

Transportation Safety Board  
of Canada



Bureau de la sécurité des transports  
du Canada

**MARINE INVESTIGATION REPORT  
M14A0289**



**CAPSIZING AND SUBSEQUENT LOSS OF LIFE**

**SMALL FISHING VESSEL SEA SERPENT 25  
OFF LITTLE PORT HEAD, NEWFOUNDLAND AND LABRADOR**

**26 JUNE 2014**

**Canada**



The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

## Marine Investigation Report M14A0289

### **Capsizing and subsequent loss of life**

Small fishing vessel Sea Serpent 25

Off Little Port Head, Newfoundland and Labrador

26 June 2014

### *Summary*

On 26 June 2014, at approximately 0900 Atlantic Daylight Time, the small fishing vessel Sea Serpent 25 took on water and capsized while engaged in fishing off Little Port Head on the west coast of Newfoundland. At the time, there were 4 crew members on board. No distress call was made, and the overturned vessel was sighted by chance at 1200 by a Department of Fisheries and Oceans vessel on patrol. Three crew members were rescued and 1 deceased crew member was recovered.

*Le présent rapport est également disponible en français.*



## *Factual information*

### *Particulars of the vessel*

**Table 1. Particulars of the vessel**

Name of vessel	Unnamed (model name: Sea Serpent 25)
Department of Fisheries and Oceans vessel registration number	138828
Type	Small fishing vessel
Estimated gross tonnage	4.99
Length overall <sup>1</sup>	7.62 m
Built	2006, King's Point, N.L.
Propulsion	Two 50-horsepower outboard motors
Cargo	Approximately 363 kg of crab
Crew	4
Registered owner	Not registered

### *Description of the vessel*

The Sea Serpent 25<sup>2</sup> was a multi-purpose fishing vessel constructed of moulded glass-reinforced plastic (Photo 1). It had an open deckhouse and cuddy forward, and two 50-horsepower outboard motors aft.

The hull was of open construction, and there were 2 plywood bins, 1 fitted on either side of the vessel, that were used to stow the catch. When hauling or setting crab traps, a piece of wood was placed on top of the bins and was used as a platform for the traps. A watertight deck was fitted a few centimetres above the keel and provided a flat surface to stand on. An engine well in the stern plate provided support for the outboard motors. The battery, which was not covered, rested on the port quarter of the deck under the engine well (Appendix A).

**Photo 1. Sea Serpent 25**



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- <sup>1</sup> Units of measurement in this report conform to International Maritime Organization Standards or, where there is no such standard, are expressed in the International System of units.
  - <sup>2</sup> The vessel in this occurrence was unnamed and unregistered. Therefore, it is referred to throughout this report by its model name.

A 3-centimeter drain hole with a removable plug was located in the stern plate (Photo 2). The drain hole was on the vessel's centreline and was just above the deck, but below the waterline. To drain any water that had accumulated on board, the practice was to accelerate the vessel until it was planing<sup>3</sup> and then remove the plug; the water would then drain out the drain hole. Buckets were kept on board that could be used as bailers if necessary.

Photo 2. Drain hole and removable plug



The vessel carried a lifebuoy, flares, and 4 personal flotation devices (PFDs) that were stowed on hooks on the port side of the deckhouse. A very high frequency (VHF) radiotelephone with a digital selective calling (DSC) feature was also carried on board.

### *History of the voyage*

At about 0600<sup>4</sup> on 26 June 2014, the Sea Serpent 25 departed Frenchman's Cove, Newfoundland and Labrador, with the master and 3 crew members on board. The vessel headed towards the crab fishing grounds, which were located approximately 4 nautical miles (nm) from shore, arriving at the first string of crab traps at about 0700. The master and crew then hauled and set the first string of 15 traps.

While hauling the gear, the master and crew member no. 1 were positioned by the helm where the crab trap hauler was located, while the other 2 crew members put the crabs in the plywood bins and then stacked the empty traps on a piece of wood that was placed on top of the bins (Appendix A). To set the gear, crew member no. 2 baited the traps, crew member no. 3 sewed the traps shut, and crew member no. 1 and the master threw the traps overboard. A small quantity of water accumulated on board while hauling the first string of traps, so one of the crew members removed the plug from the drain hole to drain the water.

As was normal practice, the master applied enough power to get the vessel on a plane so that the water would drain as they proceeded toward the second string. To re-insert the plug, the metal handle must be snapped down in order to expand the rubber, create a watertight seal, and lock the plug in place. This required physically getting on hands and knees and reaching aft to where the plug was located.

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<sup>3</sup> As the speed of a vessel increases, hydrodynamic lift increases and the buoyant force decreases. The hull rises out of the water as lift becomes the predominant upward force on the hull and, at this point, the vessel is planing.

<sup>4</sup> All times are Atlantic Daylight Time (Coordinated Universal Time minus 3 hours).

The second string was then hauled and the crabs were distributed evenly between the 2 bins. The combined yield weighed about 363 kg. The empty traps were divided evenly and placed on top of the bins. The master then began to set the second string of traps, alternating between taking traps from the stack on the port side and the one on the starboard side.

After 4 traps had been set, one of the crew members noticed that there was a considerable amount of water on board and alerted the others. The crew began bailing out the water with a 20-litre bucket, but there was too much water for this to be effective. The crew then pushed the remaining traps stacked on the starboard side overboard, followed by the ones on the port side. As the vessel continued to settle lower in the water, the outboard engines stalled and all power and maneuverability was lost. About a minute later, at approximately 0900, the stern was under water and the vessel capsized to starboard. There was no opportunity to make a distress call.

Following the capsizing, the master and 2 of the crew members each managed to fully don the PFDs that had been hanging on the port side of the deckhouse. The master and 2 crew members then hung onto the capsized vessel. The third crew member, however, was unable to don a PFD and treaded water until he could grab onto a 20-litre gas can and the 20-litre gas tank for the outboards that had floated to the surface. As he held on to the containers, he drifted away from the overturned vessel, which was held in position by the crab gear.

At about 1000, one of the crew members hanging onto the capsized vessel was checked for signs of life by the master and was found unresponsive. The master secured him to the vessel with some rope. At 1200, the overturned vessel was inadvertently discovered in position 49°08.04' N, 058°30.17' W, 3.3 nm west-northwest of Little Port Head (Appendix B) by 2 Department of Fisheries and Oceans (DFO) officers who were patrolling the area. The DFO officers recovered 2 survivors, and then continued the search for the third crew member, who had drifted out of sight. He was rescued from the water, still holding onto the containers, at around 1230. The deceased crew member was recovered by the Canadian Coast Guard cutter (CCGC) *Cape Fox* at 1405.

Following the recovery, the CCGC *Cape Fox* towed the overturned vessel to Lark Harbour, arriving at 1740. The surviving crew members were released after being transported to shore by the DFO patrol vessel and cleared by medical personnel. The cause of death for the deceased crew member was drowning.

### *Environmental conditions*

At the time of the occurrence, the weather was clear and the winds were from the north at 5 to 10 knots. The seas were less than 0.5 m, and the sea temperature was 10°C.

### *Vessel certification*

As a small fishing vessel not exceeding 15 in gross tonnage, the *Sea Serpent 25* was subject to Part II of the *Small Fishing Vessel Inspection Regulations* (SFVIR). As such, the vessel was not

required to undergo periodic inspections by Transport Canada (TC). The owner had not registered the vessel with TC, but it was licensed with DFO.

### *Personnel certification and experience*

The master had over 40 years of experience fishing and held a valid Marine Emergency Duties (MED) certificate. He did not hold a marine certificate of competency and was not required to until 07 November 2015.<sup>5</sup> He did not hold a Radio Operator's Certificate with Marine Qualifications (ROC-M) as required by regulation.<sup>6</sup>

Crew member no. 1 and crew member no. 2 were lifelong fishermen, each having over 30 years of experience. Crew member no. 3 was not a fisherman, but occasionally took part in short fishing excursions. The 3 crew members did not work regularly with the master.

### *Damage to the vessel*

One of the outboard motors was deemed a total loss. The other was put back into operation after servicing. There was no damage to the vessel's hull.

### *Equipment requirements for small fishing vessels*

#### *Personal flotation devices*

In Canada, falling overboard is the second highest cause of death in the fishing industry.<sup>7</sup> Falling into cold water involves an initial cold shock, which is most dangerous and potentially lethal when a person is suddenly immersed in water below 15°C.<sup>8</sup> This can be quickly followed by exhaustion while the person attempts to stay afloat in the water. Exhaustion increases rapidly without the assistance of a PFD.

For fishing vessels less than 15 in gross tonnage, such as the Sea Serpent 25, the SFVIR addresses the carriage of lifesaving equipment, fire extinguishing equipment, and some precautionary measures against fire. Specifically, the SFVIR requires that vessels in the length range of the Sea Serpent 25 carry an approved standard lifejacket for each person on board, a lifebuoy, and 6 flares.

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<sup>5</sup> *Marine Personnel Regulations*, paragraph 212(1)(e)

<sup>6</sup> *Marine Personnel Regulations*, division 7, section 266

<sup>7</sup> TSB Marine Investigation Report M09Z0001, *Safety Issues Investigation into Fishing Safety in Canada*

<sup>8</sup> Dr. C.J. Brooks, K.A. Howard, et.al., "Chapter 10 - Drowning is Not a Helpful Diagnosis Written on the Death Certificate," *Survival at Sea for Mariners, Aviators and Search and Rescue Personnel*, North Atlantic Treaty Organization and Research and Technology Organization (February 2008)



In 2012, TC issued Ship Safety Bulletin 06/2012, which allows PFDs to be used as an alternative to approved lifejackets. The bulletin specifies that if PFDs are used, they must be approved by TC, the Canadian Coast Guard (CCG), or DFO, and they must be worn at all times when in an open vessel.

TC currently has an initiative underway to replace the existing SFVIR with new fishing vessel safety regulations,<sup>9</sup> and the proposed modifications were tabled and discussed at the meetings of the Canadian Marine Advisory Council in April and November 2014. The proposed regulations include expanded requirements for lifesaving equipment and, for certain vessels,<sup>10</sup> incorporation of the policy permitting PFDs to be carried on board in lieu of lifejackets as long as the PFD is worn at all times while in an open vessel, such as the Sea Serpent 25, is underway.

Furthermore, the proposed regulations will require that no person shall operate, or permit another person to operate, a fishing vessel in circumstances that could jeopardize the safety of the crew unless a lifejacket or PFD is worn by all persons on board if the fishing vessel has no deck or deck structure, or by all persons on the deck, if a fishing vessel has a deck or deck structure. TC is continuing to work with stakeholders and industry on new standards for flotation devices that are more wearable.

Data from the Workplace Health Safety and Compensation Commission (WHSCC) of Newfoundland and Labrador indicate that, between 2005 and 2014, 72 percent of all fatalities involving fish harvesters were drownings at sea. The WHSCC also notes the importance of assessing the type of PFD that would be ideal for fishing operations.

The Newfoundland and Labrador *Occupational Health and Safety Regulations, 2012* also specify that when a worker is employed under conditions where there is a risk of drowning, he or she “shall wear a personal flotation device appropriate to the work environment and hazards.”<sup>11</sup>

#### *Very high frequency radiotelephone with digital selective calling*

A registered very high frequency (VHF) radiotelephone with digital selective calling (DSC) can be a reliable means to transmit a distress signal to search and rescue authorities and other vessels within the area that may be able to provide immediate assistance. It allows the master or crew member to simply press a button that automatically transmits the distress signal. However, in order to function properly, the DSC must be properly integrated with a

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<sup>9</sup> Part I of the proposed regulations, which addresses safety equipment and stability, is currently working its way through the regulatory process. TC does not have a detailed timeline of when the proposed regulations will be published in the *Canada Gazette*.

<sup>10</sup> Vessels up to 12 meters in length and operating within Near Coastal, Class 2 voyages.

<sup>11</sup> *Occupational Health and Safety Regulations, 2012*, section 466

GPS receiver and programmed with data about the vessel and owner. This essential information helps potential rescuers find and reach the vessel as quickly as possible.

### *Emergency position-indicating radio beacons*

Emergency position-indicating radio beacons (EPIRBs) are currently required for vessels over 8 meters in length travelling outside Near Coastal Class 2.<sup>12</sup>

The proposed fishing vessel safety regulations will require EPIRBs to be carried on all fishing vessels over 12 meters in length on any voyage. As well, vessels of less than 12 meters in length (which represents approximately 66 percent of the fishing vessels) and operating in Near Coastal Class 2, will be required to carry

- (a) one or more life rafts, or a combination of life rafts and recovery boats, with a total capacity that is sufficient to carry the number of persons on board, or
- (b) the following equipment: (i) an EPIRB or means of two-way radio communication, unless the vessel is carrying on board an EPIRB required by the Ship Station (Radio) Regulations, 1999, and (ii) if the water temperature is less than 15 degree C, an immersion suit or an anti-exposure work suit of an appropriate size for each person [on] board.

### *Buoyancy and flotation*

A vessel's ability to remain afloat and upright in all loading and operating conditions is fundamental to safety. To this end, it is essential that the vessel has sufficient reserve buoyancy and stability, as well as the means to prevent water from accumulating on deck or from entering the hull. Freeboard, sufficient downflooding height, and adequate drainage must also be maintained. To ensure safety at sea, these factors must be taken into consideration when designing, constructing, and operating decked and undecked vessels.

For a decked vessel, buoyancy and stability are mainly provided by the volume of the watertight hull below the deck.<sup>13</sup> If the deck is surrounded by a bulwark, thereby forming a well, then the size, number, and location of openings in the bulwark, called freeing ports, should be sufficient to drain water quickly to avoid a free surface effect.<sup>14</sup> Reserve buoyancy and stability are a function of the freeboard measured to the position of the lowest downflooding point. Reducing the freeboard or the height of the downflooding point, therefore, reduces reserve buoyancy and stability, decreasing the margin of safety.

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<sup>12</sup> *Ship Stations (Radio) Regulations, 1999*, section 13

<sup>13</sup> A weathertight superstructure may also provide additional buoyancy and stability.

<sup>14</sup> A free surface effect may occur when water cannot drain freely from within a well and shifts with the vessel's movement.

For an undecked vessel, such as the occurrence vessel, buoyancy and stability are provided by the watertight hull, which extends to the top of the gunwale. This type of vessel is vulnerable to swamping as a result of water coming over the sides. The risk may be mitigated by limiting operations to relatively calm waters, by incorporating built-in flotation to improve survivability, and by providing means to efficiently remove any water that is shipped over the side. As with decked vessels, reducing the freeboard or the height of the downflooding point reduces the reserve buoyancy and stability, decreasing the margin of safety.

### *Small fishing vessels*

Under the current regulatory requirements in the SFVIR, there are no standards addressing adequate buoyancy and flotation for open vessels. Under the proposed fishing vessel safety regulations, vessels that are between 6 and 9 meters in length, such as the Sea Serpent 25, may be required to demonstrate conformity with recommended practices and standards for stability including, if applicable, buoyancy and flotation.

The proposed regulations also indicate that TC will provide further guidance as to the industry standards and practices that may be considered adequate for assessing stability or buoyancy and flotation. They specifically mention the standards offered by organizations such as Fish Safe BC, the Food and Agriculture Organization (FAO), the Society and Naval Architects and Marine Engineers (SNAME) and the Danish Fishermen Occupational Safety Services. Of these, only the FAO recommends tests for open vessels to ensure that they remain afloat and upright (adequate buoyancy and flotation) when swamped. The proposed modifications for fishing vessel construction requirements will be addressed in Part II of the new fishing vessel safety regulations.

### *Small commercial vessels*

For small commercial vessels, other than fishing vessels, stability, buoyancy, and flotation requirements are set out in the *Small Vessel Regulations* (SVR), which provide the following 2 options for compliance:

- adherence to the International Standards Organization (ISO) standard 12217-1:2013. For a vessel of similar operational profile, design, and construction as Sea Serpent 25, this standard includes provisions to
  - (i) protect against downflooding by ensuring a minimum freeboard and an adequate margin of heel to downflooding openings,
  - (ii) ensure sufficient stability against offset loading,
  - (iii) ensure adequate resistance to heel/roll due to wind and waves,
  - (iv) ensure adequate swamped buoyancy/flotation and stability, and
  - (v) ensure adequate bilge pumping and water detection in normal operations;

or

- adherence to the stability criteria found within TC's TP 1332, Construction Standards for Small Vessels, which does not specifically address fishing vessels. For a vessel like Sea Serpent 25, with a length greater than 6 m, the intact stability criteria can be applied to determine the vessel's lightship displacement and centre of gravity and the subsequent development of righting arm curves for various assumed operational conditions.

### *Safety Issues Investigation into Fishing Safety in Canada*

In August 2009, the TSB undertook an in-depth safety issues investigation into fishing vessel safety in Canada. The *Safety Issues Investigation into Fishing Safety in Canada* (SII) report was released in June 2012 and provides an overall, national view of safety issues in the fishing industry, revealing a complex relationship and interdependency among these issues. The Board identified the following safety significant issues requiring attention: stability, lifesaving appliances, fisheries resource management, the cost of safety, safety information, safe work practices, the regulatory approach to safety, fatigue, training, and fishing industry statistics.<sup>15</sup>

### *Outstanding recommendations*

Following the *Brier Mist* occurrence (TSB Marine Investigation Report M98L0149), in which a scallop dragger sank off Rimouski, Quebec, and 2 crew members drowned, the Board recommended that:

[t]he Department of Transport require small fishing vessels engaging in coastal voyages to carry an emergency position indicating radio beacon or other appropriate equipment that floats free, automatically activates, alerts the search and rescue system, and provides position updates and homing-in capabilities.

#### **TSB Recommendation M00-09**

The proposed fishing vessel safety regulations, Part I, will require EPIRBs for all fishing vessels over 12 meters on any voyage. Vessels less than 12 meters<sup>16</sup> operating in Near Coastal Class 2, such as the Sea Serpent 25, will not be required to carry an EPIRB if the vessel is carrying a life raft or recovery boat sufficient to carry the total number of persons on board, or both a means of 2-way radio communications and immersion suits. Transport Canada's response to Recommendation M00-09 was assessed in 2014 as Satisfactory Intent.<sup>17</sup> Given the

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<sup>15</sup> TSB Marine Investigation Report M09Z0001, *Safety Issues Investigation into Fishing Safety in Canada*

<sup>16</sup> Approximately two-thirds of fishing vessels operating in Canada are less than 12 m.

<sup>17</sup> A Satisfactory Intent rating is assigned if the planned action, when fully implemented, will substantially reduce or eliminate the safety deficiency, and meaningful progress has been made since the recommendation was issued.

delay in implementing the new regulations, the Board has reviewed the response to the recommendation and reassessed it as Unsatisfactory.<sup>18</sup> The recommendation remains active.

In addition to the Sea Serpent 25, between February 2010 and June 2014, the TSB received reports of 6 other fishing vessels of less than 12 meters that either capsized and/or sunk without being equipped with an EPIRB or otherwise successfully transmitting a distress message. These occurrences resulted in a total of 16 crew members having to abandon their vessels; only 7 of these 16 crew members survived.

- TSB Marine Investigation Report M10M0007 – The 11-meter scallop dragger vessel *Whole Family*, with 2 people on board, was reported missing and presumed sunk an estimated 7 nm from shore in February 2010, resulting in 2 fatalities.
- TSB Marine Investigation Report M10M0042 – The 11.6-meter scallop dragger vessel *R.L.J.*, with 4 people on board, was reported missing and presumed sunk 5.5 nm from shore in September 2010, resulting in 4 fatalities.
- TSB Marine Investigation Report M11M0057 – The 11-meter fishing vessel *Wendy and Michael*, with 2 people on board, was found capsized in November 2011, resulting in 1 fatality.
- TSB Marine Investigation Report M12W0062 – The 10.6-meter prawn trap vessel *Pacific Siren*, with 3 people on board, sank 5 nm from shore in May 2012. There were no fatalities. The crew was rescued 9 days later from a nearby island.
- TSB Marine Investigation Report M12M0046 – An unnamed 5-meter lobster trap vessel (VRN 155526), with 1 person on board, was reported overdue and was later found to have sunk close to shore in September 2012, resulting in 1 fatality.
- TSB Marine Investigation Report M14P0121 – The 7.6-meter crab trap vessel *Five Star*, with 2 people on board, sank about 500 meters from shore in June 2014, resulting in 1 fatality.

## *TSB Watchlist*

### *Loss of life on fishing vessels is a Watchlist issue*

The Watchlist is a list of issues posing the greatest risk to Canada's transportation system; the TSB publishes it to focus the attention of industry and regulators on the problems that need addressing today.

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<sup>18</sup> An Unsatisfactory rating is assigned if no action has been taken or proposed that will reduce or eliminate the deficiency. This rating may also be assigned when recommendations have been issued and outstanding for more than 5 years and there is no precise action plan or timeline provided to complete the required safety actions.

One of these critical safety issues is the loss of life on fishing vessels, given that there continues to be approximately 1 fishing-related fatality per month in Canada. The Board remains concerned about vessel stability, the use and availability of lifesaving appliances on board, and unsafe operating practices. Although regulations have been proposed by TC to address several deficiencies with respect to fishing safety, there have been significant delays in their implementation.

The Watchlist highlights the need for concerted and coordinated action by federal and provincial authorities and by leaders in the fishing community to improve the safety culture in fishing operations, recognizing the interaction of safety deficiencies.

## *Analysis*

### *Events leading to the capsizing and loss of life*

During normal fishing operations on the Sea Serpent 25, water accumulated on the vessel after hauling and setting traps. The procedure used to remove this incidental seawater was to increase the vessel's speed to an extent that the vessel was planing, remove the plug, and allow the water to drain through the open drain hole. In this occurrence, it is likely that the plug, which was difficult to access, was not re-inserted after this procedure, or was not re-inserted properly to create a watertight seal. Although the crew had observed a small amount of water coming into the engine well, the well was fitted on the stern plate with drain holes that were designed to drain that water overboard. There were no other through-hull openings, there was no hull damage, and the seas were slight at 0.5 m. Therefore, the drain hole is the most likely source of the water ingress in this occurrence.

The crew did not notice the increase in water level on board, as they were focused on the job of preparing and setting the traps. This is characteristic of a psychological lack of attention, inattentional blindness or perceptual blindness, which happens when an unexpected event is not recognized, even though it is in plain sight.<sup>19</sup> Furthermore, cognitive tunneling, a phenomenon of inattentional blindness, may have contributed to their lack of awareness. Cognitive tunneling is characterized by a person's lack of focus on the present environment while they are occupied with tasks such as fishing or their own internal thoughts. The vessel was not fitted with an automatic bilge pump and, combined with the fact that the crew were wearing rubber boots and would not have been alerted by the sensation of water on their legs, the water level continued to slowly and incrementally rise.

Once the abnormal amount of water on deck was observed, the crew attempted to bail it out with 20-litre buckets, as there were no pumps fitted on board. However, the volume of water was such that the buckets were not effective. The water then reached a height where it covered the exposed single battery at the extreme stern of the vessel and the battery short-circuited, leaving the vessel, including the very high frequency (VHF) radiotelephone, without power.

The vessel settled by the stern and capsized suddenly to starboard. Despite the speed of capsizing, 3 of the 4 crew members managed to seize and don the personal flotation devices (PFDs) that had been hanging on the port side of the deckhouse. The master was unable to send a distress signal before the vessel capsized. As a result, the crew were only discovered by chance about 3 hours later by a Department of Fisheries and Oceans patrol vessel. One crew member, though wearing a PFD, had died before their arrival.

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<sup>19</sup> I. Rock and A. Mack, *Inattentional Blindness*, MIT Press, 1998

## *Wearing of personal flotation devices*

Of the several unsafe practices on fishing vessels that have been identified by the TSB over the years, not wearing PFDs is a significant one. In the fishing community, some of the reasons for resistance to PFD use include discomfort, the risk of entanglement, and the perception that it is not practical or normal to wear a PFD. Furthermore, risks such as falling overboard, drowning, or entanglement are perceived to be low, with the result that fishermen see little benefit to protecting themselves from these risks while they focus on the day-to-day business of fishing.<sup>20</sup>

Unsafe behaviours that are rooted in traditional values, attitudes, practices, and the perception of efficiency prove the most difficult to change,<sup>21</sup> despite Transport Canada (TC) regulations that place the responsibility on the authorized representative to develop procedures for the safe operation of the vessel and for dealing with emergencies.<sup>22</sup>

In this occurrence, there were no lifejackets on board the *Sea Serpent 25*. Although the vessel was carrying PFDs, the master and crew members were not wearing them while working on board. Therefore, when the vessel capsized, the master and crew members lacked the flotation and extra visibility that PFDs provide. Although 3 crew members were able to access and don the PFDs once they were overboard, 1 crew member was unable to do so and was left without the assistance of a PFD for approximately 3.5 hours, increasing the possibility of adverse consequences.

Various initiatives across Canada have been gaining traction to promote the wearing of PFDs, and their use is becoming more common in Newfoundland and Labrador. The fishing safety associations, in conjunction with various fishing associations and nautical training schools across Canada, heavily promote the wearing of PFDs through advertising, campaigns, and regular promotional visits to ports. Furthermore, the proposed fishing vessel safety regulations will accept a broader range of flotation devices that are more wearable than traditional lifejackets by incorporating the options available within the SVR. Despite these initiatives, many fishermen still choose not to wear a PFD while at sea. This is recognized as a widespread safety concern in the Canadian fishing community.<sup>23</sup>

If fishermen do not wear PFDs or lifejackets while working on deck despite the industry awareness initiatives and regulations requiring their use, there is an increased risk that fishermen will drown in the event they fall overboard.

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<sup>20</sup> TSB Marine Investigation Report M09Z0001, *Safety Issues Investigation into Fishing Safety in Canada*

<sup>21</sup> D. M. DeJoy, "Behaviour change versus culture change: Divergent approaches to managing workplace safety." *Safety Science*, Vol. 43 (2005), p. 108

<sup>22</sup> *Canada Shipping Act 2001*, subsection 106(1)

<sup>23</sup> TSB Marine Investigation Report M09Z0001, *Safety Issues Investigation into Fishing Safety in Canada*



## *Distress communications*

### *Very high frequency radiotelephone with digital selective calling*

TSB investigations indicate that on smaller vessels such as the Sea Serpent 25, which are more vulnerable to sudden capsizing or sinking, there is often very little time to transmit a distress call. The timeliness of alerting authorities and requesting assistance in the event of a capsizing or a sinking is critical to the safety of those on board the vessel.

In this occurrence, the master did not make a distress call. A VHF-DSC was fitted on board, but was not integrated with a GPS or programmed with the vessel identification number. Furthermore the master was unaware of the automatic distress function. As no emergency authorities or other vessels were notified, no search and rescue operation was undertaken.

If masters and crew are unaware of the functionality of an on-board VHF-DSC radio and/or have not configured it adequately for use in an emergency, they may be unable to request assistance and alert authorities, significantly reducing the possibility of rescue.

### *Emergency position-indicating radio beacon*

Previous TSB investigations have found that carrying an emergency position-indicating radio beacon (EPIRB) can contribute to the saving of lives,<sup>24</sup> because it automatically sends a distress signal once it is immersed in water. Recently, 6 reported incidents involving small fishing vessels have been reported to the TSB, in which there were a total of 9 fatalities. None of the vessels were equipped with an EPIRB and no distress signals were communicated.

The Sea Serpent 25 did not carry an EPIRB, nor was it required to do so by regulation. When the vessel capsized, the master did not have enough time to broadcast any information to the authorities. However, carrying an EPIRB on board would have provided an opportunity to automatically transmit an alert to search and rescue authorities at the onset of the emergency.

The current regulations do not require vessels such as the Sea Serpent 25 to carry EPIRBs, and the proposed fishing vessel safety regulations will allow fishing vessels such as the Sea Serpent 25 to substitute alternative equipment in place of an EPIRB. One such substitute is for the vessel to be equipped with both a means of 2-way radio communications and a sufficient number of immersion suits for the crew on board. However, as demonstrated in this occurrence, with the rapid sinking of the vessel, this alternative equipment requirement would not always provide an equivalent level of safety to that afforded by an EPIRB.

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<sup>24</sup> TSB marine investigation reports M93M0004 (*Cape Aspy*), M97W0236 (*Pacific Charmer*), M98N0064 (*Atlantic Prize*) and M98F0009 (*Twin J*)

Not all fishing vessels carry an EPIRB that is capable of automatically transmitting a distress signal, and neither the current nor the proposed regulations require them to do so. This means that these vessels may not be able to automatically transmit a distress signal, causing search and rescue efforts to be delayed or not initiated.

If fishing vessels do not carry an EPIRB, there is a risk of search and rescue efforts being delayed or not initiated.

### *Safety standards for vessels of open design*

By virtue of their smaller size, open vessels are often powered by outboard engines and are not always fitted with mechanical pumping systems. The only hull penetration that would normally be considered necessary might be a small drain hole intended to clear excess water, such as was the case on the Sea Serpent 25. However, the absence of a watertight deck means that open vessels are vulnerable to water shipping over the side or swamping. Considering the potentially catastrophic results of swamping, which include sinking or capsizing, it is good practice for an operator of an open vessel to reduce exposure to environmental conditions that pose a risk of uncontrollable or severe swamping and to provide an efficient means to remove water from the vessel should that occur.

To mitigate the risk of swamping, an open vessel must also have adequate inherent buoyancy<sup>25</sup> to keep it afloat and upright, providing a level of protection from the elements as well as a platform from which the occupants can call for assistance. Such inherent buoyancy is also effective in protecting occupants against an unintentional or undetected ingress of water, as was experienced in this occurrence.

The safety requirements for small open fishing vessels are established by the *Small Fishing Vessel Inspection Regulations* (SFVIR), which currently lack any measures to address the construction of the vessel and ensure upright flotation in the event of swamping or flooding. The proposed amendments to the SFVIR are vague with respect to vessels the size of the Sea Serpent 25. They would require that manufacturers make use of recommended industry practices or standards, which may or may not address the risks of swamping or flooding.

These proposed amendments would be satisfied if occupants of vessels such as the Sea Serpent 25 were to wear PFDs and carry a means of two-way communication on board. However, as demonstrated by this occurrence, these items may not be sufficient to mitigate the risks to which small, open vessels are exposed. In this occurrence, the events transpired very quickly and the master did not have time to use the VHF radiotelephone to call for help. Furthermore, despite the favourable environmental conditions and having donned a PFD, one of the crew members passed away while waiting in the water for assistance.

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<sup>25</sup> Inherent buoyancy may be provided by incorporating watertight compartments or buoyant material into the construction of the hull of an open vessel.

The standard of safety for small open vessels used in commercial operations other than fishing is established by the SVR and accompanying construction standards. However, like the SFVIR, these requirements also do not ensure that open vessels are provided with adequate flotation when swamped or flooded. Although ISO 12217-1 does address this risk mitigation measure for vessels such as Sea Serpent 25, its application is optional under the SVR/construction standards. Manufacturers have the option to bypass the requirements for buoyancy and flotation and instead apply intact stability criteria, as would be done for a decked vessel.

If Canadian design and safety standards for open vessels do not incorporate measures to ensure these vessels are manufactured with adequate buoyancy to remain upright and afloat when swamped or flooded, the likelihood of survival in these emergency situations is reduced.

### *Safety issues in the fishing industry*

The *Safety Issues Investigation into Fishing Safety in Canada* (SII) categorized actions impacting safety into 10 significant safety issues and found that there are complex relationships and interdependencies among them. These safety significant issues are further analyzed in the SII.<sup>26</sup> In this occurrence, practices and procedures relating to 4 of the 10 safety significant issues identified in the SII were evident in this occurrence:

#### *Lifesaving appliances*

<b>Findings of the Safety Issues Investigation into Fishing Safety in Canada</b>	<b>Relationship to this occurrence</b>
Fishermen resist wearing PFDs because many have accepted the risk.	The PFDs on board the vessel were not being worn.
Fishermen may fit their vessels with lifesaving appliances (LSAs) only for regulatory compliance.	The master purchased only those lifesaving appliances required by regulation.

#### *Training*

<b>Finding of the Safety Issues Investigation into Fishing Safety in Canada</b>	<b>Relationship to this occurrence</b>
Fishermen assess and manage their risk based on experience.	The master had not taken training on the use of VHF-DSC radiotelephones or EPIRBs.

#### *Cost of safety*

<b>Findings of the Safety Issues Investigation into Fishing Safety in Canada</b>	<b>Relationship to this occurrence</b>
Fishermen usually weigh the cost (time and	The master did not spend time or resources on

<sup>26</sup> TSB Marine Investigation Report M09Z0001: *Safety Issues Investigation into Fishing Safety in Canada*

money) of safety drills, training, and equipment against the likelihood of an accident happening.	non-compulsory training. He also did not purchase any non-compulsory lifesaving appliances such as an EPIRB.
Fishermen generally see the likelihood of an accident happening as very low.	On the Sea Serpent 25, falling overboard or capsizing was considered very unlikely.

*Safe work practices*

<b>Finding of the Safety Issues Investigation into Fishing Safety in Canada</b>	<b>Relationship to this occurrence</b>
Fishermen do not always emphasize the importance of safety in work practices.	It was not a standard work practice to wear a PFD during fishing operations.

*Interdependency of safety issues*

The safety of fishermen is compromised by numerous issues that are interconnected. The following safety issues share a complex relationship and contributed to this occurrence:

- Lifesaving appliances – PFDs were not being worn and there was no EPIRB on board.
- Training – the master had a minimal amount of training.
- Cost of safety – the risks of falling overboard or capsizing were deemed low enough to reject purchasing non-compulsory lifesaving appliances.
- Unsafe work practices – the risks of not wearing a PFD were accepted.

Past attempts to address these safety issues on an issue-by-issue basis have not led to the intended result: a safer environment for fishermen. The SII emphasizes that in order to obtain real and lasting improvement in fishing safety, change must address not just one of the safety issues involved in an accident, but all of them, recognizing that there is a complex relationship and interdependency among those issues. Removing a single unsafe condition may prevent an accident, but only slightly reduces the risk of others. The safety of fishermen will be compromised until the complex relationship and interdependency among safety issues are recognized and addressed by the fishing community.

## *Findings*

### *Findings as to causes and contributing factors*

1. The vessel began taking on water in slight sea conditions, most likely due to water entering the vessel through the drain hole because the drain plug had not been inserted, or had not been inserted properly.
2. The vessel had no automatic means for discharging water, and the crew did not notice the increase in water level until it was too late for their bailing efforts to be effective.
3. The vessel lost power after water covered the exposed battery, which then short-circuited.
4. The vessel settled further into the water before rolling to starboard and capsizing.
5. No distress message or signal was sent by the crew and the overturned vessel was discovered by chance several hours later by a Department of Fisheries and Oceans vessel on patrol; 3 crew members were rescued and 1 deceased crew member was recovered.

### *Findings as to risk*

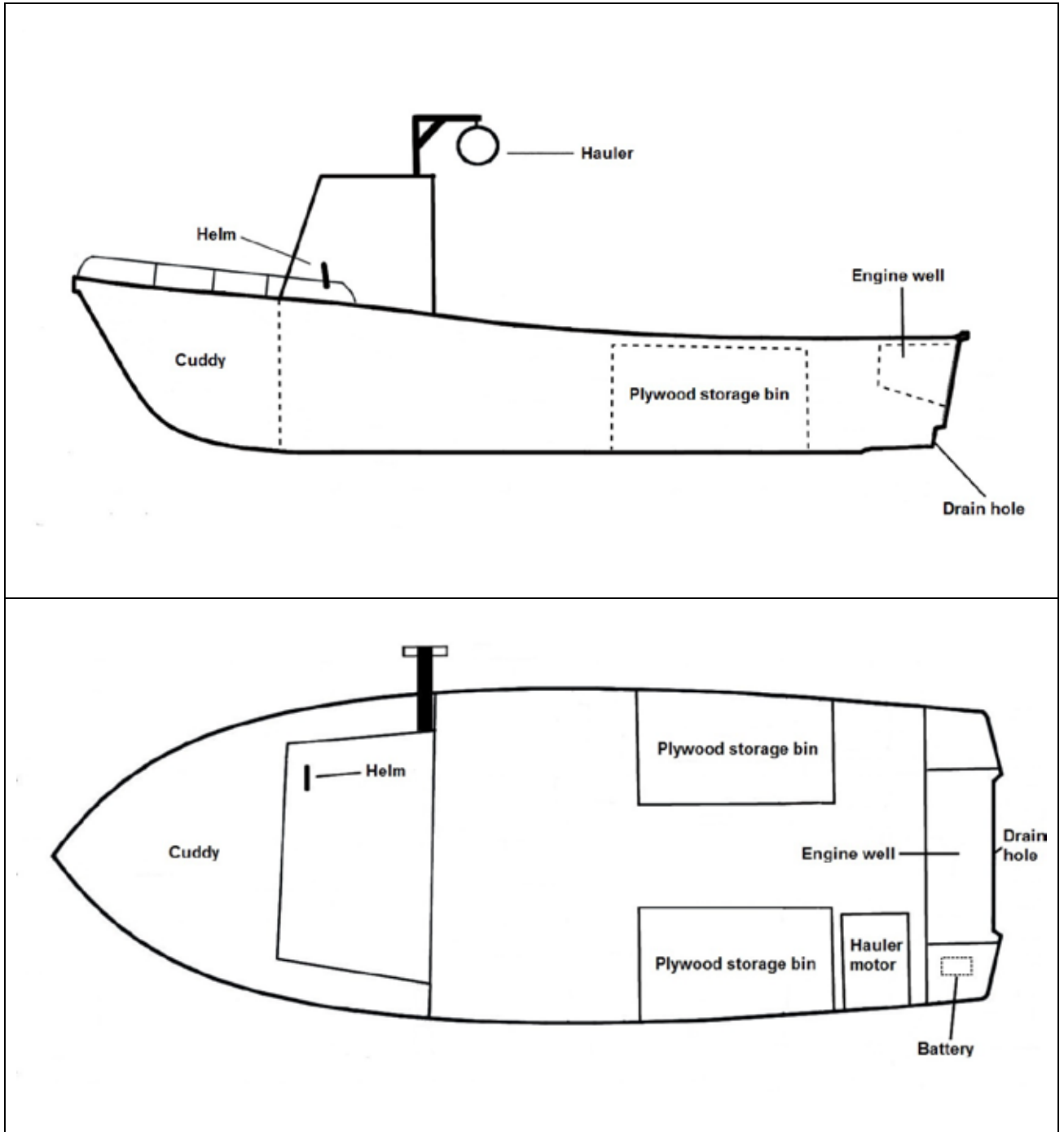
1. If fishermen do not wear personal flotation devices or lifejackets while working on deck, despite the industry awareness initiatives and regulations requiring their use, there is an increased risk that fishermen will drown in the event they fall overboard.
2. If masters and crew are unaware of the functionality of an on-board very high frequency radiotelephone with digital selecting calling, and/or have not configured it adequately for use in an emergency, they may be unable to request assistance and alert authorities, significantly reducing the possibility of rescue.
3. If fishing vessels do not carry an emergency position-indicating radio beacon, there is a risk of search and rescue efforts being delayed or not initiated.
4. If Canadian design and safety standards for open vessels do not incorporate measures to ensure these vessels are manufactured with adequate buoyancy to remain upright and afloat when swamped or flooded, the likelihood of survival in these emergency situations is reduced.
5. The safety of fishermen will be compromised until the complex relationship and interdependency among safety issues are recognized and addressed.

*This report concludes the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on 03 August 2015. It was released on 10 August 2015.*

*Visit the Transportation Safety Board's website ([www.tsb.gc.ca](http://www.tsb.gc.ca)) for information about the TSB and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.*

# Appendices

## Appendix A – Sea Serpent 25 profile and deck arrangement







*Appendix B – Area of the occurrence*

