MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

ACCIDENT REPORT

VERY SERIOUS MARINE CASUALTY | REPORT NO 6/2021 | MAY 2021

Fatal accident to a fish farm worker involving the workboat *Beinn Na Caillich* Ardintoul, Glenshiel, Scotland 18 February 2020

SUMMARY

On 18 February 2020, the Ardintoul fish farm assistant manager, Clive Hendry, drowned after falling into the water from a feed barge access ladder during a boat transfer. He was attempting to climb on to the barge from the workboat *Beinn Na Caillich* and fell into the water after being crushed between the boat and the barge. A fish farm technician attempted to stop the assistant manager from entering the water by holding onto the back of his personal flotation device and oilskin jacket, but the severely injured casualty slipped out of them.

The investigation concluded that the conduct of the boat transfer had not been properly planned or briefed and was not adequately controlled. A risk assessment for the transfer of personnel to and from the fish farm installations had not been carried out and a documented safe system of work had not been produced. Recommendations have been made to the vessel and fish farm owner, Mowi (Scotland) Ltd, to apply The Workboat Code Edition 2 to its fleet and implement a safety management system that complies with the principles of the International Safety Management Code.

A recommendation to ensure that appropriate marine expertise is present or provided to the senior management team to oversee the safety of its vessels and marine operations has also been made to the owner.

Image courtesy of George Branson (MarineTraffic.com)

Beinn Na Caillich

Image courtesy of Google Maps

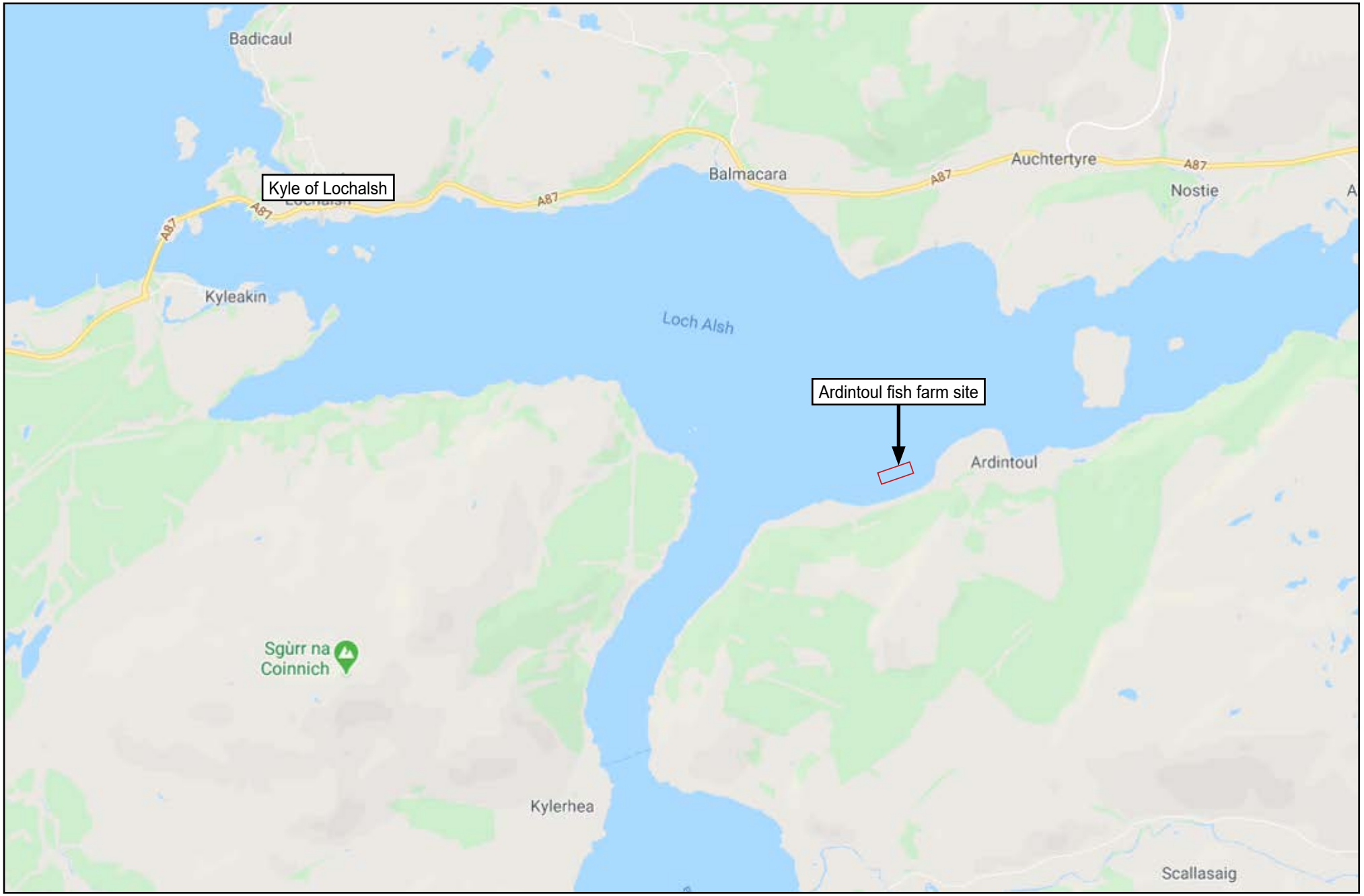

Figure 1: Loch Alsh

FACTUAL INFORMATION

Narrative

At about 0700 on 18 February 2020, the workboat *Beinn Na Caillich* sailed from Kyle of Lochalsh, Scotland and headed for the Mowi (Scotland) Ltd (Mowi) Ardintoul fish farm site **(Figure 1)**. On board were its skipper and a deckhand. *Beinn Na Caillich* arrived at the site about 30 minutes later and moored alongside its salmon keep cage 10 **(Figure 2)**. Another workboat, *Beinn Bhreac*, was already moored on the cage.

At 0830, two Polarcirkel rigid buoyancy boats (RBB) carrying the fish farm site manager, assistant manager and four technicians arrived at the salmon cage. With the assistance of the workboat's hydraulic cranes, the workers began to rig a tarpaulin under the cage in preparation for administering a 4-hour chemical lice treatment. At about 0930, the site manager returned ashore in one of the RBBs to meet a fish welfare standards auditor. At 1110, after an initial problem rigging the tarpaulin, the chemicals were added to cage 10.

Satellite image courtesy of Google Earth

Figure 2: Satelitte image with plan of the Ardintoul fish farm

On completion of the task, the four technicians boarded the remaining RBB and left the salmon cage. One of the technicians was transferred to the fish farm's feed barge (the barge) **(Figure 3)**; the other three moved on to salmon cage 4. The assistant manager remained on cage 10 to monitor the chemical treatment.

Figure 3: C Cap feed barge

At about 1230, the fish farm manager returned with the auditor to inspect the site. They spoke to the assistant manager on cage 10, who briefed them on the progress of the lice treatment, and then visited the barge before returning ashore. At approximately 1400, the three farm technicians left cage 4 and went on board the barge for lunch. They also took the assistant manager's lunch on board.

After lunch, the three farm technicians left the barge in the RBB to collect the skipper and deckhand from the workboat, *Stolt Madah*, which was moored to a buoy nearby. *Stolt Madah*'s crew had completed their day's work and were taken to *Beinn Na Caillich* for transfer ashore. The three farm technicians then went to salmon cage 2 to remove its dead fish.

At 1437, the assistant manager sent a text message to the manager to advise that the wind had strengthened and that he wanted to terminate the chemical treatment as the fish were becoming agitated. The manager responded in agreement. The two workboat crews removed the tarpaulin from cage 10, reset its net and then *Beinn Bhreac* departed the fish farm to return to Kyle of Lochalsh. At 1452, the assistant manager informed the manager by text message that the treatment was finished. Shortly afterwards, the assistant manager asked *Beinn Na Caillich*'s skipper to take him to the barge so that he could eat his lunch.

During the short passage from cage 10 to the barge, the assistant manager joined *Beinn Na Caillich*'s skipper and *Stolt Madah*'s skipper on the bridge. The three men chatted but did not discuss the transfer to the barge. The two workboat deckhands, unaware that the transfer was about to take place, remained in the galley.

As *Beinn Na Caillich* approached the barge, the assistant manager left the bridge and went to the starboard side of the deck and stood by the open forward bulwark gate. *Beinn Na Caillich*'s skipper engaged astern propulsion to slow the vessel as it approached the barge. His intention was to align the forward bulwark gate with the barge access ladder and ensure that the vessel was stationary before instructing the assistant manager to step across.

At about 1510, with *Beinn Na Caillich* still moving slowly ahead, the assistant manager stepped through the open gate and on to the barge access ladder. *Stolt Madah*'s skipper saw this from the back of *Beinn Na Caillich*'s bridge and, realising the danger, shouted out in surprise. As he did so, *Beinn Na Caillich*'s bulwark gate post caught the assistant manager and crushed him against the barge ladder's fender structure **(Figure 4)**.

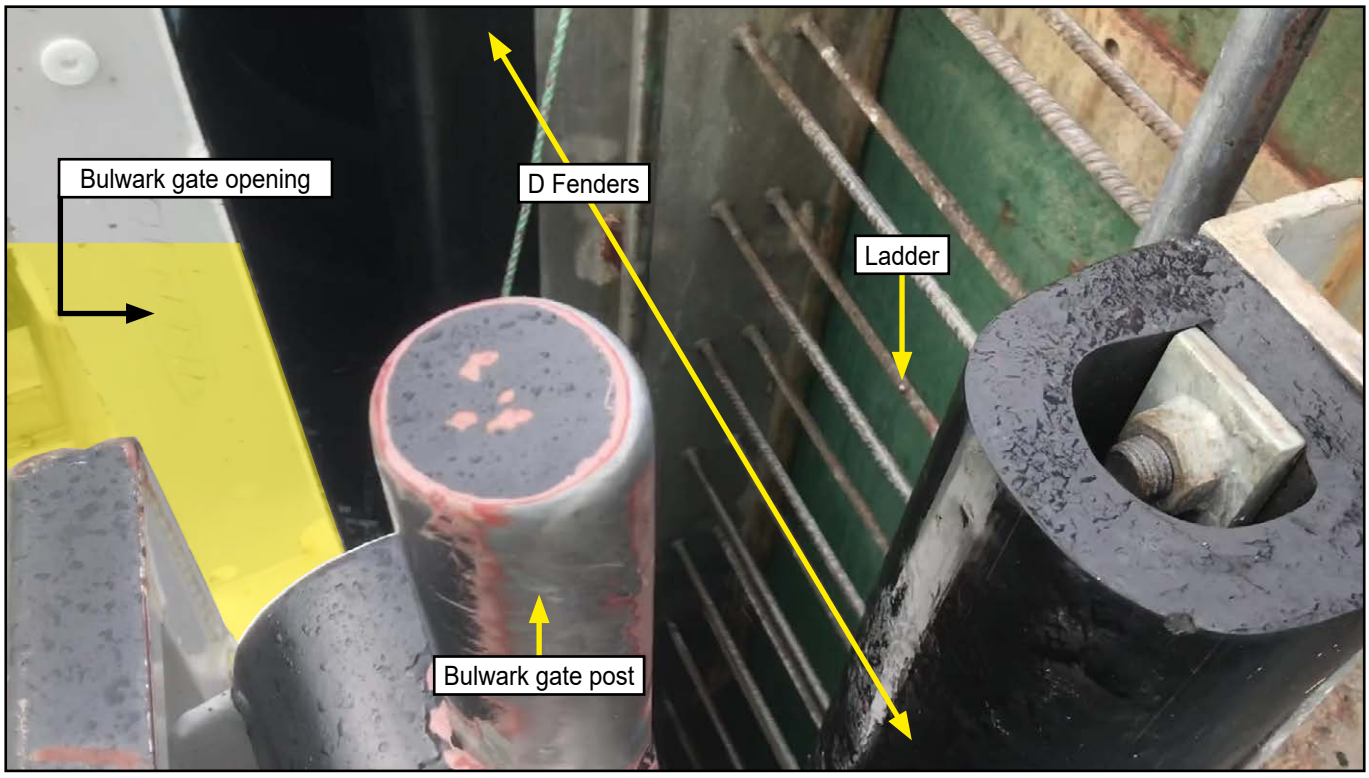

Figure 4: *Beinn Na Caillich*'s bulwark gate and barge ladder

With the assistant manager holding on to the rungs of the ladder and shouting out in pain, *Beinn Na Caillich*'s skipper manoeuvred the workboat clear of the barge. *Stolt Madah*'s skipper ran down to the main deck, where he was joined by the two deck crew from the galley, who had heard the assistant manager's shouts. The fish farm technician in the barge office also heard shouting and hurried to the top of the ladder.

The technician saw the assistant manager hanging from the ladder and grabbed hold of the strap at the back of his lifejacket **(Figure 5)**. The assistant manager told the technician that he could not use or feel his legs. Shortly after, the assistant manager lost his grip on the ladder, slipped out of his lifejacket and oilskin coat, and fell 2.7m into the water. The technician was left holding the lifejacket and oilskin coat.

The assistant manager floated to the surface and lay motionless on his back, with water lapping over his face. *Beinn Na Caillich*'s skipper lowered the workboat's bow door and manoeuvred the vessel close to the casualty. *Stolt Madah*'s skipper grabbed a lifebuoy but decided not to throw it. Instead, with the

Figure 5: The assistant manager's personal flotation device

assistance of the two crewmen, he used a boat hook to pull the assistant manager toward the bow door and supported him with his airways clear of the water. The assistant manager appeared to be conscious but was unresponsive.

At 1520, Stornoway Coastguard received a “Mayday” call from the barge on very high frequency (VHF) radio channel 16, and shortly afterwards a “Mayday” call from *Beinn Na Caillich*. The technician on the barge also contacted the RBB crew by VHF radio and requested their assistance.

The three technicians in the RBB arrived at the barge quickly and pulled the assistant manager on board. By that time he was unconscious and was not breathing. The men began cardio-pulmonary resuscitation while *Beinn Na Caillich*’s skipper updated the coastguard.

Within a few minutes, *Beinn Bhreac* was on the scene to help, and the coastguard had tasked lifeboats and a search and rescue helicopter to attend. Despite the early use of a defibrillator and the determined efforts of the fish farm workers, emergency services, and medical staff, the assistant manager could not be resuscitated, and he was pronounced life extinct in hospital at 1630.

A postmortem examination identified that the assistant manager’s death was caused by drowning following a crush injury to his pelvis. The assistant manager had no previously diagnosed medical conditions. Toxicology tests for alcohol and drugs were negative.

At the time of the accident, the wind was south-westerly at 15 knots, the sea state was slight, the air temperature was 5°C and the water temperature was about 7°C.

Beinn Na Caillich crew and fish farm staff

Beinn Na Caillich's skipper and a deckhand worked to a 2-week on / 2-week off rota. During their 2 weeks on, they worked 8-hour shifts between October and March and 12-hour shifts between April and September. *Beinn Na Caillich*'s crew had started their 2-week shift the day before the accident.

Beinn Na Caillich's skipper was a 36-year-old UK national. He started work as a deckhand in the aquaculture industry in 2012 and had been a skipper since 2014. Before that, he was employed as a deckhand on commercial fishing vessels. He held a commercially endorsed Royal Yachting Association (RYA) Powerboat Advanced Certificate of Competence and had completed the RYA's Coastal Skipper/ Yachtmaster Offshore theory training.

The deckhand was a 24-year-old UK national. He had been employed by Mowi as a fish farm technician since August 2018, after previously working in the construction industry. He began working as a deckhand on board *Beinn Na Caillich* the day before the accident and this was his first experience on a large workboat. He had completed Mowi's induction process and held a commercially endorsed RYA Level 2 Powerboat Handling Certificate (PB2).

Ardintoul fish farm's assistant manager, Clive Hendry, was a 58-year-old UK national. He had worked in the aquaculture industry for over 20 years and had completed many fish farm safety and environmental management training courses. He held a commercially endorsed RYA PB2, an STCW[1] Elementary First Aid certificate, and had completed a Seafish[2] basic sea survival course. He was regarded as a hard-working member of the team and was respected for his experience.

The assistant manager was wearing company issued oilskin bib and braces, oilskin jacket and wellington boots. He was also wearing a Regatta SeaRescue Hybrid 225 Newton auto-inflation lifejacket **(Figure 5)**. The lifejacket was fitted with crotch straps, which were unfastened at the time of the accident.

Like most Mowi fish farms, Ardintoul fish farm operated with a team of six people, comprising a manager, assistant manager and four technicians. The fish farm manager was 24 years old and had worked in the aquaculture industry since leaving school. The four technicians had varying experience but had all undergone a 2 or 3-day induction at the company offices in Fort William, during which time they gained attendance certificates for safety awareness. In common with all Mowi farm technicians they held commercially endorsed RYA PB2 certificates, which allowed them to drive the RBBs. The technicians also held basic sea survival and first-aid certificates.

Beinn Na Caillich and the rigid buoyancy boats

Beinn Na Caillich was purpose built in the Netherlands as a landing utility vessel for the aquaculture industry and was delivered in October 2018. It was owned and operated by Mowi and was used mainly for lifting nets and for transferring equipment between Mowi's shore sites and its fish farms.

Beinn Na Caillich had a displacement of 95.4 tonnes (t), was 19.3m length overall with a beam of 7.55m, and was equipped with a deck mounted fully foldable knuckle and telescopic boom crane. It was propelled by two 261kW Volvo Penta D9 engines driving two fixed pitch propellers with a rudder in line with each shaft. The vessel had a hydraulic bow door and two 0.55m wide, 1.0m high bulwark gates. The gates were located on the starboard side of the main deck, approximately 3m fore and aft of midships, and were visible from the bridge. They could be secured in the open position or locked closed by means of a deadbolt arrangement, but were habitually left in the open position. *Beinn Na Caillich* was equipped with life-saving appliances, including a Markus Lifenet manoverboard recovery system.

The Polarcirkel RBBs were open workboats, with rigid sponsons filled with polystyrene; they were powered by outboard motors and were designed to be tough and virtually unsinkable. They were mainly used for transportation to and around the fish farm installations.

[1] International Convention on the Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended.

[2] Seafish is a non-departmental public body with a mission to support a profitable, sustainable and socially responsible future for the seafood industry.

Regulation, certification and guidance

Beinn Na Caillich was operated under the Maritime and Coastguard Agency's (MCA) *The Safety of Small Workboats and Pilot Boats – A Code of Practice*[3] (the Brown Code). It was certified by The Society of Consulting Marine Engineers and Ship Surveyors (SCMS)[4]. The RBBs were also certified workboats.

The Brown Code required that workboats be examined by an authorised person annually, and that out of water survey intervals did not exceed 3 years. The Code focused mainly on vessel construction, equipment requirements and crew qualifications; it did not include operational safety management requirements. The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997, which applies to all UK ships, required employers to adopt 'a coherent approach to management of the vessel or undertaking, taking account of health and safety at every level of the organisation'.

On 31 December 2018, the MCA published *Edition 2 of The Code of Practice for the Safety of Small Workboats & Pilot Boats* (Workboat Code Edition 2), which was mandatory for all new vessels and optional for existing ones. The Workboat Code Edition 2 included a recommendation to implement a safety management system (SMS) that complied with the principles of the International Safety Management Code (ISM Code). It also contained guidance and explained the requirements for risk assessment, training, and the conduct and recording of emergency drills. Workboats acquired by Mowi after 31 December 2018 had been certified under the Workboat Code Edition 2.

Guidance for seafarers and vessel operators on health and safety and best practice is available in the Code of Safe Working Practices for Merchant Seafarers (CoSWP). The CoSWP contains guidance for many shipboard situations including transfer of personnel, emergency drills and the use of personal protective equipment (PPE). The MCA's Marine Guidance Note (MGN) 71 (M), *Musters, Drills, On-Board Training and Instructions, and Decision Support Systems*, provided further guidance on drills to be conducted by workboat crews. Emergency drills were rarely conducted on board *Beinn Na Caillich* and there were no records of them having taken place.

Personnel transfers by workboat

The transfer of fish farm technicians to and from the salmon cages and feed barges was typically achieved using the RBBs but, occasionally, larger workboats, such as *Beinn Na Caillich*, would be used for the task.

Comprehensive guidance to the offshore industry on how to complete boat transfers safely had been issued by many stakeholders, including the Workboat Association and the MCA. The Workboat Association's publication *Crew Transfer Vessels: Good Practice Guide* provided specific guidance on personnel transfer and stated that:

> *Transfer of personnel shall be covered by the company's risk assessment system, however, the variable nature of this operation requires that the risk must be (without record) assessed locally again by the Master on each occasion to determine if it is safe to proceed.*

The good practice guide also explained that a transfer should only take place once a briefing to all personnel involved has been completed, and it emphasised that no personnel should proceed to or access the transfer area without being under the direct control of the vessel crew. The guide also stated that: *Prior to transfer, the crewmember shall verify…that the vessel is stable*.

[3] The Brown Code and subsequent Workboat Code Edition 2 are enabled and underpinned through Statutory Instrument by Regulation 3(1) of the Merchant Shipping (Small Workboats and Pilot Boats) Regulations 1998, SI 1998 No. 1609, as amended.

[4] SCMS was an MCA approved certifying authority. Certifying Authorities are authorised by the Maritime and Coastguard Agency to examine and certificate small commercial vessels in accordance with the Small Commercial Vessel Codes of Practice or MGN 280.

MGN 432 (M+F) (as amended) *Safety during Transfers of Persons to and from Ships*, included the following specific guidance on transfer of personnel when a vessel is underway:

> *1.7.1 Except where a vessel has a specially designed and dedicated passenger transfer system, the transfer of persons (other than those experienced in the use of pilot ladders) from/to vessels which are not secured alongside or at anchor should not be attempted unless it is unavoidable.*

The CoSWP also included the following regarding personnel transfer to/from installations:

> *31.9.6 Personnel transfer is to commence only if all identified parties have confirmed readiness.*
>
> *31.9.7 All personnel transfers should only take place after a thorough risk assessment has been completed and a toolbox talk carried out with all personnel involved.*

Fish farm feed barge

The barge was a SeaCap[5] 10m diameter cylindrical reinforced concrete pontoon that was anchored to the seabed using a 6-point anchor system. It was manufactured by Gael Force Marine Equipment Ltd and was specifically designed as a feeding unit. On board were a kitchen, mess area and office space, with electrical power supplied by a 100kVA diesel generator. The weight of the barge when full of feed, water and fuel was 570t. The barge was loaded at regular intervals with feed, which was distributed using a compressed air system through a series of pipes to the 12 salmon cages.

The primary means of access to the barge was via an 800mm wide vertical fixed ladder **(Figure 6)** with double reinforcing bar rungs and handrails. The ladder was protected on either side by steel structures with rubber D-shaped fenders, and the depth from the ladder rungs to the outside edge of the D fenders was 375mm. On either side of the ladder there should have been a vertical rubber tyre fender arrangement designed to provide protection when larger vessels were mooring alongside. However, the vertical fender on the right-hand side of the ladder was missing after becoming detached following a heavy contact during a feed delivery on 8 February 2020.

The barge was classed as a fixed installation, and therefore was not subject to maritime regulation or oversight.

Mowi (Scotland) Ltd

Mowi was part of the Norwegian owned Mowi ASA[6], which was one of the largest seafood companies in the world, and the world's largest producer of Atlantic salmon. Mowi was formerly named Marine Harvest (Scotland) Ltd, and was rebranded in January 2019.

At the time of the accident, Mowi operated 25 sea farms in Scotland, plus three hatcheries, four freshwater loch sites, a harvest station in Mallaig and a processing plant in Fort William. To service its sites, Mowi operated a fleet of 140 workboats; 99 RBBs of between 6 and 8m in length, and 41 large workboats up to 24m in length. Day-to-day management of the RBBs was the responsibility of the individual fish farm site managers, while the workboats were managed by site area managers. Neither the site managers nor the area managers had marine experience.

To ensure the safety of its employees and to comply with statutory legislation, Mowi employed a health and safety manager and two assistants who were experienced in the fish farm and manufacturing industries. As well as management of health and safety on the fish farm shore sites and offshore installations, the team monitored the certification and training of the workboat crews.

[5] Sometimes referred to as C-Cap feed barge.

[6] ASA is the Norwegian abbreviation for Allmennaksjeselskap, which signifies a public company similar to PLC in the UK.

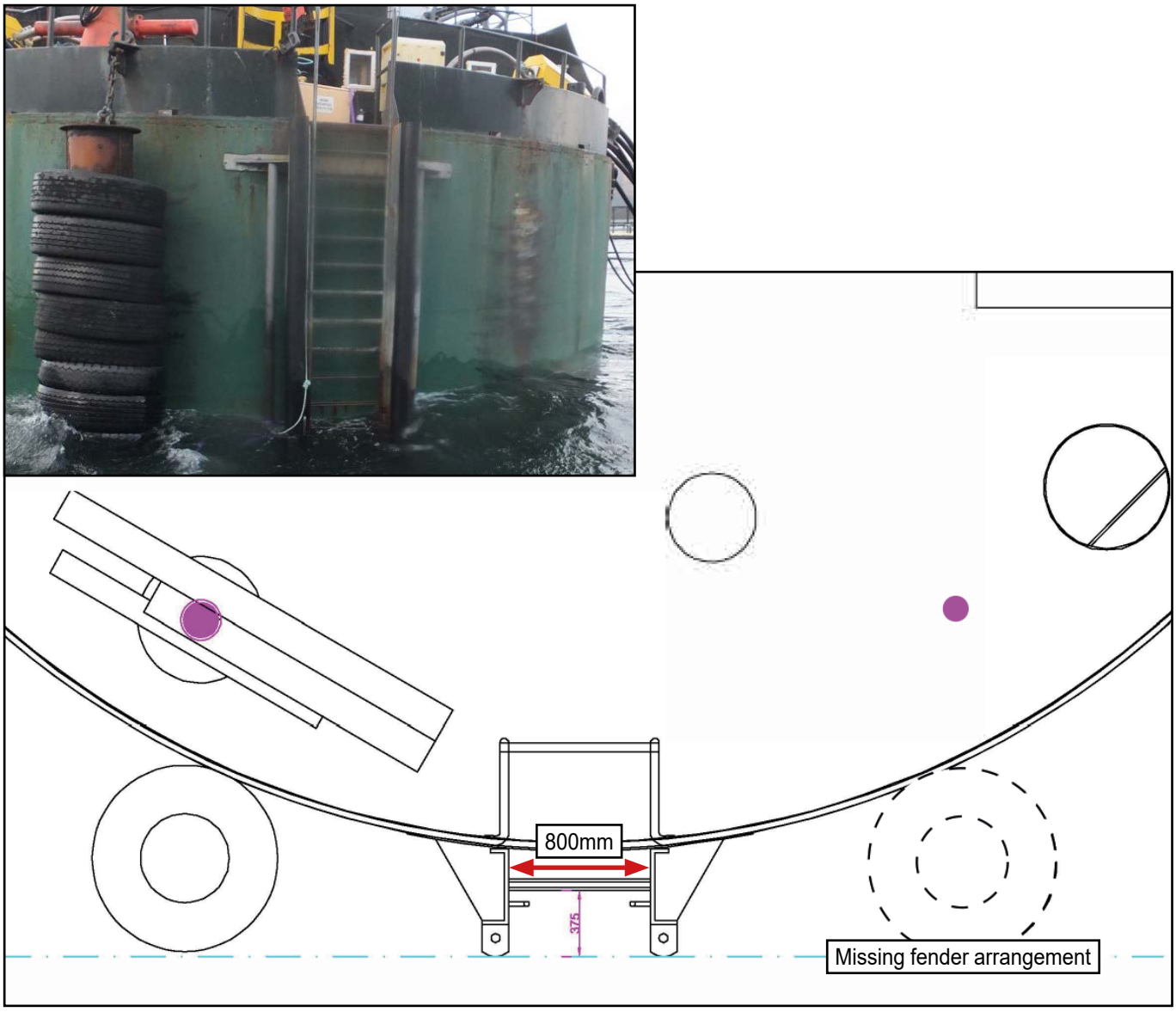

Figure 6: Plan view of the barge ladder arrangement

The health and safety team had conducted a wide range of risk assessments and developed and implemented safe systems of work that covered most of the shore and farm-based activities. Mowi did not have a marine safety management system (SMS) for its workboats but had conducted a generic risk assessment for boat operations and a risk assessment titled *Workoat Operations – Coming Alongside Circle Pens or Steel Groups*. There were no dedicated risk assessments, procedures or safe systems of work for the transfer of personnel to and from the cages or the barge.

The boat operations risk assessment identified the risk of injury due to crushing; to mitigate this, it required the boats to be brought alongside the barges, cages and SeaCaps in a controlled manner. *The Workboat Operations – Coming Alongside Circle Pens or Steel Groups* risk assessment was conducted in April 2019 following concerns raised about the dangers to personnel when mooring workboats alongside cages or pens. The focus of the risk assessment was damage to the offshore installations and injuries to those working on them. The generic risk control measures included:

> *MOWI Site Manager or his Assistant to discuss procedure with Workboat outside the area of the pen grid, and make a proper risk assessment of the site **BEFORE** approaching the pens to highlight any possible risks. Relay relevant information to all concerned.*

For the specific risk of crushing injuries to personnel when the workboat approaches alongside the salmon cages or pens, the risk control measures included the pre-rigging of mooring lines on the installation, and staff to keep clear of the danger zone until the boat is secured alongside.

Mowi's PPE policy for site staff was as follows:

- *Standard Oil Skins worn with 403 Hybrid Life Jacket – suitable for daylight & hours of darkness*
- *Fladen survival suit worn on its own – suitable for daylight hours only*
- *Fladen survival suit worn with 403 hybrid life jacket – suitable for daylight & hours of darkness*
- *Crotch straps are provided but it is not mandatory to wear them, however if not worn they must be safely stowed away in the back of the jacket.* [sic]

During the previous 5 years, Mowi had recorded 18 other boat transfer incidents, including 8 crush injuries to personnel involved in transfers to/from the RBBs and the fish farm installations.

The aquaculture industry

The aquaculture industry in the UK has grown and consolidated in the last 30 years, with 5 companies responsible for around 93% of, predominantly, Atlantic salmon production. The industry produced approximately 200,000t of salmon in 2019 and was a major contributor to the Scottish economy.

During recent years, the aquaculture industry has joined with stakeholders to develop safety initiatives, including an annual safety health and awareness day. The Aquaculture Safety Group also meets biannually and is attended by industry representatives, the Health and Safety Executive and the MCA.

ANALYSIS

The accident

Ardintoul fish farm's assistant manager was crushed between *Beinn Na Caillich*'s bulwark and the barge ladder structure because he stepped across onto the ladder while the workboat was still moving ahead. He drowned because he was unable to hold onto the ladder and slipped out of his lifejacket before entering the water.

This section of the report will consider the conduct of the boat transfer operation, the cause of the crush injury and subsequent drowning, the emergency response, use of PPE and Mowi's management of marine safety.

Conduct of personnel transfers

The guidance provided by the MCA and the Workboat Association was clear on the importance of conducting risk assessments for all personnel transfers and for ensuring that they are properly planned, communicated and supervised by a responsible person. Mowi had a large fleet of workboats and routinely used them to transfer staff to and from its offshore fish farm installations. However, it had not conducted risk assessments or provided safe systems of work, nor written procedures for personnel transfers by boat.

Personnel transfers between the fish farm installations were typically carried out using the RBBs. On this occasion, the assistant manager asked *Beinn Na Caillich*'s skipper to transfer him from salmon cage 10 to the barge. This was probably because there was only one RBB on site and it was being used by the three fish farm technicians working on salmon cage 2.

Beinn Na Caillich's skipper agreed to the assistant manager's request and decided to carry out a 'touch and go' transfer rather than secure the workboat to the barge using mooring ropes **(Figure 7)**, the procedure usually used for longer stays alongside. This was probably because he wanted to save time; however, his decision might also have been influenced by the fact that one of the mooring fenders was missing. Regardless, the skipper did not discuss his plan with the assistant manager and did not inform his crew or the fish farm technician on the barge of his intentions for the transfer. This was probably because he had an expectation that the assistant manager understood his intentions and knew not to step onto the ladder until it was lined up with the bulwark door and the vessel was stopped.

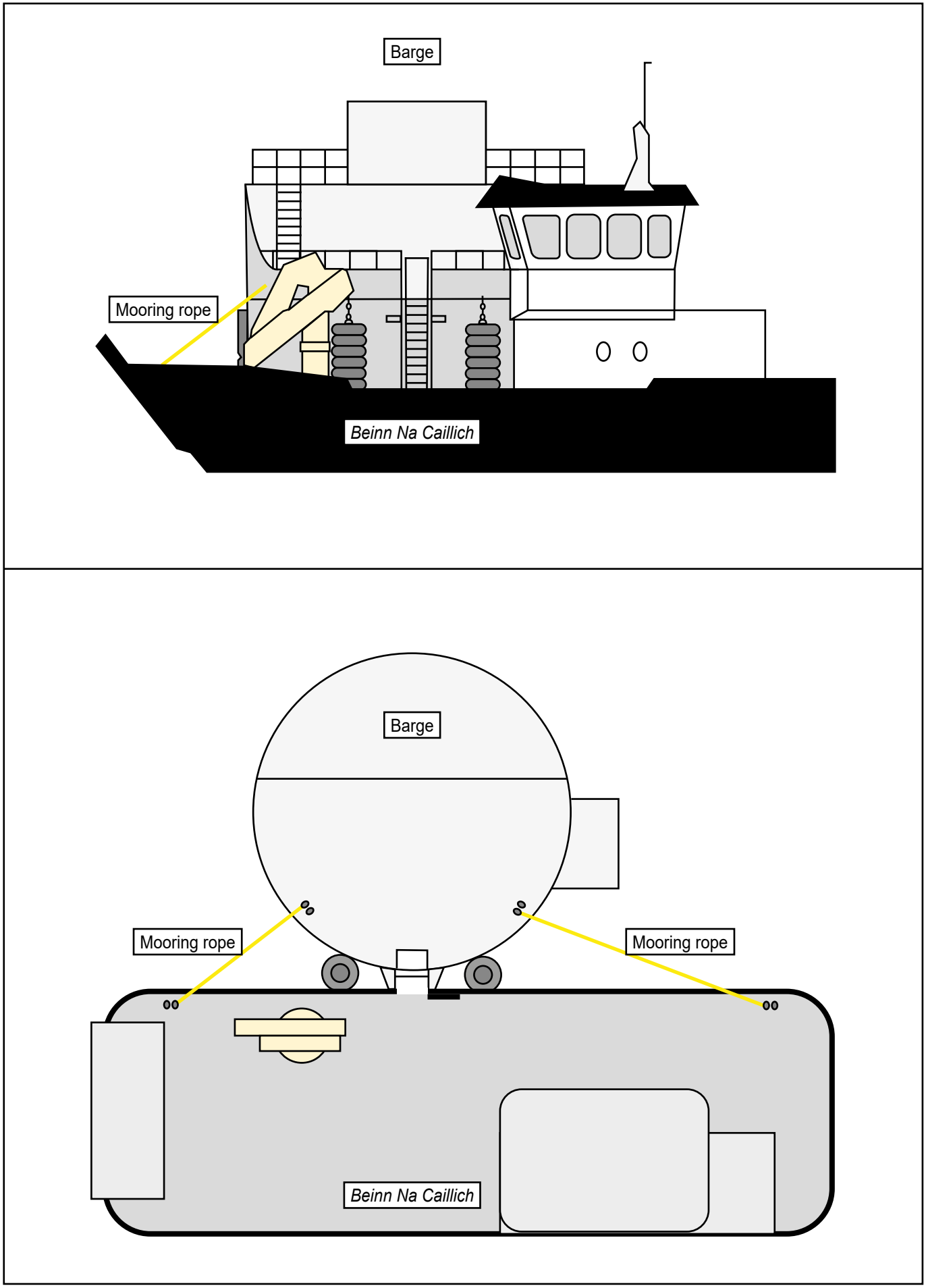

Figure 7: Illustration of the method usually used to secure the workboat alongside the barge

The assistant manager's decision to step onto the barge access ladder while *Beinn Na Caillich* was still moving ahead might have been influenced by his experience of touch and go transfers using the RBBs. He might also have been keen to save time. Regardless of his motivations, the assistant manager clearly did not appreciate the risk he was taking.

Being crushed against a fixed object such as a quayside, pontoon or, as in this case a barge, while attempting to step on or off a moving boat is entirely foreseeable. For that reason, all personnel transfers need to be properly supervised by the boat's crew. In this case, the assistant manager was allowed to make his own way to the disembarkation point and there were no crew on hand to control and supervise him. The bulwark gate being routinely left in the open position made it much easier for the assistant manager to act on his own initiative and more difficult for the master to intervene.

Given the number of previous accidents that had occurred on Mowi sites during staff transfers using the RBBs, it was surprising that a risk assessment had not been carried out and procedures put in place for personnel transfers. The absence of established procedures or any formal planning and communication, in accordance with the guidance set out by the MCA and industry bodies such as the Workboat Association, meant that personnel transfer operations on Mowi sites were not being adequately controlled, and therefore were not always being carried out in a safe manner.

Emergency response

During the rescue operation, no consideration was given to using *Beinn Na Caillich*'s manoverboard recovery equipment. While the use of the bow ramp and a boat hook was effective in bringing the casualty alongside and lifting his airways clear of the water, the crew relied on the RBB crew to recover the casualty from the water.

Beinn Na Caillich's crew had not conducted manoverboard drills and it was evident that they were unfamiliar with the workboat's manoverboard recovery equipment. The conduct of regular emergency drills helps ensure that all crew members are familiar with their vessel's emergency procedures and safety equipment and are therefore fully prepared to respond when things go wrong.

The use of personal flotation device crotch straps

The assistant manager suffered severe crush injuries before he fell from the ladder into the water; however his cause of death was drowning. The assistant manager was wearing a lifejacket when he stepped from the boat. However, he slipped out of it as he fell from the ladder, with the result that he was unsupported in the water.

It is unknown how well fitted the lifejacket was, but as permitted by company policy, its crotch strap had not been fastened. Crotch straps are designed to stop lifejackets riding up on entry to and while in the water; they are not designed to support the weight of the person wearing it. However, had the assistant manager's crotch straps been fastened, it is possible that he would not have slipped out of his lifejacket.

Mowi's policy of allowing the wearer to decide whether or not to attach the crotch strap was contrary to best practice and published guidance from both the MCA and the International Maritime Organization. Properly fitted lifejackets with fastened crotch straps will help keep an unconscious or incapacitated casualty's airways clear of the water and therefore significantly increase their chances of survival.

Safety management

Mowi Scotland operated a substantial fleet of workboats on its fish farm sites, 41 of which were a similar size to *Beinn Na Caillich*. Despite this, it did not have a dedicated marine manager or a marine SMS. Instead, it relied on its area managers and local site managers to oversee the safe operation of its on-water activities. The area and site managers had no maritime experience, and they relied on the individual workboat skippers to safely operate their vessels. This allowed for inconsistent levels of safety across the workboat fleet.

There is no doubt that operating so many vessels presented a challenge that was made more difficult because senior management were not fully aware of the marine risks or the published guidance. The company had one generic risk assessment for its boat operations and no documented safe systems of work. The risk assessment carried out for the activity of workboats coming alongside the pens identified the risk of crush injuries, but this was focused on those working on the fish farm installations and did not consider those on board the boats. This oversight reflects the safety management team's lack of maritime knowledge and their focus on the safety requirements of shoreside regulations.

The Workboat Code Edition 2 recommended the implementation of an SMS that complied with the principles of the ISM Code, and it contained some specific operational requirements, including the conduct and recording of emergency drills. The purpose of the ISM Code is to provide an international standard for the safe management and operation of ships and for pollution prevention, and it contains guidelines for shipping companies and their employees, both on ship and ashore, to follow.

The need for Mowi to implement a marine SMS, as recommended in the Workboat Code Edition 2, was clearly apparent, as was the need to employ maritime management expertise. The introduction of these elements would also ensure that Mowi complied with its obligations under The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997 to adopt a coherent approach to safety management at every level of the organisation. *Beinn Na Caillich* was brought into service under the Brown Code, before the Workboat Code Edition 2 came into force; however, Mowi was operating several newer workboats that were certified as compliant with the latest code of practice. Given this, it would make good sense for Mowi to ensure all its existing workboats are certified to, and comply with the requirements of the Workboat Code Edition 2.

Organisational factors (industry maturity)

The aquaculture industry has grown rapidly during the last 30 years. Consequently, the sector's safety management approach has struggled to keep pace with its organisational culture to deliver commercially, as illustrated by this accident. The disparity between aquaculture practices and traditional marine industries can be regarded as a strong contributory factor in this case, particularly with respect to the knowledge of control measures that are effective in the traditional marine industry. The aquaculture industry straddles the regulatory requirements of both the Health and Safety Executive and the MCA, which can give rise to confusion regarding which regulations apply. The only effective counter to this is an improvement in organisational knowledge and learning throughout the industry.

Although the industry and regulators have collaborated with events and the Aquaculture Safety Group forum to promote safety, it is evident that this work must be accelerated to improve maritime knowledge and reduce the likelihood of accidents across the aquaculture industry going forward.

CONCLUSIONS

- Ardintoul's assistant manager was crushed between *Beinn Na Caillich* and the feed barge because he stepped from the workboat on to the barge access ladder while the vessel was still moving ahead.
- He did not appreciate the risk he was taking and was able to step across because the bulwark gate had been left in the open position and there were no crew on hand to supervise the transfer.
- The assistant manager drowned because he slipped out of his lifejacket before he dropped into the water and, due to his injuries, was unable to keep his airways above the surface.
- The use of a crotch strap, in addition to correct fitting of the lifejacket, might have prevented the assistant manager's lifejacket slipping off, and therefore would have increased his chances of survival once in the water.
- The crew on board *Beinn Na Caillich* were not fully prepared to deal with the emergency situation. They had not conducted regular manoverboard recovery drills and were not familiar with the use of the vessel's manoverboard recovery equipment.
- The transfer of personnel by workboat had not been properly risk assessed, and the absence of a documented safe system of work meant that these operations were not being properly controlled.
- Despite the large number of vessels operated by Mowi, the company lacked both staff with the experience to oversee marine operations and an effective marine safety management system.

ACTION TAKEN

Mowi (Scotland) Ltd has:

- Reviewed, revised, and developed policies and risk assessment method statements for:
    - embarking and disembarking vessels
    - wearing of lifejackets
    - manoverboard emergency procedures.
- Introduced new equipment and training for recovery of a man overboard.
- Incorporated the lessons learned from this accident into its E-Learning package for employees during induction.
- Engaged external auditors to undertake an audit of its current health and safety management systems.

RECOMMENDATIONS

Mowi (Scotland) Ltd is recommended to:

2021/110 Apply the standards set out in the Workboat Code Edition 2 to all its existing workboats and, specifically, to fully implement a safety management system across its fleet that complies with the principles of the International Safety Management Code.

2021/111 Ensure that appropriate marine expertise is present or provided to its senior management team to oversee the safety of its vessels and marine operations.

SHIP PARTICULARS	
Vessel's name	*Beinn Na Caillich*
Flag	UK
Classification society	Not applicable
IMO number/fishing numbers	Not applicable
Type	MCA Category 2 workboat
Registered owner	Marine Harvest (Scotland) Limited
Manager(s)	Marine Harvest (Scotland) Limited
Year of build	2018
Construction	Steel
Length overall	19.30m
Registered length	17.53m
Minimum safe manning	2

VOYAGE PARTICULARS	
Port of departure	Kyle of Lochalsh
Port of arrival	Kyle of Lochalsh
Type of voyage	Coastal
Manning	2

MARINE CASUALTY INFORMATION	
Date and time	18 February 2020 at 1510
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	Ardintoul Point, Loch Alsh
Place on board	Deck
Injuries/fatalities	1 fatality
Damage/environmental impact	None
Ship operation	Personnel transfer
Voyage segment	Transit
External & internal environment	Air temp 4°C, water temp 6-8°C, WSW force 4-5, visibility good, sea state calm
Persons on board	5