DEBILITATION

After the leading deckhand had been carried overboard, his lifejacket inflated and he was able to hold onto the port trawl net. *Beryl*'s crew immediately responded: the vessel was stopped, the leading deckhand was pulled to the stern and a lifebuoy was lowered. Thereafter, the leading deckhand remained afloat in close proximity to *Beryl* for approximately 49 minutes but, despite desperate efforts, the crew, were unable to recover him.

The inability of *Beryl*'s crew to recover the leading deckhand from the water was due to several significant factors. In particular, they were hampered by the vessel's 4m freeboard and its rolling motion in the rough seas, which prevented them from reaching him. In addition, the crew were slow to deploy the Markusnet. Moreover, when they did so, they were unable to use it effectively and the leading deckhand was incapacitated and unable to help himself into the recovery system's net.

As the sea water temperature was approximately 8°C, the leading deckhand would have experienced cold water shock to some degree when first immersed. However, with his lifejacket keeping him afloat, he remained conscious and able to grasp rescue equipment for 20 minutes while the crew attempted to recover him. Thereafter, the leading deckhand lost motor function and was unable to help himself until eventually becoming completely unresponsive. It is likely that the leading deckhand drowned as a result of waves washing over him during the onset of fatigue and hypothermia in the cold water. That the leading deckhand was wearing a lifejacket meant that he was able to survive the shock of entering the cold water. It is, therefore, highly regrettable that the crew were unable to recover him from the water before he lost the ability to assist in his rescue.

2.5 ASSISTANCE

When *Caledonian Victory*'s master was alerted to the man overboard from *Beryl*, the ensuing preparation of the vessel's ARRC and the turn towards the fishing vessel were prompt and positive. However, by then, the leading deckhand had already been in the water for about 13 minutes. This delay was possibly due to the skipper's confidence that *Beryl*'s crew would manage to recover the leading deck hand from the water fairly quickly. This was because, during the early stages of the attempted recovery, the leading deck hand was wearing a lifejacket, clearly conscious, close to the vessel and able to hold onto the trawl net and then a lifebuoy. It was only when the skipper recognised the difficulty in getting the leading deckhand back on board that he called for external assistance. If he had made the call sooner, the likelihood of the leading deckhand's survival would have been increased.

Alerting the coastguard and other vessels of a man overboard must be done as soon as possible to enable assistance to be provided quickly. As indicated on the guidance provided in MGN 430 (F) **(Annex B)**, this is easily achieved by sending a digital selective calling (DSC) alert on a frequency band appropriate to a vessel's location.

2.6 MANOVERBOARD PLANS AND PROCEDURES

The guidance detailed in MGN 430 (F) provides generic advice on the action to be taken in the event of a manoverboard from a fishing vessel. However, although not directly applicable to fishing vessels, the SOLAS principle that ship-specific plans and procedures for manoverboard recovery must be developed in order to identify appropriate equipment and safeguard crews is equally relevant.

The challenges faced by crews recovering a manoverboard vary between vessel types and the operations being conducted. Typically, crew fall or are carried overboard from stern trawlers during shooting or hauling operations (paragraph 1.10.2) when vessel manoeuvrability is usually restricted. Furthermore, even where casualties surface, their recovery back on board is frequently impeded by high freeboards, rough seas and the debilitation of the casualties through injury or cold water shock.

The manner in which different methods were used to try and recover the leading deckhand back on board indicate that the difficulties likely to be encountered when recovering a person from the water had not been adequately considered or practised on board.

Notably, no attempt was made to move *Beryl* to windward of the leading deckhand before deploying the Markusnet, and the skipper and the engineer put themselves at considerable risk by descending the vessel's side ladder without a lifejacket or a lifeline. It was fortunate that neither fell into the water, otherwise, the consequences of this accident could have been even more severe.

The actions of the skipper and the engineer were similar to the actions taken by a number of other fishermen who also put themselves at risk trying to assist a man overboard.[20] However, entering the water to assist an incapacitated person need not be unsafe provided the action is incorporated in a vessel's manoverboard procedures and the risks have been minimised through the provision of appropriate equipment such as a dry suit or immersion suit, a lifejacket and a lifeline. Volunteers to enter the water should also be suitably trained and be aware of their role. Alternative options, such as the deployment of a liferaft to provide either a temporary place of safety or as a platform to aid recovery, also merit consideration.

2.7 MANOVERBOARD RECOVERY SYSTEMS

The Markusnet carried on board *Beryl* was one of a number of manoverboard recovery systems available and endorsed by the MCA for use on UK registered fishing vessels. Unlike many other lifesaving apparatus, such as liferafts and lifejackets, these systems are not required to meet a specific standard. A variety of methods and types of recovery systems are available, including: scramble or rescue nets, scoops or rescue baskets, cradles and hoops.

[20] Examples include *New Dawn* (paragraph 1.10.2), *Vidar* (MAIB report 19/2013) and *Korenbloem* (MAIB report 6/2010)

These recovery systems have advantages over rescue boats in terms of size and the number of crew required for their operation. However, many, including the Markusnet, cannot be used from high freeboard vessels to recover incapacitated persons from the water unless another person enters the water to assist. This limitation must be considered when deciding on which recovery system to carry and when developing ship-specific procedures so that supporting or alternative methods and/or equipment is available and can be used safely when required.

The absence of a recognised performance standard applicable to manoverboard systems, and the number and types of systems available, potentially makes it harder for owners and skippers to decide which system(s) to carry on board. Provision of industry guidance on the suitability of the different systems for the various types and sizes of fishing vessel is therefore warranted.

2.8 DRILLS

2.8.1 *Beryl*

MSN 1770 (F) requires fishing vessel crews to carry out at least one emergency drill each month. However, the type of drill conducted is left to the discretion of the vessels' owners and skippers. *Beryl*'s owners/skippers had previously lost *Beryl* (BF411) and *Onward* (BF440) to flood and fire respectively (paragraph 1.10.1). As a result, the owners were recommended by the MAIB to ensure that their crews were prepared to deal with emergency situations. Despite this recommendation and the requirements of MSN 1770 (F), only 14 drills were completed on board *Beryl* in the 21 months following the vessel's purchase in 2013.

In view of the circumstances of the losses of *Beryl* (BF411) and *Onward* (BF440), it is understandable that the focus of 12 of these drills was fire, flood and abandon ship. The remaining two drills recorded were discussions on the actions to be taken in the event of a man overboard. However, they were not practical manoverboard drills, with the consequence that *Beryl*'s crew were unable to effectively deal with a manoverboard emergency. Significantly, the crew had never used the Markusnet. Therefore, they were slow to use the system, could not deploy it effectively and did not appreciate its limitations. The leading deckhand died as a result.

2.8.2 Fishing industry

UK fishermen are taught the principles of manoverboard recovery during the mandatory sea survival and safety awareness courses. However, the principles covered rarely go beyond getting the casualty alongside the vessel as the potential difficulties of recovering a person back on board are almost impossible to convey in the comfort of a training room. This can only be achieved through realistic and frequent manoverboard drills.

It is of concern that many fishing vessel crews do not carry out practical manoverboard drills. Lack of time and/or opportunity are reasons frequently cited. Consequently, many fishing vessel crews are insufficiently practised to deal with manoverboard emergencies. Furthermore, the crews who do carry out practical manoverboard drills usually use a lifebuoy or a fender to simulate a person in the water. While this allows initial actions to be practised, and hones ship-handling skills, it does not give crews the opportunity to use the recovery systems carried. The

use of these systems can only be meaningfully drilled by using rescue dummies or similar to expose crews to the difficulties of recovering a heavy, incapacitated person from the water. Fishing vessel owners and skippers need to ensure that practical emergency drills are conducted regularly so that their crews can react effectively should the need arise.

MGN 430 (F) **(Annex B)** states that MCA surveyors will check that the emergency drills required by MSN 1770 (F) are carried out. The surveyors are also supposed to witness emergency drills during intermediate and renewal surveys and, where considered necessary, require these drills to be conducted at anchor. However, it is reported that many skippers are reluctant to take their vessels out of harbour during inspections and that vessels frequently have insufficient crew on board to conduct drills. Consequently, very few practical manoverboard drills have been witnessed during surveys.

The number of fishermen who die after having fallen overboard remains a concern. Therefore, following on from the recommendation previously made to the MCA, by the MAIB in 2013 (MAIB recommendation 2013/114 - paragraph 1.10.2), a much firmer line must be taken to ensure that more practical manoverboard drills are witnessed during surveys.

SECTION 3 - CONCLUSIONS

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

1. The movement of the leading deckhand into the track and onto the net to free the snagged float by-passed the physical and procedural barriers in place. [2.2]

2. The accident could have been avoided if the risks of shooting the lashed nets had been properly assessed by the leading deckhand, or if the skipper had been informed when the net float snagged. [2.3]

3. The leading deckhand's actions and the absence of any challenge to his behaviour indicates that the safety culture among the deckhands was only embryonic. [2.3]

4. More needs to be done to convince fishermen that the risk assessments are a tool for changing behaviours rather than just a paperwork exercise. [2.3]

5. The crew were unable to recover the leading deckhand from the water due to the vessel's 4m freeboard, the rough seas and their inability to position him in the Markusnet. [2.4]

6. It is likely that the leading deckhand drowned as a result of waves washing over him during the onset of fatigue and hypothermia caused by being in the cold water for almost 50 minutes. [2.4]

7. The leading deckhand was wearing a lifejacket and so was able to survive the shock of entering cold water. It is, therefore, highly regrettable that the crew were unable to recover him from the water before he lost the ability to assist in his rescue. [2.4]

8. The 13 minute delay in requesting assistance from *Caledonia Victory* reduced the likelihood of the leading deckhand surviving. [2.5]

9. The difficulties likely to be encountered when recovering a person from the water had not been adequately considered or practised on board. [2.6]

10. The skipper and the engineer put themselves at considerable risk by going down the vessel's side ladder without a lifejacket or a lifeline. [2.6]

11. It is not possible to recover an incapacitated person from the water from a high sided vessel with the Markusnet without another person also entering the water to assist. [2.7]

12. Only 14 drills were completed on board *Beryl* in the 21 months following the vessel's purchase in 2013. [2.8.1]

13. No practical manoverboard drills were conducted on board *Beryl* in the 21 months following the vessel's purchase in 2013. Consequently, the crew had never used the Markusnet and their ability to effectively deal with a man overboard emergency was reduced. [2.8.1]

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

1. Entering the water to assist an incapacitated person is unsafe unless the action is incorporated in a vessel's manoverboard procedures and the risks have been assessed and minimised. [2.6]

2. The absence of a recognised performance standard and the number and types of manoverboard recovery systems available potentially increases the difficulty faced by owners and skippers when deciding on which system to carry. [2.7]

3. The use of manoverboard recovery systems can only be meaningfully drilled by using rescue dummies or similar to expose crews to the difficulties of recovering a heavy, incapacitated person from the water. [2.8.2]

4. The number of fishermen who continue to be lost after having fallen overboard remains a concern. Fishing vessel owners and skippers need to ensure that practical emergency drills are conducted regularly, and a firmer line is required to ensure that more practical manoverboard drills are witnessed during vessels' surveys. [2.7.2]

SECTION 4 - ACTION TAKEN

4.1 MAIB ACTIONS

The **Marine Accident Investigation Branch** has**:**

Issued Safety Flyer **(Annex C)** to the fishing industry highlighting the issues raised in this report.

4.2 ACTIONS TAKEN BY OTHER ORGANISATIONS

4.2.1 The **Maritime and Coastguard Agency**

Drafted a Marine Guidance Note for publication in early 2016 that informs of the new SOLAS regulation requiring all SOLAS ships to have arrangements for the recovery of persons from the water that should follow IMO guidelines. It also establishes the need for non-SOLAS UK vessels, such as fishing vessels, to observe these international provisions as industry guidance.

4.2.2 JCJM Ltd

Researched current manoverboard recovery devices and purchased a cradle type device that it considers to be more appropriate for use with a casualty unable to assist in a rescue.

4.2.3 The **National Federation of Fishermen's Organisations**

Developed a series of emergency procedures information sheets including the actions to be taken in the event of man overboard **(Annex D)**.

SECTION 5 - RECOMMENDATIONS

The **Maritime and Coastguard Agency, Scottish Fishermen's Federation, National Federation of Fishermen's Organisations** and the **Sea Fish Industry Authority** are recommended to:

2015/156 Through membership of the Fishing Industry Safety Group, collectively explore ways of:

- Ensuring fishermen conduct regular emergency drills as required by statute.
- Procuring rescue dummies which could be made available to the owners/ skippers of fishing vessels to facilitate realistic manoverboard drills.
- Using the results of onboard risk assessments to promote behavioural change and develop robust safety cultures.

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

2015/157 Strengthen and enforce its policy regarding manoverboard drills on board fishing vessels by ensuring that during surveys:

- The witnessed drills are realistic and practice recovery procedures as well as initial actions.
- Owners are instructed to have sufficient crew available
- The frequency of manoverboard drills conducted is similar to other emergency drills.

The **Sea Fish Industry Authority** is recommended to:

2015/158 Conduct research into the manoverboard recovery systems suitable for use on board fishing vessels and promulgate advice on the systems to the fishing industry regarding their suitability, capabilities and limitations.

JCJM Ltd is recommended to:

2015/159 Take steps to improve the safe operation of its vessels and to ensure that its crews are fully prepared to deal with emergency situations, taking into account, inter alia:

- The implementation and adherence to control measures identified during the risk assessment process
- The importance of developing safe systems of work and following best practice
- The development of manoverboard plans and procedures
- The benefits of regular and realistic manoverboard drills incorporating the use of the manoverboard recovery system
- The importance of alerting the coastguard and other vessels as soon as possible.

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