Report on the investigation of

the major injuries sustained by a deckhand on board

fv *Danielle* BM478

17 miles south-south-east of Falmouth

on 6 June 2006

Marine Accident Investigation Branch
Carlton House
Carlton Place
Southampton
United Kingdom
SO15 2DZ

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Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2005 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 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 13(9) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005, 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

A&E	-	Accident and Emergency
AMPDS	-	Advanced Medical Priority Dispatch System
ARCC	-	Aeronautical Rescue Co-ordination Centre
BIEC	-	Basic Immediate Emergency Care
BST	-	British Summer Time
CG3	-	The HMCG Operational Procedures
DfT	-	Department for Transport
DLA	-	Deputy Launching Authority
DoH	-	Department of Health
DSC	-	Digital Selective Calling
EEC	-	European Economic Community
EIEC	-	Extended Immediate Emergency Care
ETA	-	Estimated Time (of) Arrival
FISG	-	Fishing Industry Safety Group
fv	-	fishing vessel
FVC	-	Fishing Vessel Certificate
GP	-	General Practitioner
HMA	-	Honorary Medical Advisor
HMCG	-	Her Majesty’s Coastguard
ILB	-	Inshore Lifeboat
IV	-	intravenous
kW	-	kiloWatt
LOLER	-	Lifting Operations and Lifting Equipment Requirements

m	-	metre
Marine Office	-	A regional MCA office responsible for vessels' survey and certification
MCA	-	Maritime and Coastguard Agency
MF	-	Medium Frequency
MGN	-	Marine Guidance Notice
MoD	-	Ministry of Defence
MRCC	-	Maritime Rescue Co-ordination Centre
MSN	-	Merchant Shipping Notice
NHS	-	National Health Service
nm	-	nautical miles
OAN	-	Operations Advice Notice
PUWER	-	Provision And Use of Work Equipment
QAH	-	Queen Alexandra Hospital
RAF	-	Royal Air Force
RNLI	-	Royal National Lifeboat Institution
SAR	-	Search and Rescue
SIAS	-	Ship Inspection And Survey
SMC	-	SAR Mission Co-ordinator
SRR	-	Search and Rescue Region
UK	-	United Kingdom
USA	-	United States of America
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency

Port side view of *Danielle* departing Brixham, 26 July 2006

Figure 1

SYNOPSIS

At 0045 on 6 June 2006, a deckhand on board the UK-registered scallop dredger *Danielle* became trapped by a rope that was being used on a winch whipping drum. He sustained serious arm and chest injuries and was evacuated by RNLI lifeboat and ambulance to hospital, where subsequently his arm had to be amputated.

The deckhand had been "tipping" each scallop dredge individually, using several turns of rope around the whipping drum on the port side of the winch house, when a riding turn developed. In an attempt to stop the winch and clear the riding turn, the deckhand slipped on the recovered dredging gear lying on the deck. His left hand became caught in the rope between the winch head and the framework beneath, and he subsequently did two backwards somersaults round the whipping drum and framework. On both occasions he was unable to reach the stop due to this framework, and it was only once his left arm had broken and shoulder dislocated, that he was able to stop the winch and avoid being dragged round it a third time.

The deckhand was freed from the whipping drum and helped into the galley. He had lost several fingers, and fractured and severed his upper left arm. His t-shirt had been forced into the wound, and was helping to stem the blood flow, and he also had red chest rashes, an indicator of his nine fractured left ribs and punctured left lung.

The skipper contacted the Maritime Rescue Co-ordination Centre (MRCC) at 0054 to report the accident, stating that they were 16.2 miles SSE of Falmouth, and steaming in at top speed.

A link call between the skipper and a radio medical advice doctor in Portsmouth was facilitated by the MRCC. During this conversation, the skipper provided a detailed description of the injuries, including the chest rashes, but on several occasions the doctor tried to interrupt for clarification, and might not have heard all the details.

The MRCC and the doctor subsequently agreed that the deckhand required evacuation to hospital and that this would most appropriately be carried out by the Falmouth lifeboat, with their volunteer Lifeboat Medical Advisor on board. The possibility of using a helicopter from the nearby Royal Naval Air Station Culdrose was discounted, due to the 45 minute airborne night response time.

At 0107, *Danielle*'s skipper provided an update to the MRCC, reporting that the deckhand was experiencing breathing difficulties, and had a semi-severed arm, with a possible neck/spinal injury. These details were passed onto the doctor at 0113, but it was agreed that the lifeboat was still the best option for providing assistance.

The deckhand was subsequently evacuated by the lifeboat, with a land ambulance completing the transfer to Truro hospital, where he arrived at 0334, 2 hours and 40 minutes after the initial VHF call.

Various issues regarding this evacuation have been identified, including:

- Ambulance Control did not obtain the full medical details available to properly prioritise the initial ambulance response. This led to the original ambulance being diverted to a "higher" priority patient and a delay awaiting a further ambulance.

- The MRCC had previously not been made aware of:
    - the RNLI's policy of using cruising speeds, which led to the lifeboat deploying to the accident at a reduced speed (20.5 knots), in accordance with an RNLI-wide circular reserving top speed (25 knots) only for life-threatening incidents;
    - the new ambulance prioritisation system used by Ambulance Control.

The actual evacuation time could have been reduced by 30 minutes if there had been no lifeboat or ambulance delays. It is estimated that if a helicopter had evacuated the casualty to hospital, this could still have been quicker than if the lifeboat had deployed at full speed and the ambulance had not been delayed.

The delay is, however, unlikely to have made any difference to the outcome of the accident or the viability of the casualty's arm, due to the severity of the injuries sustained, other than reducing the deckhand's prolonged extreme suffering.

Closer co-operation is required between the various SAR providers to ensure that each is fully aware of the others' capabilities and that important information, especially medical details, are accurately conveyed.

The accident would have probably been prevented if a risk assessment had recognised the hazards associated with the dredge tipping operation, and had appropriate control measures been adopted to improve the working environment before the accident. It is normal practice for the experienced deckhands to "tip" alone, and this is considered undesirable and dangerous, given the current "tipping" arrangement on board the vessel.

Recommendations have been made to Mermaid Trawler Company Ltd, the MCA and Seafish regarding the framework and emergency stop facilities in the vicinity of the whipping drums; the promulgation of the hazards associated with "tipping"; the recording of details of risk assessments on statutory documentation; and the provision of practical on board guidance in completing risk assessments.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *DANIELLE* AND ACCIDENT

Vessel details

Registered owner	:	The Mermaid Trawler Company Ltd., Brixham
Port of registry	:	Brixham – BM478
Flag	:	UK
Type	:	Fishing Vessel (scallop dredger, ex beam trawler)
Built	:	Tereuzensche Sccheepsbouw Maatschappij, Ternuezen, Netherlands in 1973
Classification society	:	None
Construction	:	Steel
Length overall	:	31.99m
Registered length	:	29.2m
Beam	:	7.5m
Depth	:	4.05m
Gross tonnage	:	226.00
Engine type and power	:	634kW produced by a Stork 9 FHD 240/ Wartsila diesel engine

Accident details

Time and date	:	0045 on 6 June 2006 (UTC +1)
Location of accident	:	49˚ 53.10´N, 004˚ 53.45´W, 17 miles SSE of Falmouth
Persons on board	:	7
Injuries/fatalities	:	Major arm and rib injuries to one of the deckhands
Damage	:	None

1.2 BACKGROUND

Danielle was built in 1973 in the Netherlands as a beam trawler, where she operated before coming onto the UK registry in 1995. In 1997, the vessel's ownership transferred from Grimsby to Brixham, with a number of alterations being made to the deck layout for her new role as a scallop dredger.

The vessel typically undertakes seven-day trips, dredging for scallops off the south west of England, with a crew of six or seven. A description of the vessel is at 1.5 below, with details of the scallop dredging operations at 1.6.

Like most Brixham-based scallopers, *Danielle* operates a six on, six off watch system, to allow for the highly demanding nature of this type of fishing. The skipper and mate are responsible for the wheelhouse operations in each watch, with two deckhands assigned to each watch to work on deck. When a 7th crewman, the spare hand, is embarked, he also works a six on, six off pattern, divided equally across the watches to provide additional assistance on deck.

The vessel is depicted at **Figure 1** and a general arrangement of the vessel, as built, is provided at **Figure 2**.

1.3 NARRATIVE OF ACCIDENT

All times are UTC+1 hour (BST) unless otherwise stated.

1.3.1 Environmental conditions

The conditions at the time of the accident were reported by the Maritime Rescue Co-ordination Centre (MRCC) as north-easterly Force 1 winds, calm, with no swell and good visibility. This corresponds with the description provided by the skipper of *Danielle*.

The Royal National Lifeboat Institution (RNLI) Return of Service report for the deployment of the Falmouth All Weather Lifeboat to this accident, recorded north-north-easterly winds of Force 2, sea state 3, a swell height of 0.25m, and visibility of about 4 nautical miles.

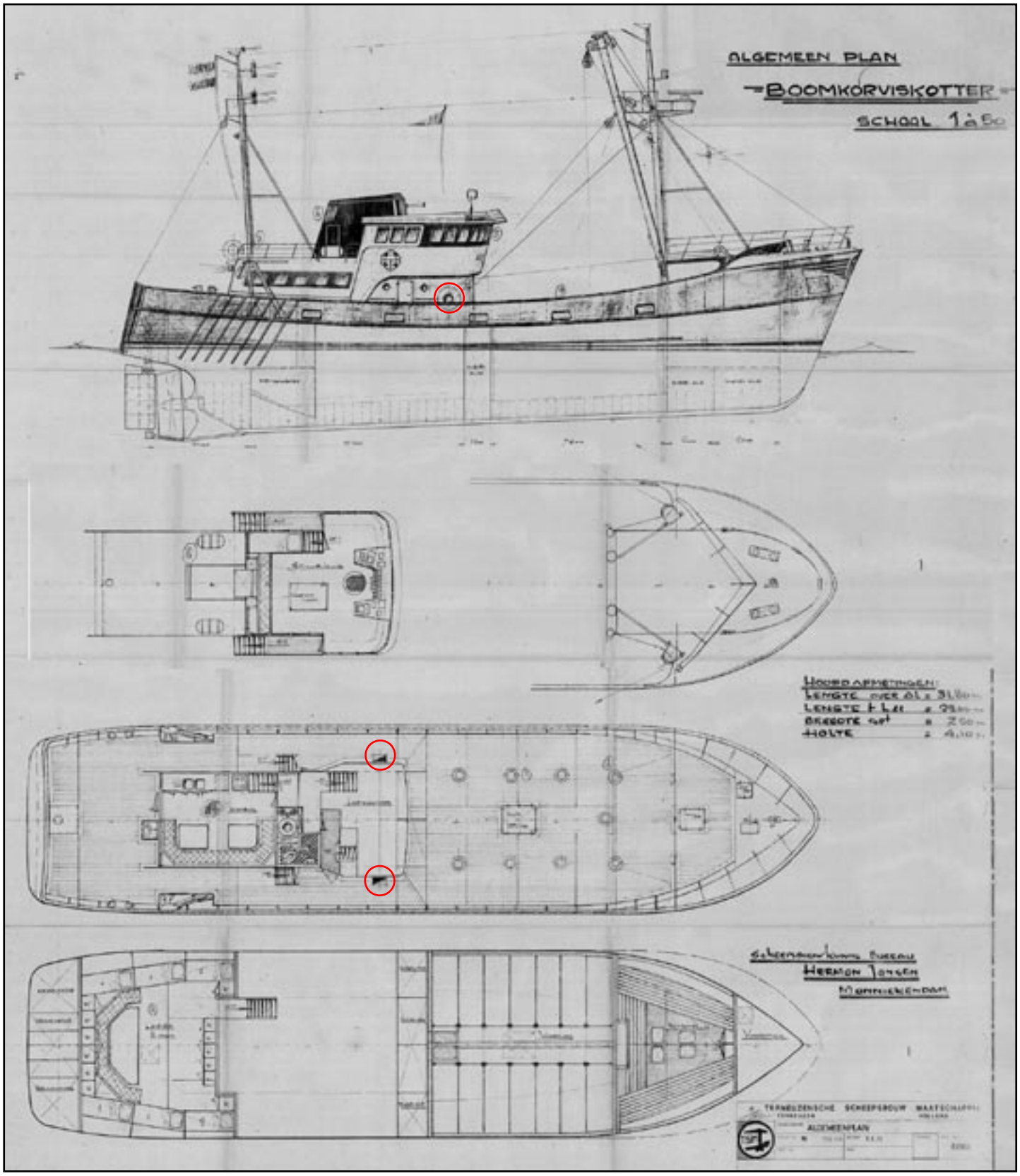
1.3.2 Details of accident

Danielle departed from Brixham at 1500 on 31 May 2006. On board were the skipper and crew of six, comprising the mate, four deckhands, and a trainee deckhand. All were UK nationals, except for two Latvian deckhands, one of whom was the 7th spare hand.

The vessel steamed for around 12 hours to south of Ushant, where they began to dredge for scallops. After 9 hauls, they sailed overnight to the Lizard grounds, and restarted dredging at 0840 on 2 June 2006. They continued to dredge in this area until 6 June 2006, and fine weather, combined with successful hauls, resulted in good onboard morale. Each tow was lasting about 70 minutes on average, with around 30 minutes between tows to haul and re-deploy the gear.

At 2000 on 5 June 2006, the skipper and two of the deckhands, one an experienced local fisherman, the other one of the Latvians, came on watch to join the other Latvian spare deckhand.

Figure 2



General Arrangement drawing

Location of whipping drums

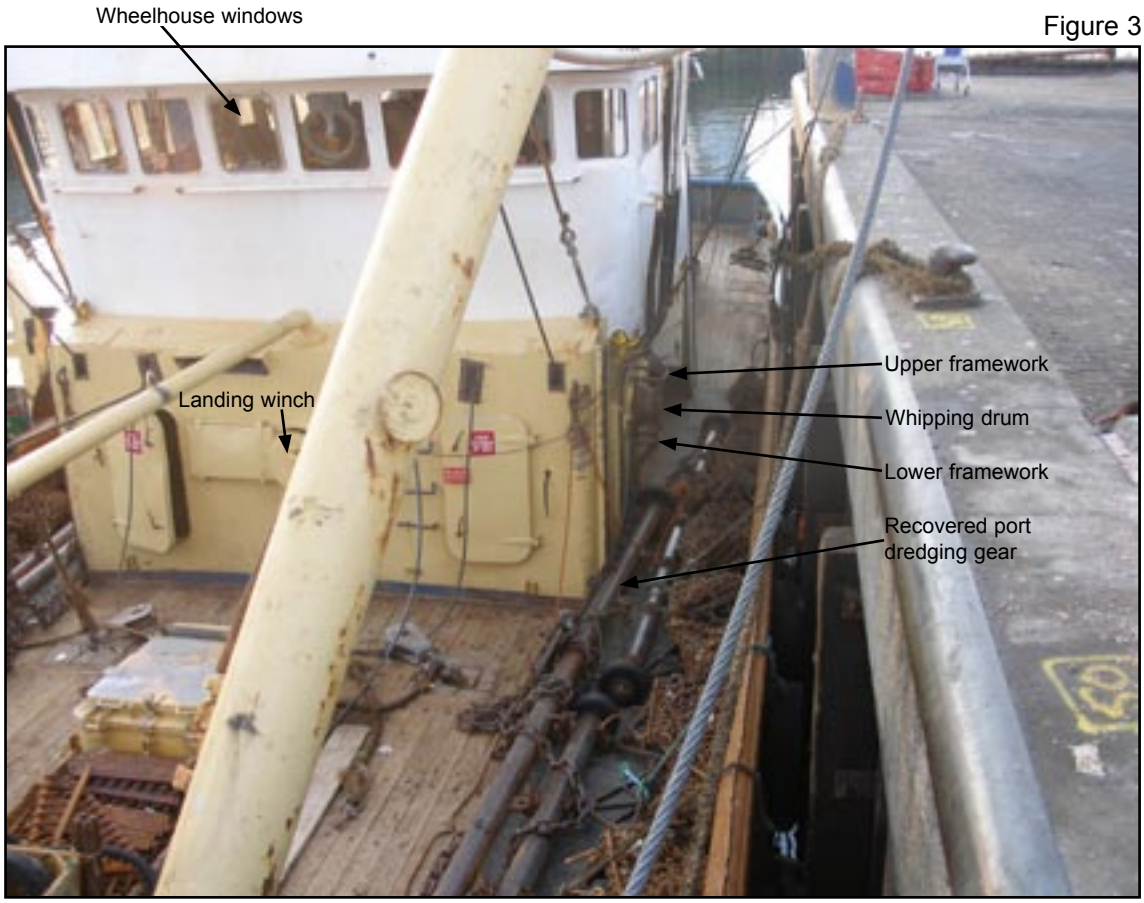
The first two hauls of the watch were completed without incident, other than the routine replacing of damaged tooth bars and springs, while the gear was on deck. At around 2316, they shot the gear away, with the intention of hauling again at about 0035 the next morning.

The skipper began to haul slightly earlier than planned at 0031 on 6 June due to an intermittent gyro compass fault.

A description of the hauling procedure is provided at 1.6, which involves the gear being brought alongside the vessel, by the skipper or mate operating the winch in the wheelhouse. Once alongside, the deckhands then check the dredges on each side for any damage, before giving the all clear to the skipper or mate to commence the "tipping" of the contents of each dredge onto the deck. This is facilitated by using a whipping drum, or warping drum, located on each side of the winch house on the main deck. Depicted in **Figure 3**, this is used to individually raise each dredge in turn.

During the watch when the accident occurred, the Latvian deckhand was responsible for the starboard side, with the other deckhand working on the port side. They were now the only hands on deck, the spare deckhand having completed his watch at 2300.

Figure 3



General port side main deck view, looking aft

Once the skipper had hauled the gear alongside, the Latvian reported that the starboard dredges were undamaged. The other deckhand had, however, identified several broken springs on the aft port dredges. The skipper therefore shouted down his intention to heave the starboard side in and start "tipping" those dredges, while the deckhand on the port side replaced the broken springs. He also told the Latvian that he would shortly join him to assist with the "tipping", once he had attended to the gyro compass in the wheelhouse. The skipper then started the whipping drum using the winch controls in the wheelhouse **(Figures 4 and 5)**. It was the normal practice for the skipper or mate to assist the least experienced deckhand "tip" his side, leaving the other deckhand to "tip" on his own.

The Latvian deckhand began to "tip" the starboard dredges, and after a few minutes, the deckhand on the port side shouted up to the skipper that the springs were now fixed and he was also ready to start "tipping". The skipper instructed the Latvian to take his rope off the whipping drum and stand clear, while the port dredges were brought inboard and draped over the gunwale.

Once the dredges were on the rail, the skipper went to assist on the starboard side, while the port side deckhand began his normal "tipping" preparations. He firstly went forward to get the "tipping" hook, which was attached to an 18mm diameter "tipping" rope, from its stowed position on a cleat forward on the port gantry leg **(Figures 6 and 7**), and hooked it into the back of No.8 dredge[1]. He then fed the bitter end of the tipping rope through the "tipping" block arrangement at the forward end of the winch house **(Figure 8)**, pulled the slack through, and laid the rope out along the dredges and aft to the whipping drum. The "tipping" rope was then fed into the forward bottom section of the whipping drum, and he put 2½ anti-clockwise turns round the winch head **(Figure 9)**.

Having returned to No.8 dredge, and re-positioned the hook on the bag rope, he took the strain on the rope round the whipping drum with his left hand, and used the power of the winch to raise No.8 dredge, which he shook out with his right hand. By then releasing the tension on the rope in his left hand, No.8 dredge was successfully lowered back down onto the gunwale, and the hook removed and fitted to the bag rope on No.7 dredge.

After No.7 dredge had been successfully "tipped", and the hook fitted to No.6 dredge, the deckhand became aware of a riding turn[2] on the whipping drum, and let go of the dredge and the "tipping" rope from his right hand. He was aware of the undesirable nature of riding turns, and the need to stop the winch, using the recessed emergency stop button situated above the winch head, as depicted at **Figure 10**, before dealing with them, in accordance with the skipper's verbal instructions. He therefore started to move back towards the winch head with some urgency,

As he approached the well-lit area of the whipping drum, the deckhand slipped on one of the dredge poles lying on the deck, and his left hand went into the bottom of the winch head, between the rim of the winch head and the framework **(Figure 11)**.

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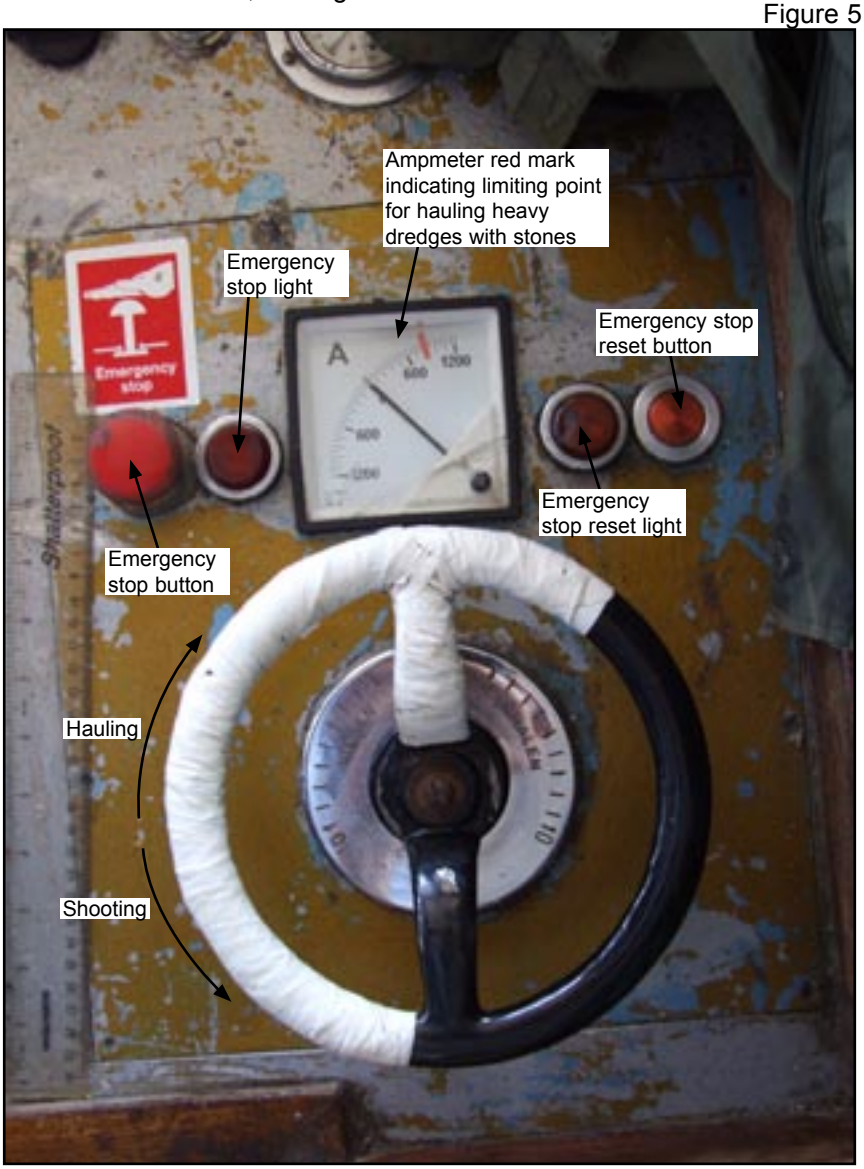
[1] The 8th dredge forward from aft; the dredge numbering system used by the crew uses Nos. 1 to 14, working forwards from the aft most dredge, which is No.1 dredge.

[2] A riding turn occurs when a second layer of rope turns rides over the first layer on a winch.

Figure 4

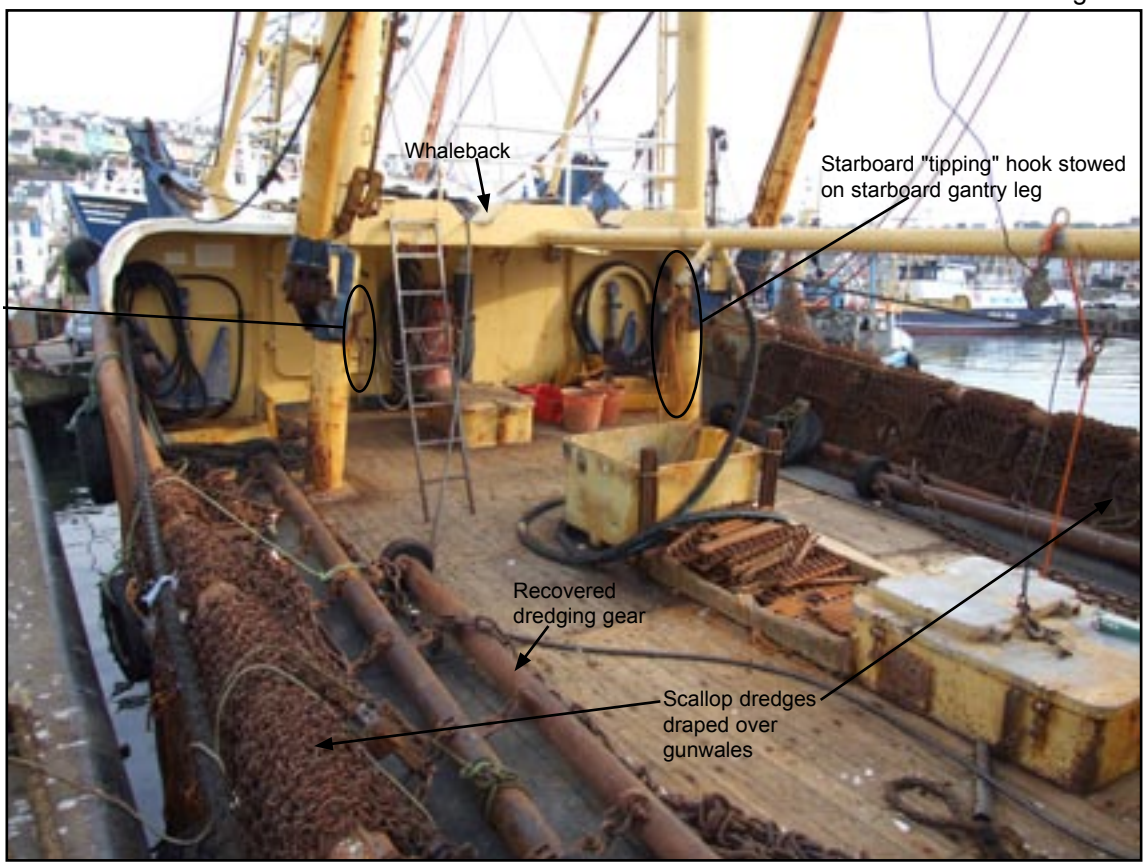
Wheelhouse, looking forward and to starboard

Figure 5



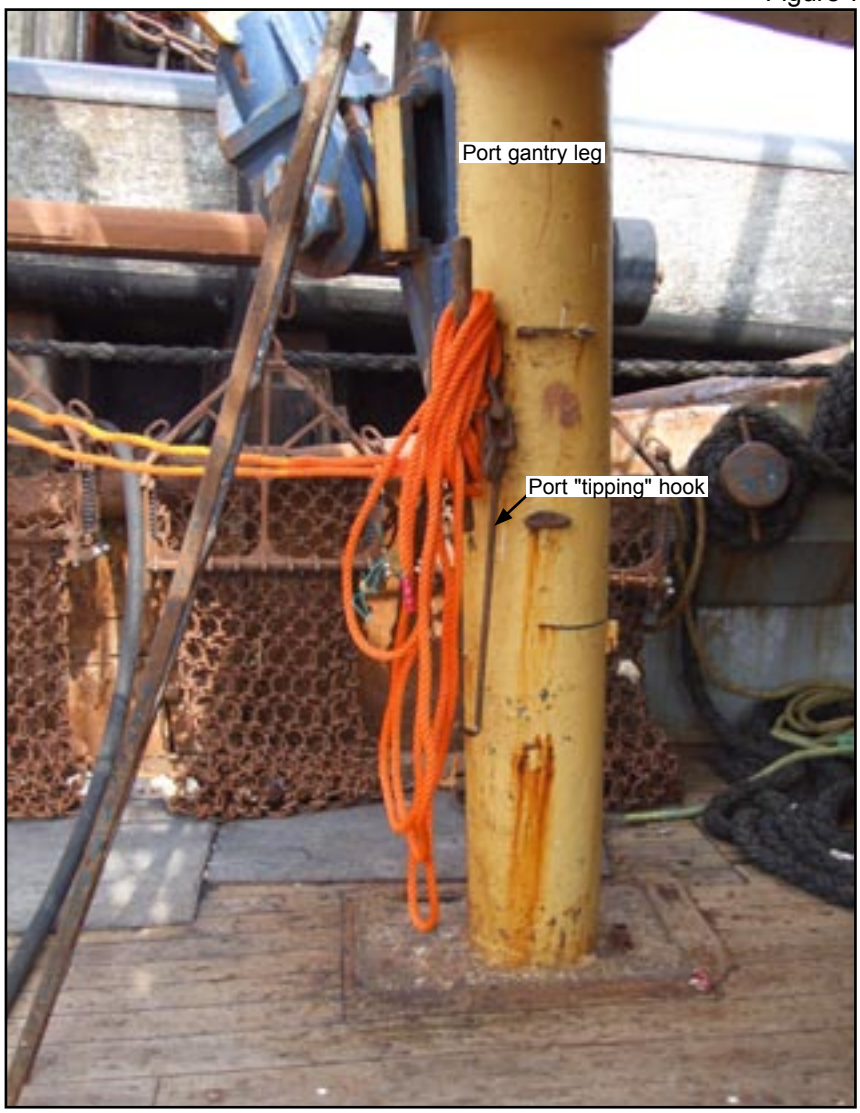
Close-up view of winch controls

Figure 6



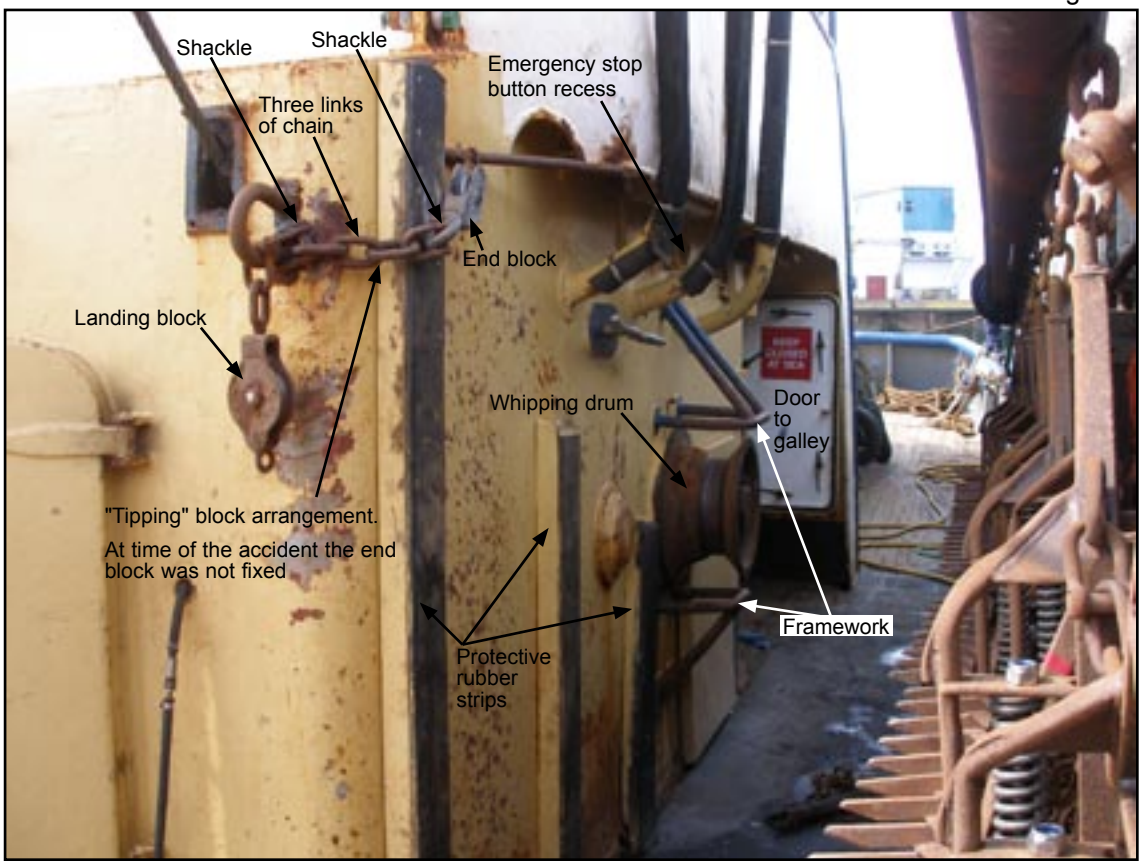
Main deck looking forward towards whaleback

Figure 7



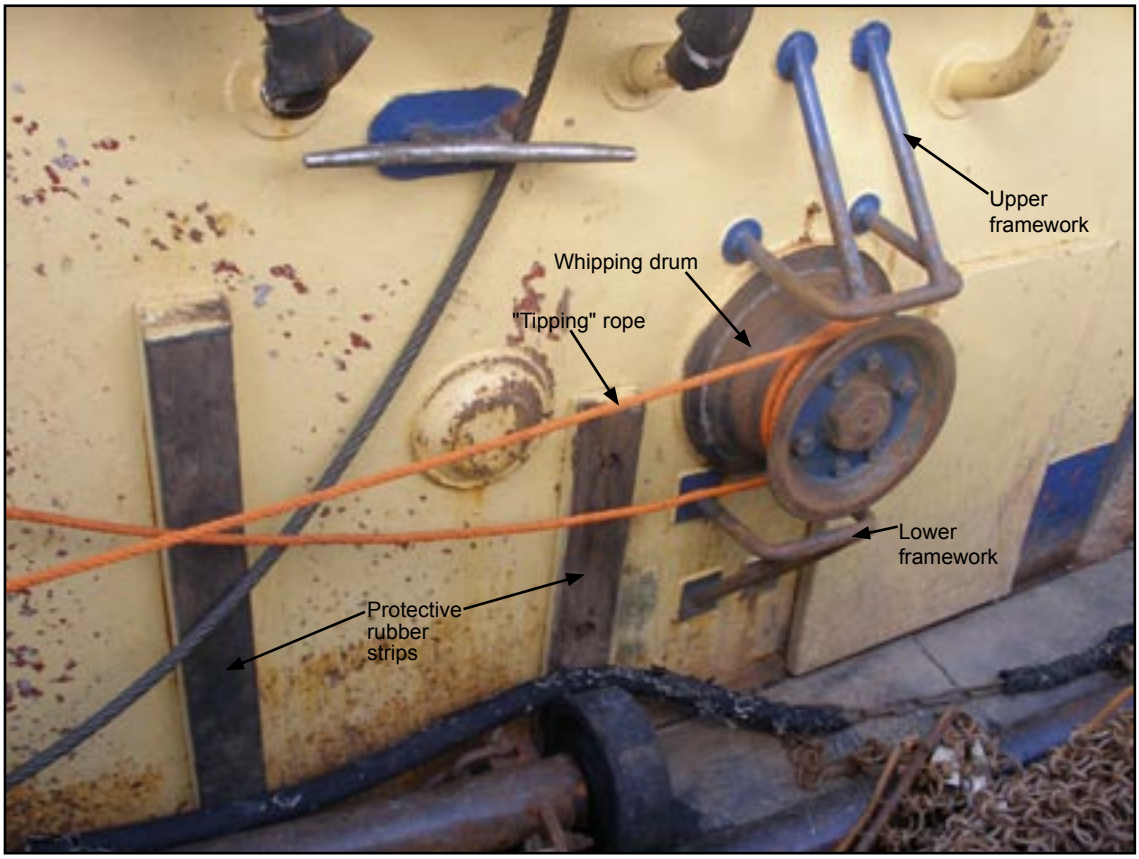
Port gantry leg and stowed port “tipping” hook

Figure 8



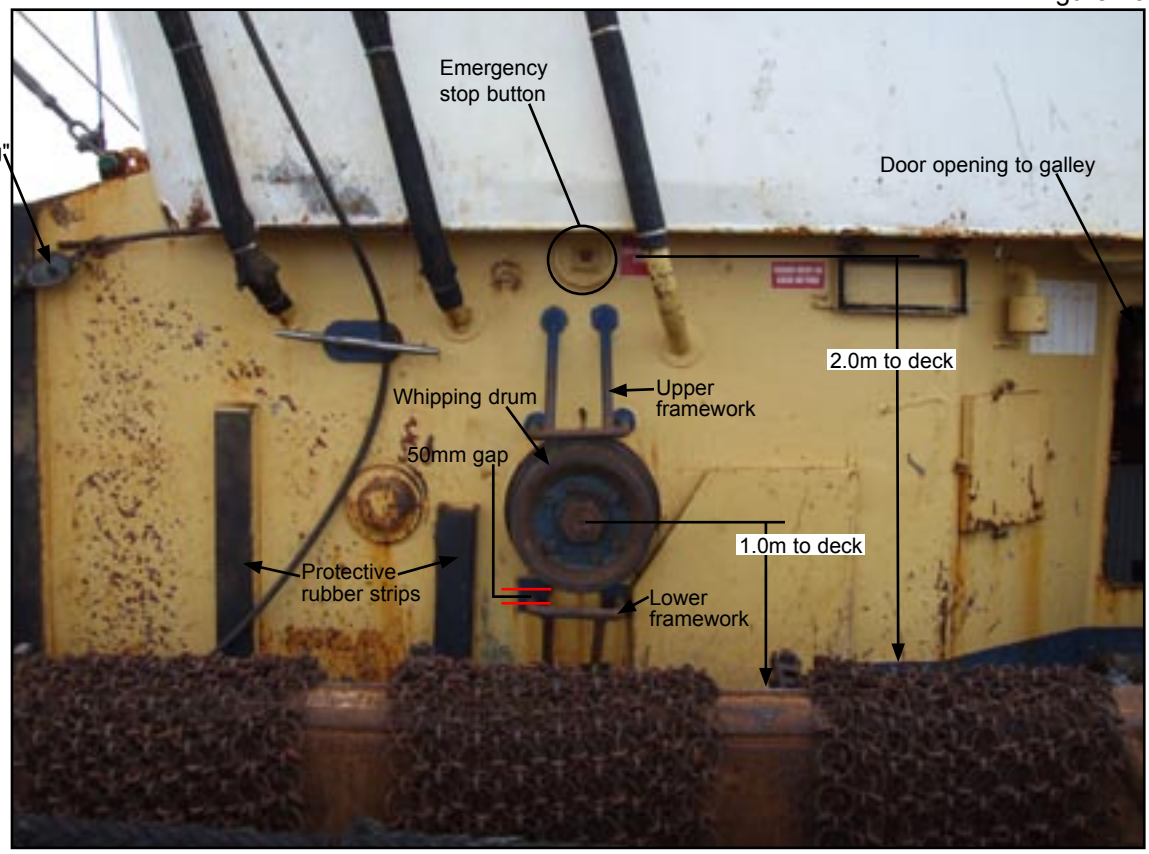
Passageway to port side of winch house

Figure 9



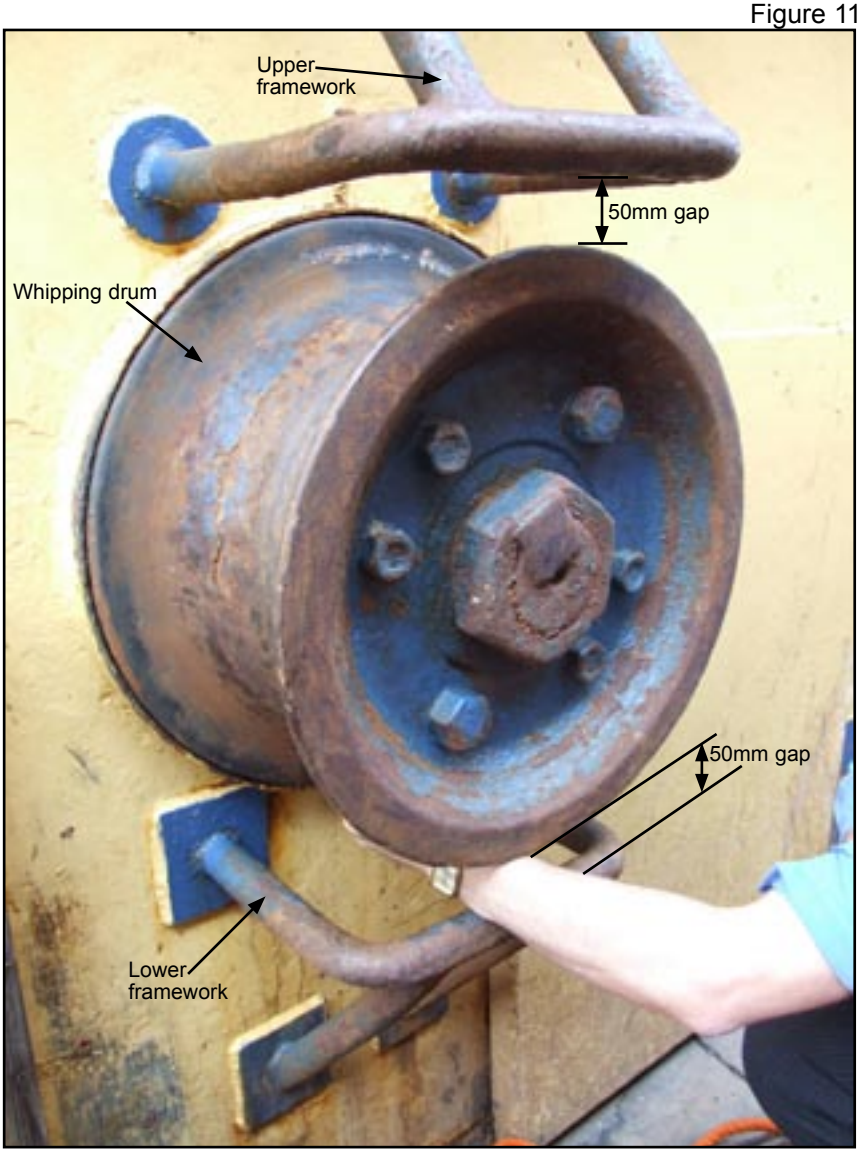
Port whipping drum, with turns of “tipping” rope

Figure 10



Port whipping drum and emergency stop button position

Figure 11



Port whipping drum with demonstration of an arm in the gap between winch head and lower framework

As his hand and arm were dragged into the gap between the lower framework and the anti-clockwise turning winch head, he did two backward somersaults, as he was dragged right round the winch. Following the second circuit, he landed heavily on his heels, and again could not reach the recessed stop button above the winch head. Having already sustained horrific injuries, he realised that if he went round a third time, he might not survive, and therefore managed to stand up and stretch to hit the stop button, following which the winch took about half a revolution to stop. He had remained conscious throughout, and ended up pulled in tight against the framework above the winch, with his ribs against the rim of the whipping drum, and his face against the bulkhead. He immediately started to shout and bang the bulkhead to try to raise the alarm.

At about 0045, the skipper and Latvian deckhand had already together "tipped" a couple of dredges, when the whipping drum stopped. Neither heard the deckhand shouting or banging the bulkhead, and the Latvian, who had been "tipping" with the skipper working the rope at the winch head, went over to the port side to investigate. He found the deckhand trapped in the winch, in the position demonstrated at **Figure 12**, although with a couple of turns of rope tight over some of his left fingers. Returning straight away to the starboard side, his expression and gestures were enough to convey the seriousness of the situation to the skipper, who instantly realised there must be a problem with the deckhand.

Figure 12

Demonstration of "as-found" position of deckhand, trapped in whipping drum

The skipper told the Latvian to go and cut the port “tipping” rope, and headed straight up to the wheelhouse to ensure the winch was stopped. On his arrival there, he threw a knife down to the Latvian and told him to release the port side emergency stop button.

The Latvian duly cut the rope, and No.6 dredge, which had become suspended during the accident, crashed to the deck. However he did not recall releasing the stop button as instructed. Meanwhile, the skipper tried to reverse the winch head slightly to ease some of the pressure, assuming the deckhand to be trapped in the winch. He briefly tried to activate the winch from the wheelhouse control position **(Figures 4 and 5)**, but neither of the deckhands recalled the winch rotating at any stage after the accident. The skipper then depressed the winch stop button in the wheelhouse, and ran down to help the deckhand.

By the time the skipper had arrived at the whipping drum, the Latvian had already removed the turn of rope over the deckhand’s upper arm. Both estimated that there were about 6 or 7 turns round the winch and the deckhand when they found him. The skipper then supported the deckhand, and began to unravel the turns of rope running over his hand on the winch head. In the process of doing this, the deckhand was able to pull away slightly from the winch and release his hand from the left glove, which remained trapped in the rope. This revealed that the flesh had been stripped off his left little finger and ring finger.

Now that the deckhand was free of the winch, the skipper and the Latvian helped him to walk the short distance into the galley. They managed to get him to sit down, it being too painful for him to lie down on the bench seat.

1.3.3 Details of medical evacuation to hospital

Once the injured deckhand was settled in the galley, the Latvian remained with him while the skipper went to wake the rest of the crew. He then headed immediately to the wheelhouse and reported the accident to the MRCC at 0054. The skipper told the operator that one of his crew had been seriously injured. He advised that the casualty had several fingers missing, and a badly twisted arm, with his shoulder probably out of joint. He then reported that the vessel’s position was 16.2 nautical miles south-south-east of Falmouth at 49° 53.10 N 004° 53.45, as depicted at **Figure 13** (which confirms that it was actually about 17nm to Falmouth, and 16.2nm to St Anthony’s Head). He stated that although *Danielle* was steaming towards Falmouth, the crewman probably needed to be evacuated as soon as possible.

During the ensuing conversation, the MRCC operator contacted the Queen Alexandra Hospital in Portsmouth at 0055 to obtain medical advice under the Radio Medical Advice Service provided to the Coastguard by this hospital. Further details of this contract are included at 1.10.

The MRCC operator spoke to a registrar doctor, and it was agreed that a link call would be established between the doctor and *Danielle* to evaluate the most appropriate course of action. During his initial conversation with the MRCC, the doctor raised the possibility of a helicopter being used to evacuate the casualty. The MRCC however pointed out that SAR helicopters were on 45 minute standby in the hours of darkness. The MRCC provided brief details of the injuries, and the conversation concluded with the MRCC stating that the proposed link call would be “just like using the telephone”.

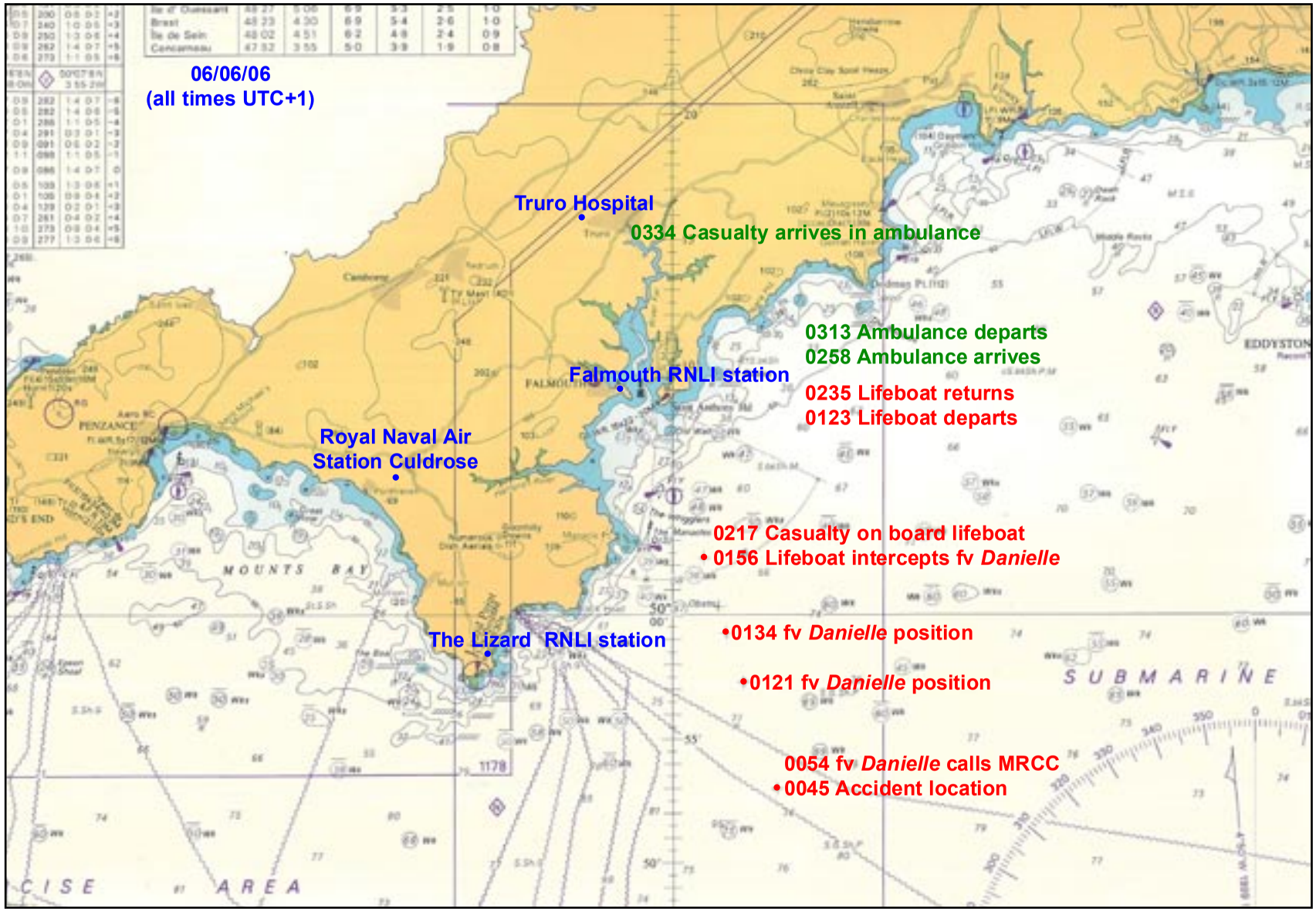


Figure 13

Chart showing accident timings and locations

The MRCC then requested *Danielle's* skipper to change to VHF channel 86, one of the channels used for duplex[3] link calls. The link call commenced at 0059, and the skipper described the injuries in detail to the doctor. He noted that several fingers had been shredded down to the bone, with what looked like nerve endings hanging off. He also reported that the deckhand's arm appeared totally misshapen and contorted, having been bent over, and that it had snapped. He added that the deckhand had suffered a possible shoulder dislocation. Confirmation was given that the crewman had gone over the top of a winch, and that there were large blood rashes under his arm and ribs.

The doctor queried the vessel's ETA, and nearest port, which the skipper confirmed was Falmouth, and that it would take about 1 hour 45 minutes to get tied up there. During the call, the doctor tried on several occasions to interrupt the skipper to obtain clarification, in particular while the skipper was describing the blood rashes. However, these interruptions were unsuccessful due to the semi-duplex[4] nature of the call, and the skipper continued to detail the injuries without being aware of the doctor's interruptions.

The conversation ended with the doctor seeking confirmation of the patient's pulse rate and state of consciousness. The skipper confirmed the crewman was still conscious, but that he had been drifting in and out of consciousness, and agreed to go to check his pulse rate. He then went off air. At this point the MRCC spoke directly to the doctor. The former immediately reiterated that it would probably be slightly quicker to get a lifeboat to the vessel than a helicopter, due to the 45 minutes required to become airborne, attributable to the alert time for the helicopter crew, and an estimated 15 minutes to arrive on scene. The MRCC suggested that, due to these timings, the lifeboat would get the casualty to hospital quicker, and that attempts were being made to get a doctor to deploy with the lifeboat.

The doctor agreed that the best course of action appeared to be to transport the injured crewman ashore in the lifeboat. After summarising his initial diagnosis, he discussed with the MRCC operator the possibility of someone attempting to manipulate the crewman's injured arm in order to reduce any further damage, and to make the crewman more comfortable. It was agreed that, based on the sound of the skipper's voice during the initial VHF conversation, the doctor and MRCC believed the skipper was probably too traumatised by the accident to do this.

While the above continued, the MRCC paged Falmouth RNLI at 0104, to request a launch. At 0106, the MRCC also called the RNLI to request a doctor to deploy on the lifeboat, stating that there had been a serious accident on board a fishing vessel involving a man's arm, with possible loss of fingers.

The conversation between the MRCC operator and the doctor concluded at 0107, at the same time as *Danielle*'s skipper came back on air, having gone below to check the casualty's condition. The MRCC tried to catch the doctor before he hung up, but this was a fraction too late, so the skipper instead provided the MRCC with the update. He

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[3] Radio frequencies can only accept one signal at a time, so that if one party is transmitting no one else can also transmit on the same frequency at the same time. This is referred to as simplex. Some VHF channels however allow duplex working, whereby two different frequencies are used simultaneously, one for reception, one for transmission, thus allowing two-way conversations similar to those using a land-based telephone.

[4] Semi-duplex involves one party working simplex (*Danielle*), the other duplex (QAH).

reported that the deckhand's upper arm was fractured, and partially severed, with the bone badly broken across the muscle. He also noted that the deckhand's t-shirt had been pushed into the arm wound, and that he didn't want to remove this as he believed it was preventing excessive bleeding. The casualty was also experiencing difficulty breathing, and the skipper felt that he had sustained a spinal or neck injury because his neck and back appeared to have been cut against the winch head and framework.

At 0108, the MRCC spoke to one of the lifeboat crew who had already mustered at the Lifeboat house, and stated that the accident involved a badly injured crewman with a "badly mangled arm".

Details of *Danielle'*s position as reported at 0058 were also provided, and the requirement to deploy a doctor with the lifeboat reiterated.

As they steamed towards Falmouth, *Danielle*'s skipper continued to provide morale support to the injured deckhand. He had fetched the vessel's Category C[5] medical kit, but did not administer any pain-relieving medication. He had not received any advice from the doctor regarding this, and felt that, given the limited nature of the medical supplies, there was no medication in the kit that would have alleviated the extreme pain and shock that the crewman was suffering.

The skipper did however make the deckhand a sling to support his arm and to try to conceal the full extent of his hand injuries from him. He also tried to keep the crewman's mouth open to reduce his breathing difficulties, and gave him occasional sips of water to prevent his tongue from swelling due to dryness. The deckhand was sweating profusely, and kept expressing he was in pain and enquiring how long it would be until assistance would arrive.

At 0112, the MRCC gave the doctor at Queen Alexandra Hospital an updated description of the crewman's injuries, which had been provided by the skipper of *Danielle* at 0107. The MRCC noted that the arm appeared to be fractured with an open wound, and that there had possibly been a spinal or neck injury. When clarifying the nature of the latter, the doctor queried whether the deckhand could move his arms and legs. The MRCC confirmed this was the case, even though the skipper had not mentioned that particular detail.

Given the serious nature of the reported injuries, the MRCC operator and the doctor agreed that it would be preferable for the lifeboat to delay its departure so that an RNLI medical advisor could be embarked. This was a local GP volunteer who was attached to the Falmouth Lifeboat organisation. The Queen Alexandra doctor noted that it sounded like the deckhand would require medical treatment during the lifeboat's return to port, and checked with the MRCC that the lifeboat doctor would be capable of dealing with the injuries. The MRCC confirmed that this was the case.

While this conversation was underway, another member of the MRCC duty staff called Falmouth Lifeboat station, and provided the RNLI with an update of the injuries. The casualty was described as being pretty badly injured, with possible lost fingers, a major shoulder and arm injury, with his shirt "in his arm", and had possibly sustained a spinal and neck injury.

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[5] The Merchant Shipping and Fishing Vessels (Medical Stores) Regulations 1995 defines three categories of medical supplies to be embarked on vessels. Category C is the lowest such category for "Harbour vessels, boats and craft staying very close to shore or with no cabin accommodation other than a wheelhouse." See section 1.15 of this report for further details.

Given this description, the RNLI questioned why a helicopter had not been deployed. The MRCC confirmed that the decision had been made purely due to time considerations, as the 45 minute helicopter response time meant that the lifeboat was considered a quicker option.

The lifeboat departed Falmouth at 0123, with the doctor embarked, and proceeded out to *Danielle* at 20.5 knots, rather than her top speed of 25 knots. This was in accordance with an RNLI fleet-wide memorandum regarding the use of reduced speeds for deployments, other than life-threatening incidents, as detailed at section 1.12. At the time of the accident, the MRCC duty staff were unaware of this RNLI requirement, and assumed the lifeboat would proceed at top speed.

At 0134, the MRCC contacted *Danielle* for a further update, and the skipper stated that the deckhand was complaining of breathing difficulties, was heavily perspiring, and that his condition had probably worsened. *Danielle*'s position at this time is shown at **Figure 13**.

The MRCC contacted the now en route lifeboat at 0138 and described to the embarked doctor the extent of the injuries. The deckhand was reported as having suffered severed fingers on his left hand, a probable fracture to his left arm, with an open wound to the upper section of this arm. The MRCC also stated that the casualty had possibly been caught around the neck by the rope, which had potentially caused a neck or back injury, and that he was conscious, but complaining of breathing difficulties.

At 0142 the MRCC contacted the Ambulance Control at the South Western Ambulance Service Trust to arrange for an ambulance to meet the lifeboat. The MRCC reported that Falmouth lifeboat had deployed with a doctor on board to rendezvous with a fishing vessel on which one of the crewmen had suffered "a nasty accident", having been round a winch. They also estimated that the casualty would be landed at Falmouth RNLI station in about 30 minutes, and requested an ambulance transfer to the Royal Cornwall Hospital, in Truro.

The ambulance controller took some of the deckhand's personal details, confirming whether a stretcher would be required, and that a doctor was in attendance. The MRCC noted that the casualty had suffered severe hand injuries, an open upper arm wound, and a possible neck and back injury.

The MRCC stated they would confirm once the casualty was embarked in the lifeboat, and that they would be able to provide a maximum of 15 to 20 minutes notice of its ETA. Ambulance Control acknowledged this, confirming that the accident had been prioritised as "Urgent", and they were therefore not yet allocating an ambulance response time.

As the lifeboat and *Danielle* closed, regular radio contact was maintained between the two vessels, and at 0150, *Danielle'*s mate reported to them that the casualty's pulse had risen from 76 to 87 over the previous 10 minutes.

At 0156, the doctor and one of the lifeboat crew were successfully transferred onto *Danielle*.

The deckhand's condition was far worse than the doctor was expecting. He requested the urgent transfer of a stretcher from the lifeboat, and intra-venously administered Pethidine, an opiate "class" analgesic, and Maxolone, to prevent vomiting. He had considered administering Diamorphine, which he carried with him, but decided against this as he had no equipment with him to intra-venously supply fluids, which he considered a necessary precaution when administering morphine due to the risk of a collapse of the casualty's circulation. He also tried to give the deckhand entonox, a mixture of oxygen and nitrogen (nitrous oxide), commonly known as laughing gas, to assist with his pain. The deckhand was however unable to receive any of this, as his breathing was already too weak and painful to allow him to activate the demand valve on the entonox regulator. After the fitting of a neck collar, and strapping into a scoop stretcher, the patient was taken out through the aft end of the galley, and transferred onto the lifeboat at 0217.

Once they were on board, the lifeboat coxswain confirmed to the MRCC that they were inbound for Falmouth. He also noted that the casualty was pretty poorly, and requested an ambulance meet them on their arrival. The lifeboat returned to Falmouth harbour at full speed.

Ambulance Control had, however, already called the MRCC at 0216 for an update, and the MRCC noted that the casualty was by now in quite a "bad way", and the lifeboat's ETA would be in about 15 to 20 minutes. Ambulance Control reported that the incident would be upgraded to an "Emergency", but asked no further questions regarding the deckhand's condition.

As the lifeboat headed into Falmouth, the doctor remained concerned about the deckhand's condition, and the coxswain again contacted the MRCC at 0223 to confirm that the ambulance had been tasked. The MRCC verified this, and then contacted Ambulance Control at 0224 for an update on the ETA, which was reported as 15 minutes.

At 0228, it was reported to the MRCC that the lifeboat had rounded the Eastern Breakwater of Falmouth Docks and there was no ambulance waiting for them. At 0232 the lifeboat coxswain also contacted the MRCC to inform them that they were now approaching their pontoon, and there was no ambulance on scene.

The MRCC contacted Ambulance Control at 0233 for an update, and were informed that the original ambulance had been diverted to a cardiac patient in Penryn, who had been allocated a higher priority than the injured deckhand. The next available units, which were automatically allocated at 0232, were a Rapid Response Vehicle (ambulance car) from Helston, and an ambulance from Newquay. At 0237, the latter was stood down as a nearer ambulance came off task, and was re-allocated to this accident.

Once alongside in Falmouth, the lifeboat coxswain again contacted the MRCC at 0235 for another update and was informed of the original ambulance diversion. The coxswain asked for the ambulance ETAs, and the MRCC stated that he did not have these.

Given the absence of an ambulance, the deckhand was taken into the RNLI Boathouse on the stretcher, where the doctor continued to attend to him and administer oxygen. The doctor was also now able to assess the severity of the chest injuries for the first time, as it had not been conducive to carry out this examination during the short transit in the lifeboat, partly due to poor light and engine noise.

At 0250, the ambulance car, driven by a lone ambulance technician, arrived at the Boathouse. Although first-aid trained, this technician was not trained to use all of the medical equipment in the car. The car did, however, include equipment for intra-venously supplying fluids, and the doctor was able to administer this to the deckhand, before injecting morphine to further alleviate the extreme pain.

At 0258, the ambulance arrived at the Boathouse, and the on board paramedic immediately began treating the deckhand and preparing him for transfer to hospital. The ambulance departed at 0313 with the by now unconscious deckhand embarked, and arrived at Truro hospital at 0334 **(see Figure 13)**.

1.3.4 Details of injuries

The deckhand spent most of the early hours of 6 June 2006 in theatre. His condition later that day was described by hospital staff as stable, but critical, with significant arm and chest injuries. He remained in Intensive Care for several days.

He had experienced a deep cut in the upper third of his left arm and extending into his armpit, and a degloving[6] injury to his left ring, middle and index fingers. He also had a fractured left shoulder blade, and a compound fracture of the left humerus bone was visible in the cut. There was also extensive arterial and nerve damage to the arm, and nine ribs were fractured on his left hand side, resulting in the life-threatening tension pneumothorax[7], and the requirement for a temporary tracheotomy[8] to be performed.

Subsequent assessment of the injuries determined that primary amputation of the arm beneath the shoulder joint offered the deckhand the best outcome in the circumstances. Attempts to save the arm would have required prolonged surgical procedures that would not only have further compromised and delayed his recovery from the chest injury, but were also considered to offer little chance of resulting in a properly functioning limb.

His arm was therefore amputated, and the deckhand was fortunately able to pull through from the injuries He was released from hospital on 28 June 2006.

1.4 CREW DETAILS

1.4.1 Skipper

The skipper of *Danielle* had fulfilled this role since the vessel was purchased by the current owner, his brother, in 2002, and was the first vessel he had skippered. An experienced fisherman, with 16 years spent mostly on scallop dredgers, he obtained both his Class 2 Deck Officer Certificate of Competency (Fishing Vessel) and 2 Engineer Officer Certificate of Competency certificates in 2000. He had also completed the mandatory Seafish training courses, including the Safety Awareness course in 2003.

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[6] Involving the loss of skin and underlying tissue to reveal the bone and joint tissue underneath

[7] The condition in which air collects in the chest cavity around the lining of the lung, compressing the lung and preventing its re-expansion, thus impairing breathing until relieved by the insertion of a drain through the chest wall.

[8] A surgical procedure performed on the neck to open a direct airway through an incision in the trachea or windpipe.

1.4.2 Injured deckhand

The injured deckhand was aged 42 at the time of the accident. He was an experienced scalloper, with around 15 years working on similar vessels in the south west of England.

It was his second trip on board *Danielle*, while his regular vessel, which he had planned to rejoin a few weeks later, was laid up. It is understood that on this vessel, the deckhands would normally work in pairs to "tip" the scallop dredges on each side in turn.

He had completed all of his mandatory training courses, including Safety Awareness in 2003, and had hoped in the future to obtain his Class 2 Deck Officer Certificate of Competency and progress to mate.

At the time of the accident, he had been wearing a t-shirt, tracksuit bottoms, Wellington boots, and Size 9 blue Comasec gloves. The soles of the boots were in good condition, and the gloves were a good fit and reasonably new, with no holes or tears. He was of slight build and was approximately 5' 9" (1.75m) tall.

Earlier in the trip, a rope had come undone at No.1 dredge while the deckhand was in the process of "tipping". The dredge fell and temporarily trapped him, injuring and cutting into his hip. Following this incident, the deckhand raised his concerns over the safety of the "tipping" arrangement with the skipper, but the skipper could not recall this conversation.

During the remainder of the trip, the deckhand had been taking standard doses of both Ibuprofen and Paramol to relieve the pain of this injury. The latter contains Paracetamol and dihydrocodeine, and although available over the counter, generally comes with a warning that it can cause dizziness, and that affected individuals are recommended not to drive or operate machinery. However, at the time of the accident, the deckhand felt alert and had been sleeping well for about half of each of his six hour off-duty periods, as normal.

1.4.3 Crew members

The five other crewmen all had varying levels of experience. *Danielle'*s mate had been fishing for 24 years, mostly on beam trawlers, and had been scalloping on *Danielle* for about a year prior to the accident. The deckhand/cook had worked on *Danielle* for 10 years, while the trainee deckhand had been on board only since May 2006. The two Latvian deckhands had recently joined the vessel. They had not yet completed the mandatory Seafish training courses, and had a reasonable grasp of English, albeit with occasional communication difficulties.

1.5 GENERAL DESCRIPTION OF VESSEL

1.5.1 Vessel history

The vessel was built as a steel beam trawler in 1973 in the Netherlands, where she operated before joining the UK registry in 1995.

The as-built general arrangement drawing for the vessel is included at **Figure 2**. This depicts a typical beam trawler design, with an aft deckhouse/superstructure incorporating an enclosed winch house at main deck level, and a forward working deck, with covered whaleback. The winch house was extended a further 0.7m forward than shown in the original drawings, at an unknown date.

In 1997, the vessel's ownership transferred from Grimsby to Brixham, with **Figure 14** depicting the vessel during her delivery voyage. Her new owners renamed her *Danielle* from *Nellie* and made a number of deck layout alterations to adapt her for her new role as a scallop dredger. These included:

- halving the depth of the whipping drums on the winch house sides to provide more space for recovering the gear;
- fitting a guard framework, above and below each whipping drum;
- fitting protective bars on the wheelhouse sides.

The framework was intended to protect the whipping drums from the dredging poles swinging inboard during gear recovery; the lower framework sloped upwards to reduce the likelihood of the gear becoming snagged. A vertical gap of approximately 2" (50mm) existed between the framework and the drum.

Courtesy of www.westcoasting.com

Figure 14

Delivery voyage of *Nellie* in July 1997 to Brixham

1.5.2 Current owners

Ownership again changed in 2002, albeit with the vessel continuing to operate solely as a scallop dredger, still based in Brixham. No further alterations were made by the current owners, other than the fitting of protective rubber strips on the winch house sides, as depicted in **Figure 10**.

The current owner also acts as the vessel's relief skipper or mate when required. He is, himself, an experienced fisherman, having skippered the *Geeske*, another Brixham scallop dredger, for seven years prior to owning *Danielle*.

1.5.3 Winch design and controls

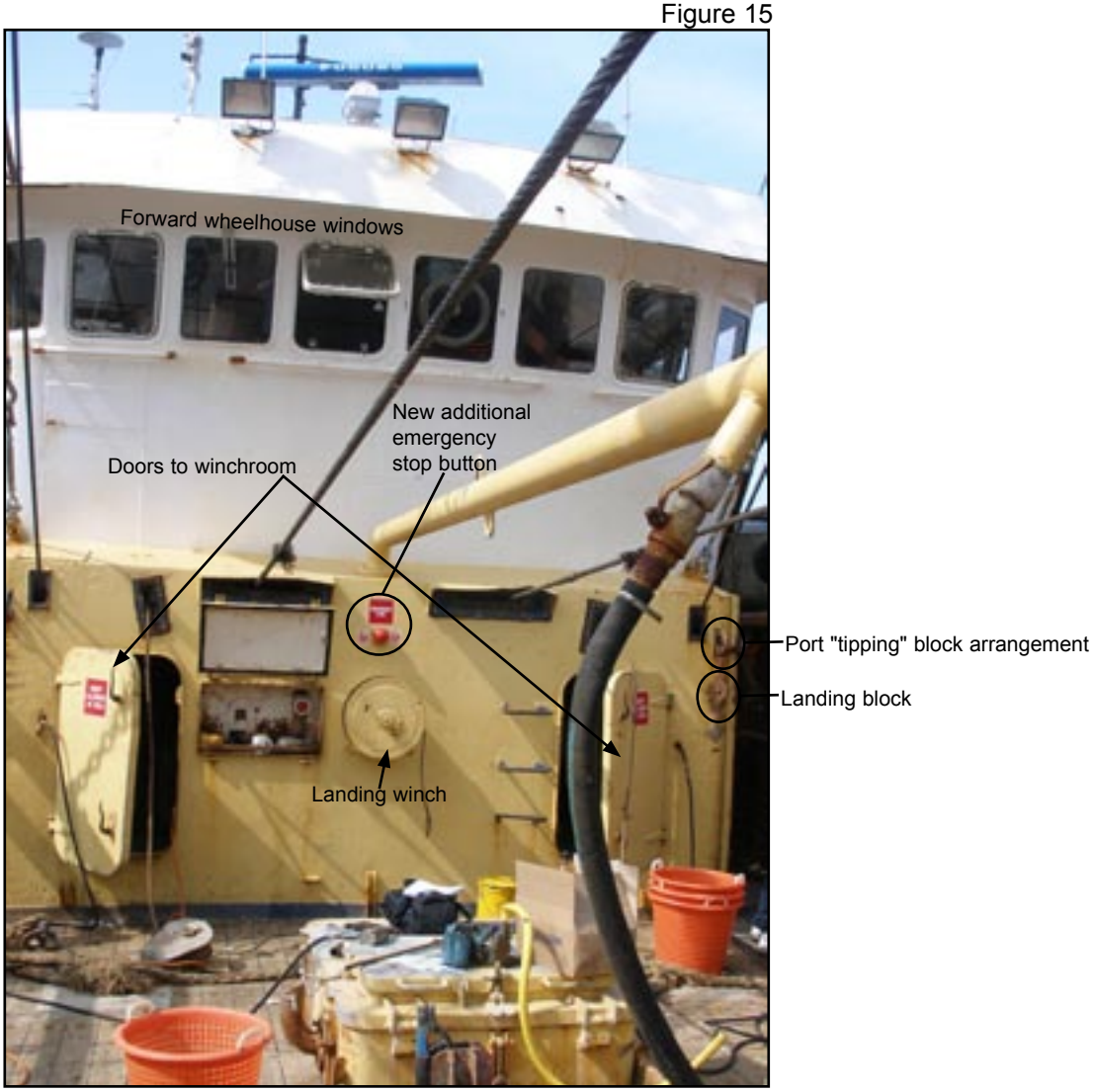
The vessel has a J. Luyt B.V. 20 tonne main electric winch, with six drums on a common shaft, located in the enclosed winch house. The whipping drums are on a separate shaft, offset to aft and geared to the main shaft, and thus operate simultaneously with the main winch.

The controls for the winch are located in the wheelhouse, as depicted in **Figures 4 and 5**. These incorporate a dial, for altering the speed of the winch, and an emergency stop and reset button. The normal setting for "tipping" resulted in the whipping drums rotating at around 27 rpm, with the port drum rotating anti-clockwise, the starboard drum clockwise.

At the time of the accident, the only external emergency stop buttons were fitted above the whipping drums, recessed as shown in **Figure 10**. The button was 2.0m above deck level, with the centre of the whipping drum, 1.0m off the deck. Following the accident, the owners fitted an additional emergency stop button on the foreside of the winch house **(Figure 15)**.

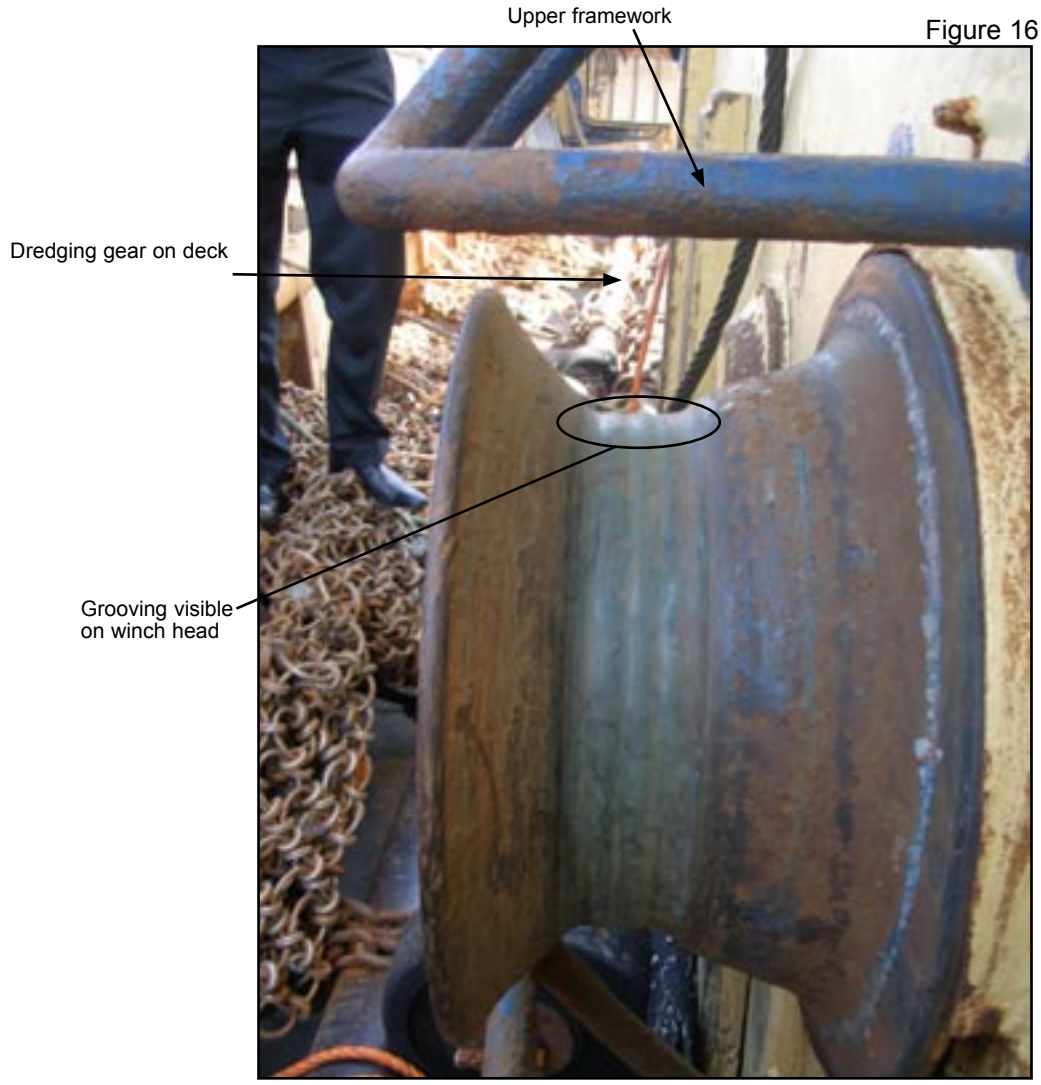
The owner reported that the whipping drums eventually become worn with use, and are then removed and machined smooth. **Figure 16**, taken two days after the accident, illustrates some grooving of the winch head, which the owner did not consider to be excessive.

Figure 15



Forward end of wheelhouse showing new emergency stop button

Figure 16



Close-up view of grooving on port whipping drum

A single separate electric landing winch is also fitted on the foreside of the winch house, as depicted in **Figure 15**. This winch is used solely to land the bagged scallops while alongside, and is operated using a wired “remote” control, similar to those used on land-based hoists or cranes.

1.6 THE FISHING GEAR AND HAULING OPERATION

1.6.1 Description of fishing method

As the name of this type of fishing suggests, the gear is dragged along the seabed to dredge up scallops, a variety of shellfish. A sketch of a typical arrangement of dredging gear is shown at **Figure 17**, while **Figure 18** describes the design and operation of a standard scallop dredge. **Figure 19** shows the scallop dredge bags used on *Danielle*.

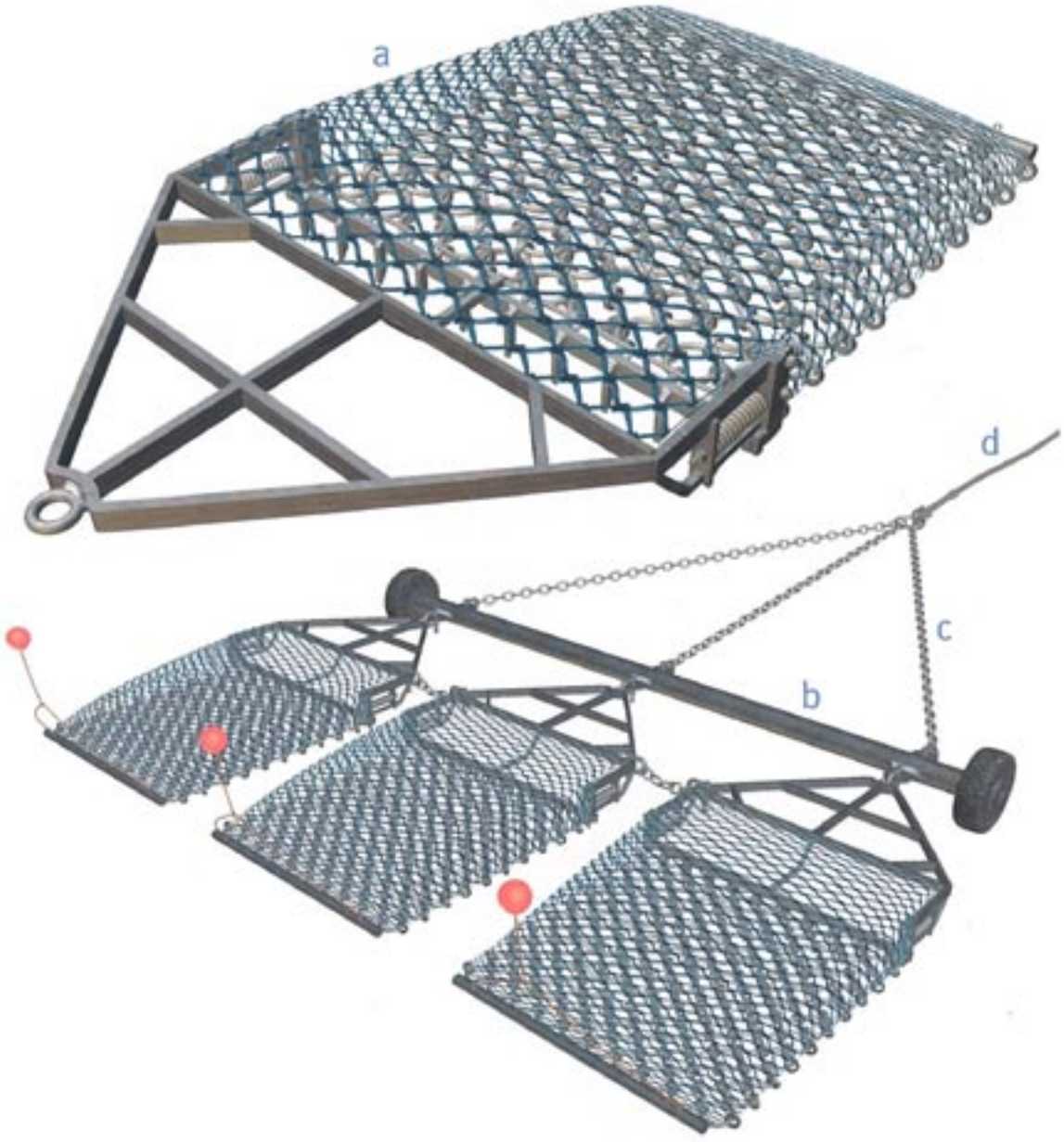
The configuration of dredges used by *Danielle* is similar to that shown in **Figure 18**, except that seven dredges were suspended beneath each of the two bottom poles. The fourteen dredges, combined with the three poles and ancillary bridles, weighed around 5 tonnes.

Source: An Introduction to Commercial Fishing Gear and Methods Used in Scotland, Scottish Fisheries Information Pamphlet No 25 2004, Fisheries Resarch Services, Scottish Executive

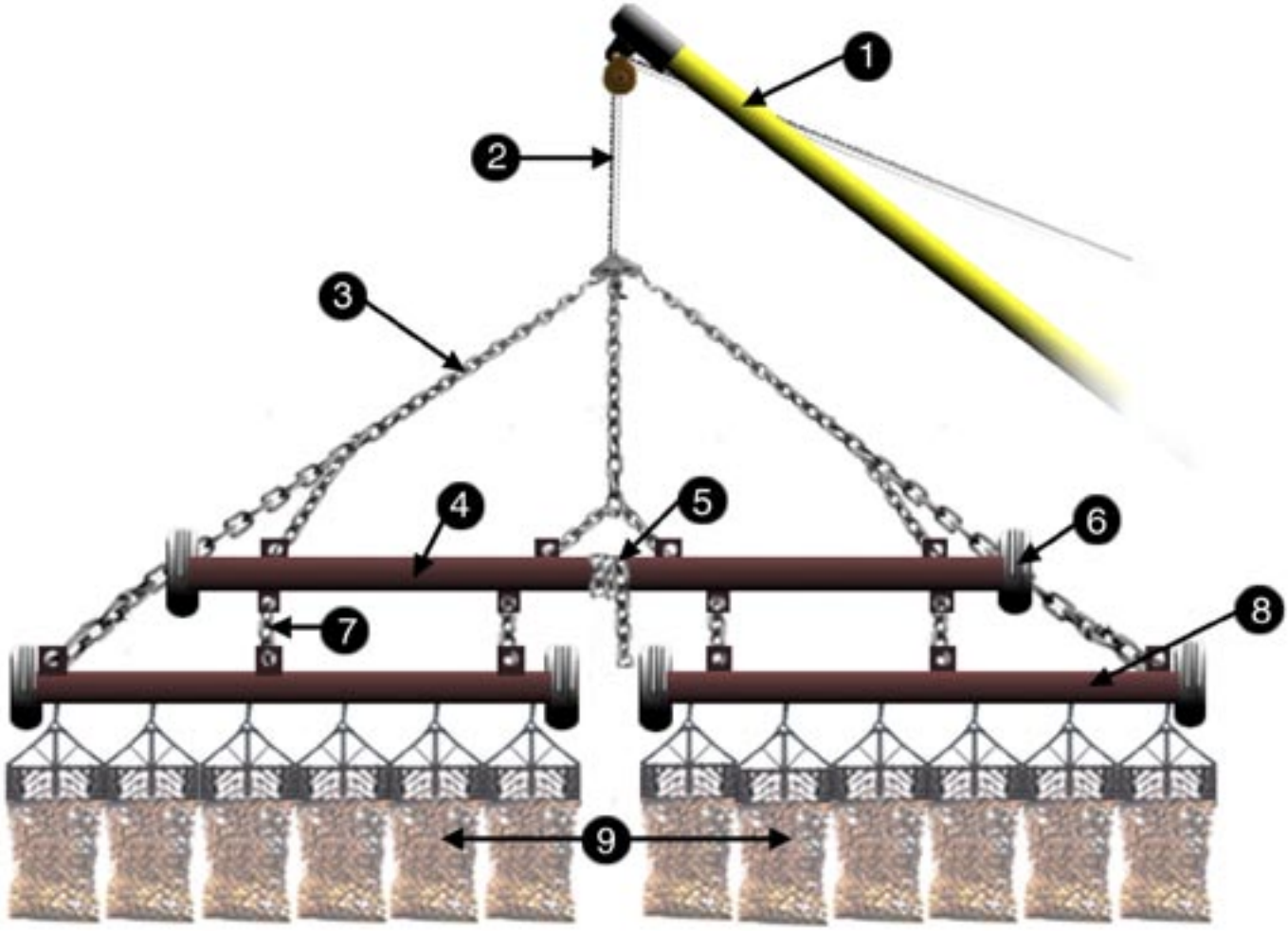
Figure 17

Scallop Dredging

Each dredge consists of a ruggedly constructed triangular steel frame and tooth bearing bar or sword, behind which a mat of linked steel rings is secured. A heavy netting cover or back (a) is laced to frame, sides and after end of this mat to form a bag in which the catch is retained. Scallops, which usually lie recessed in sand and fine gravel, are raked out by the teeth and swept into the bag. Several dredges are shackled to a hollow steel tow bar (b) fitted with chain bridles (c), one for each dredge. The entire assembly is towed on a single wire warp (d) and larger vessels generally tow two bars, one on each quarter. Ships rigged for beam trawling deploy dredge arrays from outrigger booms in the manner of beam trawls. The number of dredges used varies with towing power, handling capabilities and area, with fourteen (i.e. seven on each side) a fairly typical number, although the largest vessels may deploy more.



Overview of scallop dredging, extracted from Scottish Fisheries Pamphlet

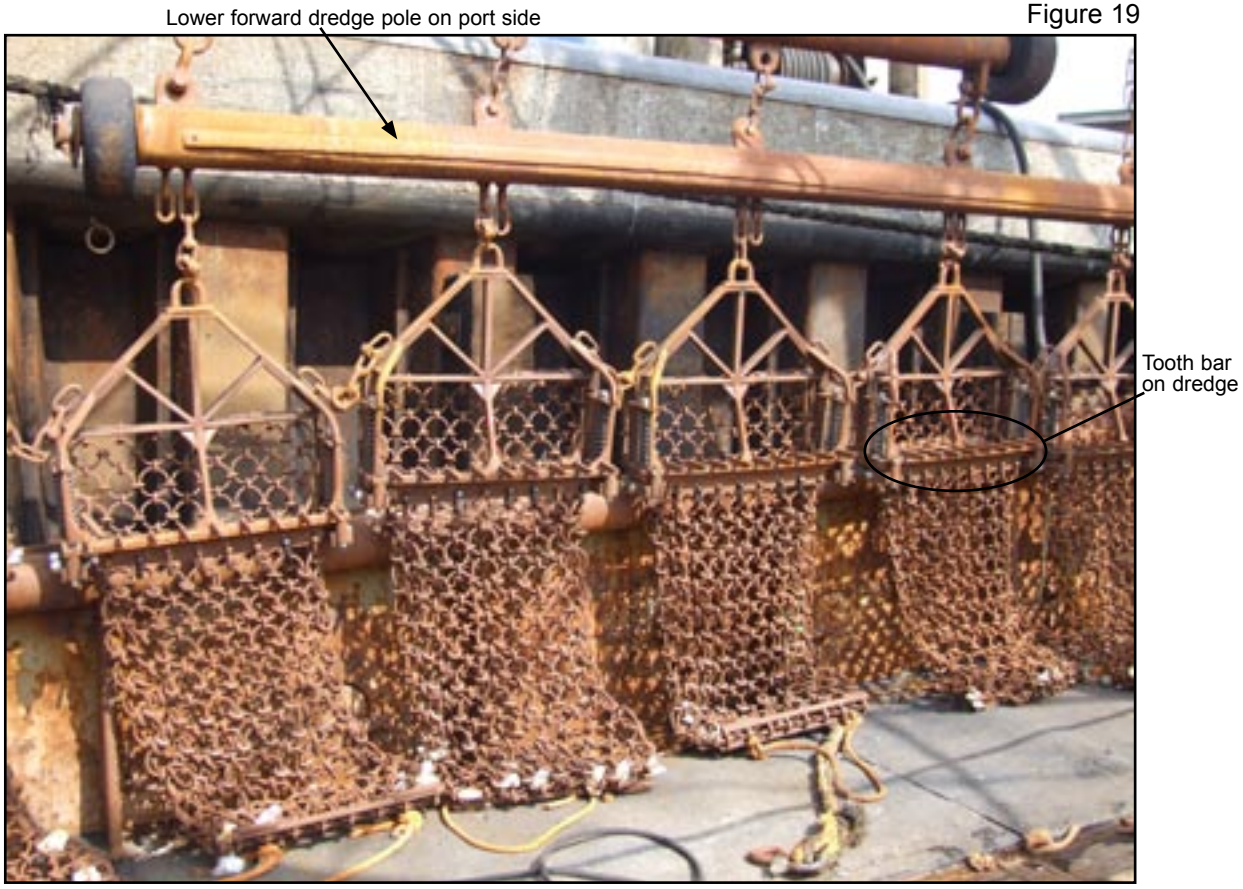


Typical Scallop Dredge Arrangement

Key
1 Derrick
2 Warp
3 Bridles
4 Top pole
5 Pulling-in chain
6 Rubber wheels
7 Chain hook goes in here
8 Bottom poles
9 Dredges

Copied from MAIB Report of death of one person on fv *Geeske* (BM140) on 09/12/98

Figure 19



Port side scallop dredges on *Danielle*

1.6.2 Hauling procedure

A set of working instructions describing the vessel's fishing operations was posted in *Danielle*'s galley, for reference by the crew. These detailed the hauling and shooting procedure, and they are reproduced at **Annex A**. A further set of instructions prepared by the owners for the vessel's skipper and mate was also displayed in the wheelhouse, and is included at **Annex B**.

New crew members were provided with a safety induction by the skipper or senior member of the crew. This covered the location of safety equipment and general instructions to stand under the whaleback during gear recovery and to avoid getting their fingers topped during "tipping" operations. It was also the skipper's policy that only experienced crewmen were permitted to "tip" a side of dredges on their own.

A series of photographs taken during a demonstration of the hauling and tipping process, when *Danielle* was alongside in Brixham on 26 July 2006 is at **Annex C**.

1.6.3 Arrangement for "tipping" on *Danielle*

The procedure for "tipping" the dredges on *Danielle* had previously required "reverse turns"[9] to be used on the whipping drum. However, in January 2006, the mate had hit the back of his hand on the framework around the whipping drum, while using this method, resulting in bad bruising.

[9] "Reverse turns" describes the method of leading the "tipping" rope straight from the derrick end to the whipping drum, without passing through any lead block.

"Reverse turns" are generally regarded as harder to use, and more likely to result in riding turns (see 1.6.4 below). Therefore, following the incident in January, a "tipping" block was fitted to each forward corner of the winch house to lead the "tipping" rope aft to the whipping drum. The arrangement is shown in **Figure 8**, and incorporates a shackle, three links of chain, and a shackle and end block, with the latter fixed. At the time of the accident, this end block was free to move.

The 18mm nylon "tipping" rope being used during the accident was inspected by MAIB inspectors and found to be in good condition.

Figure 20 shows a view of the "tipping" demonstration provided by the crew on 26 July 2006 on the vessel's starboard side.

Figure 20

"Tipping" demonstration on board *Danielle* on 26 July 2006

1.6.4 Riding turns

A riding turn develops when a second layer of turns of rope rides over the first layer. On a whipping drum, this will prevent the rope surging on the drum, and could result in both ends of the rope being pulled under tension into the winch, and if the "hook end" is attached to a dredge, the rope will almost certainly part.

If it does part, it can take about 15 minutes to retrieve the “hook end” of the rope from the derrick end. One of the crew will need to don a lifejacket and crawl out to the derrick end to retrieve the hook.

Danielle’s crew reported that riding turns had been occurring on the whipping drums about once a week on average.

1.6.5 Current guidance for scallop dredging

MGN 265 (F) entitled *Fishing Vessels: The Hazards Associated with trawling, Including Beam Trawling and Scallop Dredging* provides guidance on the safe operation of fishing vessels engaged in these types of fishing. Despite describing many of the hazards of scallop dredging, this document does not refer to the dangers involved in either “tipping” or using whipping drums.

In 1994, the MCA, then known as the Marine Safety Agency, issued MSN No. M.1561, *Dangers From Winches, Machinery And Fishing Gear*. Noting that 40% of all recent accidents to fishermen involved winches, machinery or fishing gear, this notice describes a number of such incidents and provides a list of recommended design considerations for winches and a checklist of safe operational procedures. A copy this notice is at **Annex D**.

The MCA also produces a leaflet, *Fishermen and Safety*, available from the MCA’s Fishing Safety Branch. This contains practical advice on the operational aspects of fishing, and a copy of the section covering the use of whipping drums is at **Annex E**.

1.7 RISK ASSESSMENT

1.7.1 Regulatory requirements

The European Directive EEC 89/391 introduced various measures to encourage improvements in the safety and health of workers. In the UK, these were enacted in *The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997*. These impose various health and safety duties on employers, so far as is reasonably practicable, by the application of certain principles, including:

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

The 1997 Regulations also require that a written statement should be prepared of the employer’s general health and safety policy, and that:

A suitable and sufficient assessment shall be made of the risks of the health and safety of workers arising in the normal course of their activities or duties...

Further advice on the practical implementation of these regulations is contained in MGN 20 (M+F). This notes that the basis of all safety measures should be an assessment by the employer of any risks to workers’ health and safety from their work activities, and the annex to this note contains useful guidance for the conduct of such an assessment.

1.7.2 MCA Guidance to Surveyors

Guidance to Surveyors - Survey and Inspection of Fishing Vessels, MSIS 27, currently available on the MCA website (www.mcga.gov.uk) states that:

1.11 Risk assessments

All fishing vessels are required to have undertaken risk assessments. For vessels over 15m this must be in a written format. Seafish produce a free "Fishing Vessel Safety Folder" which can be utilised by fishing owners, skippers and crew to prepare a risk assessment for their particular boat. Further details are contained in MGN 20.

1.7.3 Templates for written risk assessments

In September 1999, Seafish introduced Issue 1 of the Fishing Vessel Safety Folder to help fishermen comply with the 1997 Regulations. Developed with the help of the Fishing Federations and endorsed by the MCA, the folder included a series of forms that could be used as a template for completing a written risk assessment for various types of fishing and vessel operations. Each form was also accompanied by notes detailing possible hazards.

Various concerns were raised that the size of the original document was too lengthy. In April 2004, Issue 2 of the folder was therefore introduced, in a simplified and reduced format, including the removal of the notes sections.

1.7.4 *Danielle's* risk assessment

During a visit by MAIB inspectors to the vessel the day after the accident, the owner noted that the vessel's written risk assessment was in the process of being completed, and that difficulties were being experienced in completing the Seafish Fishing Vessel Safety Folder. When asked to view the risk assessment, it could not be located on board and was subsequently reported as having been lost a week before the accident.

Nearly 7 weeks after the accident, the skipper was in the process of preparing a risk assessment for the vessel, using Issue 2 of the Seafish Fishing Vessel Safety Folder. The skipper again noted to MAIB inspectors that he was experiencing difficulties in completing the Safety Folder. Many of the hazards in the scallop dredging section in this risk assessment were not considered at this stage to be applicable to the vessel.

A later, more complete version of the risk assessment was subsequently provided to the MAIB several months later. This noted that an additional control measure had been introduced in that the forward seven dredges were only to be "tipped" single-handedly by an experienced deckhand, and that he should then wait for a second deckhand to assist with the aft seven dredges.

1.7.5 Risk assessment training and assistance

Basic training is provided to fishermen on conducting risk assessments during the 1-day mandatory Seafish Safety Awareness course. The syllabus of the Class 2 Deck Officer Certificate of Competency (Fishing Vessel) course completed by *Danielle's* skipper also covers risk assessments.

In one of the MCA's marine offices in the north east of Scotland, a fishing vessel surveyor has been appointed as a Fisheries Liaison Inspector, providing practical assistance in improving on board safety. Part of this role has also involved helping

to facilitate risk assessments with the crew. The Mallaig and North West Fishing Association has been utilising the local Seafish Training Officer to also provide practical on board guidance with various safety matters, including the completion of risk assessments.

1.8 ANNUAL INSPECTIONS/SURVEYS OF VESSEL

1.8.1 Background

Fishing vessels of registered length greater than 24m are surveyed by the MCA every 48 months for the issue and renewal of International Fishing Vessel Certificates (FVCs). Periodic intermediate inspections are also conducted every 2 years, plus or minus 3 months.

1.8.2 *Danielle*'s surveys and certification

The current International FVC for *Danielle* was issued by the MCA in November 2003. Neither the International FVC or the corresponding Declaration of Survey for *Danielle* contain a dedicated location to record the status of the vessel's risk assessment.

The MCA's Fishing Safety Branch maintains a computer database, Ship Inspection And Survey (SIAS), containing a record of all surveys and inspections conducted on a vessel. The SIAS entries for the vessel's final full survey visit in 2003 and the intermediate survey in October 2005 contain no reference to any identified deficiencies regarding the risk assessment.

1.8.3 Format of Record of Particulars

The Fishing Vessels (Safety Provisions) Rules 1975 require that, following a fishing vessel survey, a record of particulars should be completed and the current template for this for vessels over 24m in length is MSF1301. Despite including a section to record the status of the stability booklet, MSF1301 contains no such section for recording the status of risk assessments.

1.8.4 MCA inspection of risk assessments

During MCA fishing vessel surveys, MCA surveyors are required to confirm that a risk assessment has been conducted. They do not, however, check the adequacy of the assessments, nor are they currently trained to do so.

1.9 COASTGUARD INCIDENT CO-ORDINATION

1.9.1 Responsibility for national SAR

SAR response and co-ordination is undertaken by Her Majesty's Coastguard (HMCG), which is responsible for the initiation and co-ordination of civil maritime SAR, and for requesting and tasking HMCG and other emergency service organisations SAR assets.

1.9.2 MRCC details

In accordance with Operational Procedures, the watch manager acted as the SAR Mission Co-ordinator, in charge of the SAR operation and responsible for the decisions made. The majority of external communications were conducted by other members of the watch, under his direction.

1.9.3 Liaison with emergency service providers

The Coastguard undertakes extensive liaison with other SAR providers, both nationally and locally at various regular meetings and forums. These include annual local SAR committee meetings, annual district maritime safety committee meetings and quarterly RNLI liaison meetings.

Various multi-agency exercises are also regularly conducted, as well as familiarisation visits for watch staff to Air Stations and Ambulance Control. Currently, no regular meetings take place at management level between the MRCC and the Ambulance Control.

1.9.4 Recording of SAR information

Although all verbal communications between the Coastguard and other organisations are recorded, the duty watch also maintains a computerised Incident Log, with summaries of key conversations or events entered.

Following the link call between *Danielle*'s skipper and the hospital at 0055, and the later update provided by the skipper at 0107 to the MRCC, entries were made in the log at 0102 and 0118 respectively. Although these entries described the deckhand's hand, arm and possible neck and back injuries, as well as his breathing difficulties, no reference was made to his chest injury.

1.10 RADIO MEDICAL ADVICE SERVICE

1.10.1 Background

The European Directive EEC 92/29 concerning medical treatment on board vessels requires that each Member State designates one or more medical centres to provide radio medical advice to ships.

1.10.2 Service provided

The MCA currently has a contract in place with Queen Alexandra Hospital, Portsmouth, and Aberdeen Royal Infirmary to act as the officially designated centres providing the UK Radio Medical Advice Service, 24 hours a day. Around 300 calls are made each year to the centres.

MGN 225 (M+F) *Radio Medical Advice For Ships At Sea* provides information on how to obtain advice during a medical incident or emergency at sea, using this service. The advice is free of charge.

Contact should firstly be made with the MRCC, who will obtain basic details of the accident. The caller will then be connected using a radio/telephone link call to a doctor at one of the advice centres.

1.10.3 Responsibility for decision-making

The MRCC will act on medical advice, to arrange the evacuation of the casualty ashore, or for a doctor to be taken to the vessel.

Coastguard Operational Procedures state that:

> *It should be noted that the doctor will not necessarily choose helicopter evacuation quite so readily as we might, but it is the medical team who will be responsible for any decision taken regarding the choice of rescue unit.*

1.10.4 Arrangements at Queen Alexandra Hospital

Calls to this hospital are taken by the most senior doctor available at the time, who, during this accident, was a registrar doctor specialising in Emergency Medicine and Intensive Care Medicine. Unusually, this registrar had also undertaken a BASICs[10] training course, and was experienced in the use of VHF radio.

All new doctors in the Emergency Department receive a short training presentation on the radio advice service. This outlines the service provided and highlights the available treatment options, including evacuation, and states that the Coastguard will advise how best that can be carried out. The training currently contains no practical exercises in link calls, but notes that only one person can talk at a time although the calls will be on a duplex system.

1.11 SAR HELICOPTER RESOURCES

1.11.1 Helicopter resources

The nearest SAR helicopter resource to the accident was based at Culdrose, in Cornwall **(see Figure 13)**, which operates a fleet of Sea King Mk 5 SAR helicopters, capable of 120 knots normal maximum airspeed.

Each helicopter has four crew: a pilot; co-pilot; and two “rear seat” crew, a navigator/ winch operator and a winchman. Stretcher-bound casualties can be winched, and a comprehensive first-aid kit is also carried, including entenox and oxygen units.

All Culdrose “rear seat” crew are either trained or are being trained to BIEC (Basic Immediate Emergency Care) or EIEC (Extended Immediate Emergency Care) standards of medical care. The former is equivalent to ambulance technician level, the latter to a state-registered paramedic (see 1.14.3).

If a doctor is required to deploy with a helicopter, a landing is typically made either at Truro Hospital or in Falmouth to embark the doctor en route to an incident. If an EIEC qualified crewman is not available, and a paramedic is required, a request can be made to the local cottage hospital at Helston for an available paramedic to deploy.

1.11.2 SAR response times

SAR helicopters at Culdrose are organised so that two serviceable aircraft are available whenever possible. The first of these, the duty aircraft, is on 15 minutes notice from 0800 until 2200, and 45 minutes notice outwith these times. Both these notice periods are target times, and the actual airborne response times may differ due to actual operational considerations. Factors such as the distance to the incident scene, whether the airfield is or has recently been open, or whether the duty crew are still awake, can all affect the actual airborne response times at night.

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[10] BASIC is The British Association for Immediate Care, a registered charity which acts as the national co-ordinating body for individuals providing immediate medical care. BASIC Immediate Care Practitioners are drawn from professions such as doctors and registered nurses, and provide assistance to the ambulance service, particularly with administering more advanced analgesia (pain relief) and surgical procedures. BASIC also provides various training courses in immediate and emergency care.

On the evening of 5 June 2006, two helicopters had been airborne. The duty aircraft had been undertaking Search & Rescue Training until 2310, while the standby aircraft was undertaking a general training flight until midnight. Although the airfield was therefore closed by the time of the *Danielle* accident at 0100, both crews would either have been still up or not long gone to bed.

There is no historical statistical data on helicopter response times at Culdrose. However, a review of recent night time SAR deployments has shown response times of 20-26 minutes.

1.12 RNLI RESOURCES

1.12.1 RNLI cruising speed system

Since the earliest introduction of 25-knot lifeboats (early 1990s), the RNLI has operated a policy of operating at cruising speed for exercises and passages, rather than flat-out running. More recently, it has been suggested that cruising speed could be used in all but life-threatening situations. This was originally promulgated to all lifeboat stations in June 1992, and a further update was issued in April 2006.

1.13 RNLI MEDICAL PROVISION

1.13.1 Role of lifeboat medical advisers

The RNLI has a network of volunteer Lifeboat Medical Advisers, who are typically locally-based medical practitioners, attached to lifeboat stations.

These doctors provide medical advice to the station, including supporting first-aid training for lifeboat crew and conducting medical examinations of serving or potential crew members. Although not required to do so, the doctor may also deploy with a lifeboat if his services are required during an incident.

Although the RNLI currently has 304 such medical advisers, in 2005, they deployed to sea on service on only 12 occasions out of 8273 lifeboat launches around the UK and Republic of Ireland.

The only specialist “training” currently offered to these doctors is attendance at a bi-annual conference, inaugurated in 2004. At the 2006 conference, the topic of BASICs training was raised and is being considered.

1.13.2 Falmouth Medical Adviser

The Falmouth medical adviser was an experienced local General Practitioner, who had worked with the RNLI since 1990. Although in the past he had undertaken a large amount of surgical trauma work, over the past 20 years he had completed little training in emergency medicine, and had not undertaken any BASICs training. He had deployed with the lifeboat a limited number of times over the past few years.

1.13.3 Medical provision on board lifeboats

RNLI lifeboat crew are all trained to an elementary level of first-aid, with approximately 10 crew per station trained to a higher level. All weather lifeboats carry a standard RNLI first-aid kit, including oxygen and entenox supplies, but not strong analgesics such as morphine, or equipment for supplying intravenous fluids. Although only RNLI-approved first-aid equipment is to be used by RNLI crew members, an RNLI circular, last updated in January 2002, confirmed that doctors could carry medical equipment on board lifeboats for their own use.

1.14 AMBULANCE PROVISION

1.14.1 Ambulance Service Trust

The South Western Ambulance Service NHS Trust provides ambulance services for Dorset, Somerset, Devon, Cornwall and the Isles of Scilly.

1.14.2 Ambulance Prioritisation System

Rather than allocating ambulances on a "first come, first served" basis, each request for an ambulance is triaged[11] by Ambulance Control, based on the patient's clinical needs. The system used to prioritise emergency calls, the Advanced Medical Priority Dispatch System (AMPDS), is being adopted by all UK Ambulance Service NHS Trusts.

A sophisticated computer system is used to facilitate AMPDS, which dynamically tracks and manages the availability and location of all emergency resources. This system records details of each request for an ambulance, and automatically prompts the controller to ask a series of structured questions regarding the circumstances and condition of the patient. The condition severity can therefore be ascertained and calls prioritised.

There are three principal categories of deploying an ambulance:

AS1 – corresponding to **999 "Emergency" calls**;

AS2 – **Urgent** calls from a health professional to transfer a patient to hospital;

AS3 – **Patient Transfer Service (PTS)**, used for the routine carriage of patients to and from hospital.

Within category AS1, the "Emergency" calls are triaged based on the answers received to the AMPDS questions. Each call is allocated an AMPDS code and then assigned as **Red**, **Amber** or **Green**, as detailed below at **Table 1**, with ambulance resources automatically designated as appropriate.

Table 1

Category Code	Colour Code	Description
A	**Red**	Immediately life-threatening;
B	**Amber**	Serious but not immediately life-threatening;
C	**Green**	Less serious and not thought to become life-threatening.

This three tier prioritisation process occasionally results in ambulances being diverted from a lower to higher priority call, with the next closest available resource then re-allocated to the original lower call. Calls with the same priority are, however, processed in order.

[11] Triage is the system of medical prioritisation of patients' condition severity, used to effectively allocate medical resources in multiple patient scenarios.

1.14.3 Ambulance resources

The South West Ambulance Service has a variety of resources and trained personnel that can be deployed, depending on availability and the nature of the incident, to the many calls it receives. The resources available include ambulances (with two personnel), ambulance cars (with one crew member), paramedic motorcycles and air ambulances.

Various levels of personnel crew these resources, including ambulance technicians and paramedics. The former have completed a one year period of in-service training and work-based assessment, while paramedics have progressed from technicians and have received additional training in patient assessment and specific clinical skills. They can perform a number of additional medical procedures, including intravenous fluid therapy, and the use of certain medications, such as morphine.

1.14.4 Ambulance prioritisation for *Danielle* accident

When the MRCC made the initial call to Ambulance Control at 0142, the accident was classified as Urgent, as the MRCC were unable at that stage to provide an exact ETA for the lifeboat's return to Falmouth. As an Urgent call, an AMPDS code or resource could not be allocated.

When Ambulance Control called the MRCC at 0216 for an update on the accident, the call was upgraded to an Emergency (AS1) priority, and allocated an AMPDS code corresponding to Category B, **Amber**. This was based only on the information collected during the initial call, which had recorded a serious hand injury, lower arm laceration, and possible back and neck injury, and led to the original ambulance allocated to the injured deckhand being diverted at 0231 to a patient correctly prioritised as Category A, **Red**.

1.15 MEDICAL SUPPLIES ON BOARD FISHING VESSELS

1.15.1 Regulatory background

The requirements for the carriage of medical equipment on board ships are defined by EEC 92/29, which identifies three categories of vessel and their respective levels of required supplies as follows:

A – Sea-going or sea-fishing vessels, with no limitation on length of trips;

B – Sea-going or sea-fishing vessels making trips of less than 150 nautical miles from the nearest port with adequate medical equipment;

C – Harbour vessels, boats and craft staying very close to shore or with no cabin accommodation other than a wheelhouse.

This 1992 directive was legislated in the UK by *The Merchant Shipping and Fishing Vessels (Medical Stores) Regulations 1995*, which reworded the first half of the Category C description with "*A ship staying no more than 30 nautical miles from shore...*"

A 1996 amendment to these regulations, however, further replaced *"no more than 30 nautical miles from*" with "*very close to shore*". MSN 1768 (M+F) in 2003 partially reinstated the original EEC definition of Category C as:

C – Harbour vessels, boats and craft staying very close to shore or with no cabin accommodation other than a wheelhouse. *Lifeboats and life-rafts are also required to carry Category C stores.*

MSN 1768 (M+F) however also notes that:

*The UK interprets the phrase **"very close to shore"** as meaning that a vessel operating more than 60 nautical miles out to sea would not be operating very close to shore. Notwithstanding this interpretation, it is for owners and skippers, for the purpose of complying with the Regulations, to assess whether, in respect of voyages in which the vessel goes less than 60 nautical miles out to sea, the vessel is "very close to shore."*

This latter guidance was introduced following consultation with various sectors of the marine and fishing industries, when concerns were raised about the cost and security implications for smaller inshore vessels maintaining Category B medical stores, which contain some prescription-only medications.

The Annexes to MSN 1768 (M+F) provide details of the requirements for medical supplies for each of the categories, and **Annex F** tabulates these. Annex 1 of MSN 1768 (M+F) also highlights that the listed requirements are minimum standards. Owners and operators may, on the advice of a qualified medical practitioner or pharmacist, carry additional or different quantities of supplies or equipment, based on such factors as duration and nature of the voyage and type of work to be undertaken.

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 GENERAL OBSERVATIONS

It is evident from the foregoing that this serious accident and the subsequent delay in the casualty's evacuation to hospital were both preventable. It has not proved possible to quantify how close the man came at any stage to losing his life as a result of this accident, but what is clear is that by the time he reached hospital, his condition was extremely serious. The injuries sustained were severe, and despite the appalling loss of his arm, he is in many respects lucky to still be alive.

2.3 FISHING OPERATIONS

2.3.1 Manning and watchkeeping

Superficially, the number of crew employed on *Danielle* appears adequate, with even an additional spare hand employed to reduce the workload. Likewise, the six on, six off working routine, although onerous for the crew, is better than the arrangements on many of today's commercially pressed fishing vessels.

This shift pattern is driven by the physically demanding nature of scallop dredging, which is generally considered harder and more difficult than beam trawling. In scalloping, not only does the gear come aboard quicker and more regularly than on a beam trawler, but on many scallopers, the dredges each require individual physical attention.

On *Danielle*, the crew were divided into two watches of three, with the 7th hand working a staggered six hour watch. This meant that for twelve hours per day, only three crew were on watch, as at the time of the accident: the skipper in the wheelhouse and two deckhands, each responsible for working the dredging gear on one side of the vessel.

Both sides of the gear are hauled simultaneously, by necessity, to balance the vessel. The subsequent checking and fitting of restraints to the gear by each deckhand working in isolation is not unreasonable. The deckhands did not wear safety helmets while working on deck, nor lifejackets unless the weather conditions were poor, but onboard instructions did include the sensible precaution of requiring the deckhands to shelter beneath the whaleback during lifting operations.

However, it is during the process of "tipping" the dredge contents onto deck that the risks and hazards of single-handed working intensify. This had already been identified by the operators, as it was customary for the skipper or mate to leave the wheelhouse unattended and assist the less experienced deckhand "tip" the dredges on his side. Unless the spare hand is on duty, this leaves the more experienced man to empty the other dredges alone, the scenario during this particular accident.

The injured deckhand was a highly experienced scalloper, and although he had worked on *Danielle* for only a relatively short period, he had worked on numerous similar vessels, and was familiar with lone "tipping". It is of note that on his regular vessel, even with six crew and a six on, six off system, two deckhands would normally work together to "tip" the dredges, allowing the skipper or mate to remain in the wheelhouse. This, of course, meant that the "tipping" process would take twice as long, but it immediately removed the twin risks of working alone near the rotating winch head, and leaving the wheelhouse unattended.

Alternatively, an 8th crewman could have been carried to facilitate four crew working six hour watches. Although this would save time during each haul, and thus allow more hauls during a trip, commercial considerations would probably make this arrangement less preferable.

2.3.2 Vessel layout and change of use

Danielle was built as a beam trawler and, common to this type of vessel, whipping drums were fitted either side of the enclosed winch house. In her original role, these drums would have been used during the hauling process to recover the beam trawls, with the lines controlled from aft of the winch heads. As the winch controls had been located in the wheelhouse, a single emergency stop button had been fitted in the recess directly above each whipping drum in recognition that these winches could not be seen from the bridge.

With the change of role to scallop dredging, the whipping drums were an obvious choice to use for "tipping", although a number of modifications to their arrangement were deemed necessary by the previous owners.

The depth of the drum heads was halved to create additional working space in the narrow passageways to the side of the winch house. The vessel's new role would necessitate increased usage of these areas, both for stowing the gear between tows, and also to provide access to the individual dredges for "tipping".

The substantial poles and dredges need to rest in the side passageways, as shown in **Figure 3**, and represent significant slip and trip hazards, especially given that the poles are round and wet.

More significantly, substantial guard frameworks were fitted above and below the whipping drums. Their purpose is not considered to have been to protect individuals from the winch, but to guard it from being struck or snagged during deployment and hauling of the dredging gear. The presence of these frameworks created additional hazards. In fact, the horrific injuries sustained by the deckhand were largely caused by this framework, as he twice was dragged around and over it, with his arm trapped in the narrow gap between the winch head and the framework.

The framework, combined with the bars added to protect the wheelhouse sides from the gear, also meant that the original emergency stop button positions were no longer easily accessible, and were rendered inadequate.

Since the accident, the owner has fitted an additional emergency stop button on the foreside of the winch house, offering an alternative remote means of stopping the winch. Although this is commendable, the inadequacy of the emergency stops in way

of the whipping drums remains. If a crewman is working in the passageway, possibly aft of the winch, and a problem develops with the whipping drum, then he will in all probability use the closest means of stopping the winch, which is the button above the winch. Indeed, if someone else became trapped in the whipping drum, it would still not be easy to stop the winch, therefore a more accessible emergency stop is still required in the vicinity of the whipping drums on this vessel.

Alternative configurations of guard framework exist on other vessels that would be less likely to pose a hazard to crew. The current arrangement on *Danielle* needs to be reviewed.

2.3.3 Arrangement for "tipping"

The use of whipping drums to facilitate the "tipping" of scallop dredges is not uncommon and, if conducted in a safe and controlled manner, should not lead to the type of accident that occurred here. As discussed at 2.3.4 below, various alternative methods and techniques for "tipping" are available, which would remove many of the risks associated with the current practice on *Danielle*.

In early 2006, an incident occurred on board the vessel when the mate badly bruised his hand on the framework around one of the whipping drums. At this time, so-called "reverse turns" were being used on the winches, with the "hook-end" of the rope leading directly from the derrick end to the winch head. The derrick angle thus resulted in the "hook-end" of the rope leading to the outer edge of the whipping drum. If the deckhand was working forward of the whipping drum, the bitter end of the "tipping" rope would therefore cross the "hook-end" section, increasing the likelihood of riding turns.

This earlier incident prompted the fitting of a leading "tipping" block arrangement on the corners of the winch house, as shown in **Figure 8,** albeit that at the time of the accident, the end block was not fixed. Not only did this remove the need for "reverse turns", as the "hook-end" rope would now be led to the inboard side of the winch head, but it also immediately reduced the risks involved in "tipping". However, this leading block arrangement, comprising a block, shackles and chain, was still far from ideal. To further reduce the chances of riding turns, the lead onto any winch should ideally be fixed and as close as possible to the winch itself. The "tipping" block on *Danielle* prior to the accident reportedly "flopped" around, and even though the subsequent "semi-fixed" arrangement shown at **Figure 8** was an improvement, it was still likely to allow a degree of lateral movement of the "tipping" rope.

It is clear that the propensity for riding turns will depend on the lead to the whipping drum and the control of the rope on the drum. The crew of *Danielle* reported an average of one riding turn a week, which should have caused the operator to become concerned. Although the cause of the riding turn for this accident can not be stated with any certainty, what is clear is that the risk of riding turns will be greater with a lone crewman attempting to control the winch at the same time as "tipping" the dredges.

Figure 16 indicates that the condition of the port side whipping drum was in question, with visible grooving. Again, it is not known whether this contributed to the particular riding turn, but such grooving will affect the performance of a whipping drum, and should be regularly attended to.

The inherent dangers of riding turns on a whipping drum are well understood. It is possible that the deckhand's haste to stop the riding turn develop any further, contributed to him becoming trapped. In such circumstances, the chances of a slip or trip resulting in a serious injury - or worse - is relatively high, and it can only be luck and the skills and agility of the crew that have avoided previous accidents.

All of the crew on *Danielle* were well briefed by the skipper to always stop the winch before attempting to clear a riding turn. The problem of course is that, to follow this instruction, the deckhand had to place himself in danger by approaching and leaning over the winch to stop it.

The "tipping" operation requires concentration and co-ordination simultaneously to attach the "tipping" hook and shake the dredge, and to control the bitter end around the whipping drum. The MAIB considers that this can only be achieved with two people, with one person working the dredges, and the second standing, preferably aft of the whipping drum to control the "tipping" rope.

2.3.4 Alternative arrangements for "tipping"

Various other options exist for "tipping", including hydraulic troughs, onto which the dredges are lowered down, and the scallops dropped straight onto a conveyor below; and "tipping" rails, whereby the dredges are suspended on a rail that then "tips" the dredges inboard. Both options remove the need for manual "tipping" using whipping drums, but would require expensive and substantial alterations to the vessel, although the owner is currently considering the latter, subject to an EEC grant being acquired.

Some vessels also use a system of "tipping" bars, which attach together the dredge bases on a single pole, and thus allow them to be "tipped" in unison. This would remove the time-consuming process of individual "tipping" each of the 28 dredges on *Danielle*, but introduces the additional hazards involved in simultaneously raising all of the dredges to repair or maintain one dredge.

2.3.5 Current guidance for the scallop dredging industry

The MCA has promulgated numerous useful notices and pamphlets, intended to guide and assist seafarers with safer working practices. MSN M.1561 **(Annex D)** and *Fishermen and Safety* **(extract at Annex E)** are two such documents which, although now somewhat dated, provide invaluable guidance on the dangers posed while working with winches and fishing gear.

MGN 265 (F), although dealing specifically with the particular hazards posed during beam trawling and scalloping, contains no reference to the risks involved in "tipping" and the use of whipping drums.

2.4 RISK ASSESSMENT ISSUES

2.4.1 Risk appreciation and assessment

The risks involved in single-handedly "tipping" dredges on *Danielle* are evident from the photographs at **Figure 20** and **Annex C**. A shore-based factory worker would not be allowed to balance on a slippery pole resting on a moving platform, while attending to a heavy chain mail bag with one hand, and trying to control a winch with the other.

At the time of this accident, an adequate risk assessment was not available. The vessel's written risk assessment was reportedly under development the day after the accident, but could not be located. Seven weeks later, a new risk assessment was being completed by the skipper using the latest Seafish Safety Folder, with the entries based on the previous "lost" risk assessment. An improved later version introduced the additional sensible control measure that lone "tipping" was to be conducted for only the forward seven dredges, with the aft seven dredges in the vicinity of the whipping drum being "tipped" only with a second deckhand assisting.

Risk assessments are an important tool to help identify and reduce the hazards associated with dangerous working practices and environments, as were evident during this accident.

Had any assessment conducted prior to this accident recognised the hazards associated with this operation more appropriately, and control measures adopted to improve the safe working environment, it is possible that this accident would not have happened.

2.4.2 Current regulatory requirements for risk assessments

The current statutory requirements for merchant and fishing vessels only require that a risk assessment must be conducted, but not necessarily written. Publicly available guidance to MCA fishing vessel surveyors, however, notes that such vessels over 15m in length do require a written risk assessment.

An effective risk assessment does not have to be written down to save someone's life, but without it being recorded, it makes it virtually impossible for the assessment to be continually reviewed and developed by the crew, especially if the crew changes regularly.

2.4.3 Current risk assessment review processes

There were no recorded deficiencies on the MCA's SIAS database regarding the risk assessment for either of *Danielle's* full or intermediate surveys in 2003 and 2005 respectively. However, MCA surveyors are not currently trained to examine the content of risk assessments, and are only required to confirm whether one has been conducted.

Currently, none of the statutory certificates and documents associated with the MCA's fishing vessel survey regime incorporates sections to record the status of risk assessments. If the requirement for risk assessments is to be taken seriously by all concerned, then a simple means of officially recording their status is required.

2.4.4 Risk assessment templates and training

It is evident that the skipper was experiencing difficulty in completing the risk assessment template forms in the second issue of the Seafish Safety Folder, and could have benefited from some practical assistance with this.

Training is available to fishermen in the principles of risk assessment during the mandatory Seafish Safety Awareness training course, which both the skipper and the casualty had completed. The skipper had also completed his Class 2 Certificate of Competency, which again includes training in the conduct of risk assessments.

In Scotland, both the MCA and a Seafish Training Officer have been providing practical assistance with risk assessments on board fishing vessels. Consideration should be given by both the MCA and Seafish to extending these schemes more widely.

Issue 2 of the Seafish Safety Folder was slimmed down with the removal of the notes describing each of the hazards to be assessed. This followed concerns that the original document was too unwieldy. It is possible that with the removal of these notes, the folder has become less easy to use and understand. Seafish is currently reviewing the requirement for the inclusion of these notes.

2.5 SEARCH AND RESCUE AND EVACUATION ISSUES

2.5.1 General

Communication failings during the search and rescue process, and a lack of knowledge of each of the other providers' capabilities contributed to some delays in the deckhand's evacuation and treatment. However, the severity of his injuries meant that these delays probably did not affect the final outcome of the accident. Nonetheless, these delays extended his level of suffering before reaching hospital.

2.5.2 Initial actions

Following the accident, the skipper immediately contacted the Coastguard on Channel 16, appreciating that medical assistance was required beyond that available onboard. He didn't use a PAN PAN call and it is possible that this could have contributed to the Coastguard initially interpreting the situation as less serious than it was. This did not, however, affect the Coastguard's immediate reaction of seeking medical advice from Queen Alexandra Hospital, and the subsequent descriptions provided by the skipper of the crewman's condition were certainly detailed enough to convey the severity of the situation.

2.5.3 Radio Medical Advice Service issues

The remote diagnosis of a serious medical condition is clearly challenging, particularly when duplex or semi-duplex link calls are used, requiring a consistent approach to ensure information is successfully conveyed.

During the link call for this incident, the doctor tried, with entirely good intentions, to interrupt *Danielle*'s skipper to clarify some of the details. The skipper was transmitting on simplex, so would not have been aware of these interruptions, which occurred at the same time as the skipper was referring to the chest rashes, indicative of possible lung injury. No specific training in link calls is currently undertaken at the hospital, and this could be improved with the introduction of practical examples.

It is possible that by talking over the top of the skipper, the doctor could have missed details of the life-threatening extent of these injuries; they were certainly not discussed during the subsequent conversation between the Coastguard and the hospital when the decision was made to deploy the lifeboat.

Following the link call, the Coastguard and doctor agreed the most appropriate evacuation means for the casualty, with the Coastguard taking the lead in the decision-making process. The Coastguard's working instructions however suggest that the radio medical advice personnel have the responsibility for deciding on the best method of evacuation, and the wording in these work instructions would benefit from review to remove any ambiguity or uncertainty.

2.5.4 RNLI Lifeboat Medical Advisers

The RNLI's system of Lifeboat Medical Advisers provides the service with a useful network of medical advice and, in certain instances, the ability to deploy with a doctor at short notice to provide immediate medical assistance.

The doctor in this case was a highly experienced GP with some skills in emergency medicine. Given the severity of the deckhand's injuries, he performed remarkably well, especially considering that the extent of the injuries were well beyond those that a typical GP would normally have to deal with. He was only provided with full details of the injuries once the lifeboat was underway and was shocked at the severity of the deckhand's condition when he first arrived on board *Danielle*. This lack of early information might explain why he did not have all the equipment he subsequently considered necessary, although the timing of the call out would have also precluded him from collecting additional medical supplies to take with him.

Unfortunately, the Coastguard and hospital doctor's expectations of the medical advisor's capabilities were in excess of the reality. It was believed that he was trained to deal with such situations, when in fact the abilities of each lifeboat medical adviser will vary. It is suggested that if the RNLI is to use such medical advisors to their full potential, a consistent level of training, perhaps to the BASICs standard, is required. Likewise, it would be beneficial if the capabilities of the medical advisor system were made known to all search and rescue providers.

2.5.5 Ambulance control

A 23 minute delay in transferring the patient to hospital resulted from the diversion of the original ambulance. The ambulance triage system used to prioritise patient needs is highly sophisticated and largely automates this process. The Coastguard had not been made aware of the new prioritisation system.

Ambulance Control has subsequently confirmed that if all of the prompted questions had been asked, and correctly answered, based on the information now known the original ambulance would not have been diverted. It was only when the Coastguard contacted Ambulance Control for a further update were they informed of the ambulance diversion and subsequent delay.

It seems probable that the shortcomings in the ambulance prioritisation were due to a lack of familiarity by the ambulance controller with the new system, which had only been in place for a matter of days at the time of the accident. Further training should hopefully eradicate any such teething troubles.

2.5.6 Coastguard response

At the time of the initial call, *Danielle* was about 17 nautical miles offshore, closing at the full speed of about 10 knots. After the 15 minutes typically taken to muster and launch, a lifeboat travelling at 25 knots would have been able to intercept her in around 20 minutes. In contrast, the published helicopter night response time of 45 minutes, made it appear the slower option. The decision to send a doctor on the lifeboat meant that treatment could begin sooner and, with the casualty stabilised, he could be then transferred to hospital. The helicopter's ability to fly directly to the hospital and avoid the 20 minute road transfer to Truro was thus outweighed by the lengthier initial response time.

The actual evacuation to hospital from the time of the initial call took 2 hours 40 minutes. This could have been reduced by 30 minutes if the lifeboat had proceeded at top speed (estimated 7 minute delay) and the ambulance arrival had not been delayed by 23 minutes. It is estimated that if the helicopter had deployed in around 25 minutes, which practical experience suggests Culdrose helicopters are capable of, the evacuation time to hospital could possibly have been quicker than by the lifeboat and ambulance. This would of course have been subject to the actual achieved response time, and affected by factors such as:

- whether the airfield was open at the time, and the helicopter crews awake,
- whether a doctor would have been required to deploy with the helicopter,
- the availability of an ambulance required to transport the casualty the short distance from the hospital helipad to the Accident & Emergency department.

Although it would be unfair to suggest that the Coastguard should have assumed that the 45 minute night response time would be reduced, it is suggested that closer liaison during the early stages of an incident could possibly help identify the likelihood of the 45 minute night target time being achieved or reduced, and assist the decision on the choice of evacuation unit.

The RNLI's policy of using cruising speeds reserves top speeds only for incidents considered life-threatening, and is not an unreasonable practice to prolong the working lives of lifeboats. Unaware of the true sense of urgency, the lifeboat therefore steamed out at 20.5 knots, in accordance with procedures.

The Coastguard had, however, never been made aware of this lifeboat speed limitation. Had this, along with the capabilities of the lifeboat medical advisor been known, and the life-threatening nature of the deckhand's chest injuries been identified to them from the outset, it is possible that the decision on which unit to deploy might have been different. However, the decision regarding the choice of evacuation unit would have considered various other factors, including the favourable weather conditions for boat transfers, and given the information available at the time, the decision to deploy the lifeboat and doctor was based on reasonable logic.

Although the recording of medical details in the Coastguard's Incident Log was good, the conveying of this information to the other search and rescue providers could have been more effective. Not all of the details were passed on to the Falmouth lifeboat crew, and it was only once they were well underway that the doctor on board was informed about the deckhand's breathing difficulties. Likewise, little sense of urgency was initially conveyed to Ambulance Control.

2.5.7 Conclusion

The delays in the evacuation process had little effect on the outcome of this incident. However, it is evident that the various search and rescue organisations would benefit from closer co-operation to ensure that each is fully aware of the others' capabilities and to facilitate the accurate transfer of important information.

2.6 MEDICAL EQUIPMENT

While *Danielle* steamed towards Falmouth, the skipper attempted to administer first-aid and make the casualty comfortable. The vessel carried a Category C medical kit, in accordance with the current regulations for a vessel operating within 60 miles of land, and there was little the skipper could do with the limited medical supplies available, other than bandage the wounds and make a sling for the casualty's arm.

Annex F highlights the jump between the contents of a Category C and B medical kits, with a Category C medical kit containing little more than a standard first-aid kit. This seems inappropriate for a large fishing vessel operating machinery and heavy gear offshore.

The EEC directive governing this area in fact requires Category C supplies for harbour vessels and craft staying very close to shore or with no cabin accommodation other than a wheelhouse. It is hard to conceive that a 29m scallop dredger operating as far south as Ushant could be considered to fit this description. However, industry pressure regarding costs, and security issues of storing certain drugs on board vessels, has resulted in the relaxation of this regulation to vessels operating 60 miles from shore.

The current guidance however describes the minimum requirements for medical supplies, and qualified skippers may choose to carry a higher category of stores if they consider it appropriate. It should be part of the risk assessment to identify what level of medical supplies should be carried.

2.7 FATIGUE

Despite the onerous physical demands of scallop dredging and a six hour on, six hour off shift pattern, there is no evidence to suggest the deckhand was suffering from the effects of fatigue at the time of the accident. An experienced scalloper, he felt well rested and alert even though the accident occurred in the early hours of the morning.

At the time of the accident, the deckhand was taking "over-the-counter" painkillers to alleviate an injury sustained earlier in the trip. Although these can cause dizziness and should not be used while operating machinery, the deckhand reported that he had felt no ill effects from these at any stage.

2.8 SIMILAR INCIDENTS

The MAIB has recorded 92 incidents involving fishermen becoming caught in winches aboard UK fishing vessels since 1991, resulting in 90 injuries and 4 fatalities. Although the numbers of such incidents are relatively low in overall accident terms, the consequences are often terrible, including numerous instances of crush injuries, varying degrees of horrific amputations, and four needless fatalities.

Following one such fatality (*Solstice II)* in May 2000, the MAIB investigation made a recommendation to the MCA to consider introducing an enhanced programme of education across the fishing industry in respect of risk assessment.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES DIRECTLY CONTRIBUTING TO THE ACCIDENT WHICH HAVE RESULTED IN RECOMMENDATIONS

1. The framework above and below the whipping drums is to protect the whipping drum from being struck or snagged by the recovered dredging gear, and is not considered to protect individuals from the winch. [2.3.2]

2. The whipping drum frameworks create an additional entrapment hazard for personnel working in the vicinity of the winches, and contributed significantly to the major injuries sustained by the deckhand. [2.3.2]

3. The whipping drum frameworks, combined with the bars added to protect the wheelhouse sides from the swinging dredging gear, made the winch emergency stop buttons no longer easily accessible and inadequate. [2.3.2]

4. The lack of an accessible emergency stop button adjacent to the whipping drum delayed the deckhand in stopping the winch, and contributed to the severity of his injuries. [2.3.2]

3.2 OTHER SAFETY ISSUES IDENTIFIED DURING THE INVESTIGATION ALSO LEADING TO RECOMMENDATIONS

1. MGN 265(F), although dealing specifically with the hazards of beam trawling and scalloping contains no reference to the risks involved in “tipping” or the use of whipping drums. [2.3.5]

2. None of the statutory documents associated with the MCA’s fishing vessel survey regime incorporate a section to record the status of risk assessments. [2.4.3]

3. *Danielle*’s skipper experienced difficulties in completing the risk assessment proforma contained in Issue 2 of the Seafish Safety Folder. [2.4.4]

4. A Category C medical kit appears inappropriate for a large scallop dredger, even though this complies with the current regulations. [2.6]

5. The requirements for medical supplies on board vessels are minimum standards only, but this may not be commonly understood by the fishing industry. [2.6]

3.3 SAFETY ISSUES IDENTIFIED DURING THE INVESTIGATION WHICH HAVE NOT RESULTED IN RECOMMENDATIONS BUT HAVE BEEN ADDRESSED

1. The practice of simultaneously “tipping” both sides of dredges meant that for twelve hours a day, one side of dredges was “tipped” single-handedly. [2.3.1]

2. At the time of the accident, an adequate risk assessment for the vessel and the hazards involved with “tipping” was not available. [2.4.1]

3. It is possible that the removal of the explanatory notes in Issue 2 of the Seafish Safety Folder has made this document harder to use. [2.4.4]

4. The wording of the Coastguard CG3 handbook suggests that the decision regarding the choice of evacuation unit falls to the doctor. [2.5.3]

5. The RNLI medical adviser was not trained to BASICs standard and did not embark with all of the medical equipment that he subsequently believed he needed. [2.5.4]

6. Ambulance Control did not ask all of the required questions, nor obtain all of the necessary information to properly prioritise the deckhand's condition. [2.5.5]

7. The original ambulance was diverted to a higher priority case because the deckhand's condition was not properly triaged. [2.5.5]

8. The Coastguard had not been made fully aware of the new Ambulance Control prioritisation system. [2.5.5]

9. The Coastguard had not been made aware that the RNLI operates a policy of using cruising speeds for lifeboat deployment. [2.5.6]

10. The Falmouth lifeboat did not proceed to the incident at top speed because it was not believed to be life-threatening, and the Coastguard was unaware of this reduced speed. [2.5.6]

SECTION 4 - ACTIONS TAKEN

Following the accident, various actions have been taken by organisations involved both directly and indirectly in this accident. These include:

The owners of *Danielle*, **the Mermaid Trawler Company Ltd** has:

- Fitted an additional remote emergency stop button for the winch and whipping drums, located on the foreside of the winch house **(Figure 15)**.
- Revisited the vessel's risk assessment, and introduced an additional control measure so that only the forward seven dredges can be "tipped" single-handedly, and then only by an experienced deckhand.

The **Royal National Lifeboat Institution** has:

- Contacted the Coastguard on 28 July 2006 to confirm and describe the policy of using cruising speeds for a number of classes of RNLI lifeboats.
- Confirmed its intention to re-issue, with some clarification, the April 2006 RNLI Operations Circular regarding the use of cruising speeds.
- Continued its review of the "training" currently offered to lifeboat doctors.

The **Falmouth lifeboat medical adviser** has:

- Established a 'grab bag' of medical supplies, held under lock and key at the lifeboat station for future incidents.

The **South West Ambulance Services NHS Trust** has:

- Provided the Coastguard with details of its triage system, which will be introduced by all other UK Ambulance Trusts.

The **Maritime and Coastguard Agency** has:

- Confirmed its intention to review its work instructions regarding the responsibility for the decision regarding the most appropriate means of evacuation for a casualty.
- Obtained details of the ambulance triage system and confirmed its intention to issue work instructions regarding the passing of information to the Ambulance Service.
- Confirmed its intention to discuss with the Radio Medical Advice providers the possibility of involving them in exercises, in addition to the current training procedures, which includes exchange visits.
- Raised the matter of the carriage of medical stores on board fishing vessels at a FISG (Fishing Industry Safety Group) sub-committee meeting in Aberdeen, in October 2006; the possibility of enhanced medical supplies being required was considered, but rejected by the fishing federations who were present.
- Confirmed its intention to extend the current system in the north east of Scotland of engaging fishermen to assist with risk assessments on board vessels, across the MCA regions.

The **Sea Fish Industry Authority (Seafish)** has:

- Confirmed its intention to issue a draft revised version of the Seafish Safety Folder, which will incorporate:
  - the notes sections for the risk assessment forms;
  - minor amendments with regards to recent incidents and conclusions from MAIB investigations;
  - guidance on LOLER and PUWER for the purposes of risk assessment.
- Confirmed its intention to consider the provision of a small booklet to accompany the risk assessment folder which will give guidance and advice on risk and general safety assessments for both the vessel and fishing operations.

SECTION 5 - RECOMMENDATIONS

The Mermaid Trawler Company Limited is recommended to:

2007/115 Review the current arrangement of the framework in the vicinity of the whipping drums on *Danielle*, and consider the introduction of an alternative framework arrangement that is less hazardous to personnel, as adopted on other similar vessels.

2007/116 Review the provision of emergency stop facilities for the whipping drums on *Danielle*, and ensure that an accessible stop button is available to a crew member should he/she become trapped in the area of the whipping drum.

The Maritime and Coastguard Agency is recommended to:

2007/117 Provide details of the hazards associated with "tipping" and whipping drums on board scallop dredgers in the next revision of MGN 265 (F).

2007/118 Introduce a section in the statutory documentation associated with the survey and inspection regime for fishing vessels to ensure that the status of each vessel's risk assessment is recorded by surveyors.

2007/119 Amplify and expand on current advice contained in MSN 1768 (M&F) such that fishermen are reminded:

- medical scale requirements provide the minimum levels of medical stores only. Additional stores may be provided at the skipper's/owner's discretion.

Such advice should also specify the need for skippers to consider the level of additional medical stores carried on individual vessels as part of the statutory risk assessment process.

The Sea Fish Industry Authority (Seafish) is recommended to:

2007/120 Extend the use of Seafish Group Training Association Officers to provide practical on board guidance to UK fishermen in completing fishing vessel risk assessments.

Marine Accident Investigation Branch
March 2007

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