



Transportation
Safety Board
of Canada

Bureau de la sécurité
des transports
du Canada



MARINE TRANSPORTATION SAFETY INVESTIGATION REPORT M20A0160

SINKING AND SUBSEQUENT LOSS OF LIFE

Fishing vessel *Sarah Anne*
Placentia Bay, Newfoundland and Labrador
25 May 2020

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Transportation Safety Board of Canada
200 Promenade du Portage, 4th floor
Gatineau QC K1A 1K8
819-994-3741; 1-800-387-3557
www.tsb.gc.ca
communications@tsb.gc.ca

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Le présent rapport est également disponible en français.

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Summary

On 25 May 2020 shortly after midnight, the fishing vessel *Sarah Anne*, with 4 people on board, departed St. Lawrence, Newfoundland and Labrador, to fish snow crab in Placentia Bay. The Marine Communications and Traffic Services Centre in Placentia, Newfoundland and Labrador, received an overdue report at 1945 that evening. A search was launched using several vessels and aircraft. The bodies of 3 crew members were recovered the following day. The body of the 4th crew member was recovered from the shore on 06 June 2020. The vessel was not found.

1.0 FACTUAL INFORMATION

1.1 Particulars of the vessel

Table 1. Particulars of the vessel

Transport Canada name	<i>Ann Lorie</i> *
Transport Canada official number	395976
Fisheries and Oceans Canada name	<i>Sarah Anne</i>
Fisheries and Oceans Canada vessel registration number	03100
Port of registry	Shelburne, Nova Scotia (NS)
Flag	Canada
Type	Fishing
Gross tonnage	14.48
Length overall	10.64 m
Registered length	9.66 m
Built	1980, Atkinson's Harbour Craft Limited, South Side, NS
Propulsion	1 diesel engine (201 kW) driving a single-pitch propeller

Crew	4
Registered owner	Private owner (St. Lawrence, NL)

* Although the vessel is registered with Transport Canada as the *Ann Lorie*, it was commonly known, and registered with Fisheries and Oceans Canada (DFO), as the *Sarah Anne*. The vessel is referred to as the *Sarah Anne* throughout this report.

1.2 Description of the vessel

The *Sarah Anne* was a Cape Island style vessel constructed of fibreglass and wood and originally designed for near-shore lobster fishing. The wheelhouse was forward of amidships, approximately 30 cm higher than the main deck and accessible through a wooden door on the aft bulkhead near the centreline. There was a life ring secured on the exterior of this door. Near the conning station in the wheelhouse were a GPS (global positioning system), a radar, an echo sounder, and 2 very high frequency (VHF) radiotelephones, one capable of digital selective calling (DSC).¹

There was a 6-person inflatable life raft in a cradle on top of the wheelhouse. The life raft was typically secured to the cradle with straps. The vessel's mast held radio and GPS antennas and a radar reflector (Figure 1).

Figure 1. Photo of the *Sarah Anne* before the occurrence, showing the radar reflector (1), life raft (2), access ladder to life raft (3), wheelhouse conning station (4), forward section of the main working deck (5) and aft storage area (6) (Source: Third party, with permission)



The forward accommodations space in the bow was accessible from the wheelhouse. The accommodations space was separated from the bilge space below the wheelhouse by a

¹ A VHF-DSC (very high frequency–digital selective calling) radiotelephone is connected to a GPS. By pressing a button, a user can send a distress call, automatically identifying the vessel and its position.

watertight bulkhead. About 10 immersion suits were stored in the accommodations space, along with an undetermined number of lifejackets.

The main working deck was divided into 2 sections. The forward section was equipped with a trap hauler and conning station on the starboard side. Operations involving setting and hauling traps were normally conducted here. In the centre of the deck, from the wheelhouse to 2 m forward of the stern, was a hatch approximately 60 cm wide that provided access to the propeller shaft. This non-watertight hatch was made of plywood panels and secured to the deck with screws. A scupper approximately 6 cm in diameter was located on each side of the hull. The investigation could not determine whether the scuppers were left open or plugged at the time of the occurrence. The aft section of the deck was used to store the snow crab catch, ice, and spare fishing gear.

Three electric bilge pumps were installed below the main deck. Two of these pumps were manually activated from inside the wheelhouse and the 3rd pump was activated automatically in response to rising water levels in the bilge. A battery-operated portable pump was stowed on board and was used as a backup to the 3 main bilge pumps. Because the vessel was not fitted with a bilge alarm, the crew would look through a small hatch in the wheelhouse deck to see if water was collecting in the forward area of the bilge.

1.3 Fishing operations

The season for harvesting snow crab normally opens in April or May and closes in June or July. When fishing snow crab, the *Sarah Anne* would typically depart after midnight and arrive on the fishing grounds² before 0500 and return to port later the same day. Fuel and ice were normally loaded the afternoon before departure. When the crew brought traps and their associated lines on board, they would stack each string of traps and secure the stack to the vessel in the forward section of the working deck once the entire string was on board.³

In 2019, the crew harvested snow crab with 5 strings of 25 traps each. The largest load recorded for that season was 1711 kg of snow crab, 50 traps, and lines (2543 kg combined weight). The landing on the final day of the 2019 season was 114 kg of snow crab, 75 traps, and lines (1363 kg combined weight).

Under the conditions of the 2020 snow crab licence, the owner was allowed to use up to 200 traps to harvest a maximum quota of 3290 kg of snow crab for the season.

In 2020, 120 of the allotted 200 traps were used and divided into 4 strings of 30 traps each. On the 1st trip of 2020, all 4 strings of gear were set and the vessel returned to port. On

² The snow crab fishing grounds in 2020 were approximately 25 nautical miles (NM) southeast of St. Lawrence, Newfoundland and Labrador.

³ Unlike lobster traps, snow crab traps stack well enough that there is room for catch and traps on board on the same trip.

19 May, the 2nd trip, the vessel had landed 1791 kg of snow crab after hauling and then re-setting the traps from strings 1 and 2; strings 3 and 4 were not hauled on that trip.

1.4 History of the voyage

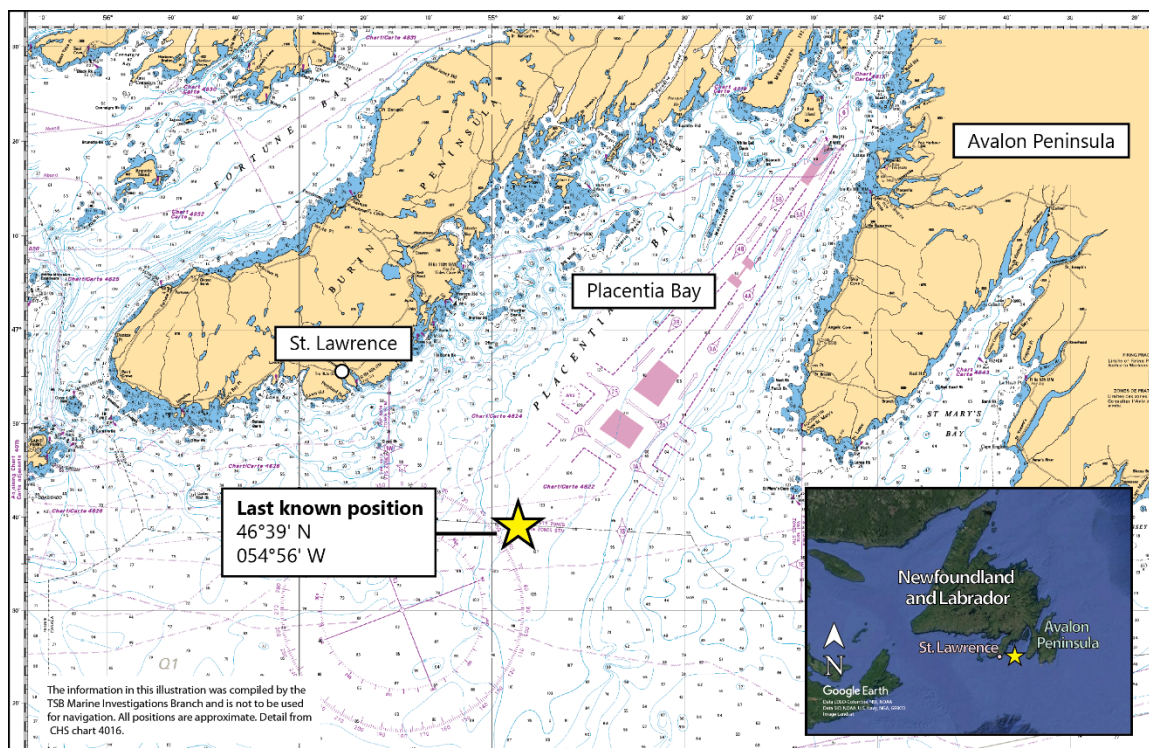
On 25 May 2020, at approximately 0012,⁴ the *Sarah Anne* departed St. Lawrence, Newfoundland and Labrador, loaded with 453 kg of ice and bound for the snow crab fishing grounds in Placentia Bay. The vessel was crewed by a master and 3 crew members. This was the 3rd and final trip planned by the crew to catch the remaining 1500 kg of snow crab quota for 2020.

By approximately 1000, the crew of the *Sarah Anne* had completed hauling strings 1 and 2, which were stowed on the port side of the main working deck. In these 2 strings, they had caught approximately 725 kg of snow crab. At this time, the crew was preparing to begin hauling string 3 and the master planned to catch the remaining quota in strings 3 and 4.⁵ When the vessel was last seen at 1030, at approximate position 46°39' N and 054°56' W, the crew was hauling string 3 (Figure 2).

⁴ All times are Newfoundland Daylight Time (Coordinated Universal Time minus 2.5 hours).

⁵ The estimated total cargo for the occurrence voyage was 3711 kg, including catch, 120 traps, and associated lines.

Figure 2. Area of the occurrence, showing the last known position of the *Sarah Anne* and the nearby traffic lanes (Source of main image: Canadian Hydrographic Service chart 4016, with TSB annotations; source of inset image: Google Earth, with TSB annotations)



That afternoon, an aircraft chartered by Fisheries and Oceans Canada (DFO) to monitor fishing activity in the area observed a total of 42 fishing vessels during its 5-hour patrol. At 1829 the aircraft's crew observed another snow crab vessel near the last known position of the *Sarah Anne* but did not observe the *Sarah Anne* at any time during the flight.

The *Sarah Anne* was expected to deliver its catch to a fish plant in St. Lawrence in the late afternoon. At 1945, the vessel was reported overdue to the Marine Communications and Traffic Services (MCTS) Centre in Placentia.

1.5 Search and rescue

At 1958, MCTS Placentia reported the overdue message to the Marine Rescue Sub-Centre (MRSC) in St. John's, Newfoundland and Labrador, so that the MRSC could coordinate the search and rescue (SAR) response. MCTS and the MRSC attempted to contact or locate the *Sarah Anne* by phone, radio, and all other available means to ascertain whether the vessel was in distress. At 2026, the Canadian Coast Guard (CCG) vessel *W Jackman* was tasked from Burin, Newfoundland and Labrador, and, at 2041, a Cormorant helicopter was tasked from Gander, Newfoundland and Labrador. At 2053, MCTS Placentia broadcasted a Mayday relay; the *Oceanex Connaigra* responded and, at 2203, was the first vessel to arrive at the last known position of the *Sarah Anne*. The search continued throughout the night.

The following day, between 0412 and 1236, the bodies of 3 of the crew members were found by SAR resources within 5 nautical miles (NM) of the *Sarah Anne*'s last known

position. The search for the last crew member continued until 27 May at 2045, when the incident was transferred to the RCMP as a missing persons report.

The SAR response took place over a 48-hour period, involving 9 vessels and 5 aircraft. Combined, these resources spent more than 200 hours searching the area for survivors.

The search continued for the *Sarah Anne* and the last crew member from 31 May to 06 June, using non-SAR resources, including the motor vessels *Keewatin* and *Paul A. Sacuta*. During the search, a buoy line from string 4 was found in 200 m of water approximately 2 NM southwest of the position where the *Sarah Anne* was last seen. Starting at this position, on 02 June, a remotely operated underwater vehicle from the *Paul A. Sacuta* was used to search for the *Sarah Anne*. During the underwater search, it was discovered that the other buoy line of string 4 had parted. Twenty-one of the 30 traps were found evenly spaced along the ground line, and the rest were found grouped together near the parted end. Neither the vessel nor string 3 were located during the underwater search.

On 06 June, the body of the last crew member was found in Doughboy Cove, 77 NM north-northeast of the *Sarah Anne*'s last known position. The bodies of all 4 crew members had work clothes on when they were recovered. The vessel was not found.

1.6 Environmental conditions

When the vessel was last seen at 1030, the reported wind speed was about 5 knots from the west-southwest, the air temperature was 4.8 °C, and the water temperature was 4.2 °C. The maximum wave height was 0.8 m.

In the hours after the *Sarah Anne* was last seen, the height of the waves began to increase to a maximum of 2.4 m at 2000. Throughout most of the day, the wave period was around 4.5 seconds. However, the recorded wave period had increased periodically to 7.4 to 8 seconds between 1030 and 1255, before returning to a 4.3 second average.

1.7 Personnel certification and experience

The master of the *Sarah Anne* had about 40 years of experience working on fishing vessels, with over 30 years as a master. Given his experience, the Professional Fish Harvesters Certification Board (PFHCB) of Newfoundland and Labrador certified the master as a Level II Fish Harvester.⁶ In 2008, the master completed a 5-day basic safety course (MED A3) for fish harvesters.⁷ The master did not hold any certification with Transport Canada (TC) and had not taken any stability training.

⁶ The Professional Fish Harvesters Certification Board (PFHCB) is a non-profit organization responsible for the professionalization of harvesters in the province of Newfoundland and Labrador. A harvester must meet PFHCB requirements to be designated as either an apprentice fish harvester or professional fish harvester Level I or II.

⁷ This course also included Canadian Red Cross Marine Advanced First Aid training.

One crew member had more than 19 years of fishing and commercial marine experience. This crew member held a TC Certificate of Competency, Bridge Watch Rating and had completed various safety training courses, including proficiency in survival craft and proficiency in fast rescue boats, marine advanced first aid, and Marine Emergency Duties (MED) A1, B1, B2 training, and a refresher course in basic safety and proficiency in survival craft. This crew member had no PFHCB certification.

Another crew member had at least 23 years of fishing experience. According to the PFHCB, in 2002 he completed MED A3 and marine advanced first aid training. He had not renewed his PFHCB apprentice fish harvester certification since 2005. This crew member did not hold any certification with TC.

This was the first snow crab fishing trip for the 4th crew member. This crew member held no PFHCB or TC certification.

According to Newfoundland and Labrador's *Occupational Health and Safety Act*, the employer may designate a worker health and safety designate to monitor the health, safety, and welfare of workers where less than 6 persons are engaged in a workplace.⁸ The investigation did not determine whether or not any member of the crew acted as the health and safety designate or participated in the mandatory health and safety certification training prescribed in the legislation.⁹

1.8 Vessel registration and inspection

When the *Canada Shipping Act, 2001* (CSA 2001) came into force in 2007,¹⁰ it contained a requirement for all commercial fishing vessels powered with a motor of 7.5 kW (10 hp) or more and owned by qualified persons¹¹ to be registered with TC, and for the registration information to be complete.¹²

The vessel was registered with TC as the *Ann Lorie*. In 2004, its ownership changed, and TC was not informed. In 2017, the master purchased the vessel without updating the vessel registration. In 2018, the vessel's overall length was measured by a surveyor to satisfy requirements for completing a DFO Application for Commercial Vessel Registration. The application indicated that the vessel's name was changed from *Ann Lorie* to *Sarah Anne*.

⁸ Government of Newfoundland and Labrador, RSNL 1990, c. O-3, *Occupational Health and Safety Act*, subsection 42.1(1).

⁹ *Ibid.*, 42.1(6).

¹⁰ Before 2007, registration was optional for commercial fishing vessels of 15 GT or less. (Source: Government of Canada, S.C. 2001, c. 26, *Canada Shipping Act, 2001* [as amended 30 July 2019], subsection 46(1)).

¹¹ A qualified person means either a Canadian citizen or permanent resident, or a corporation incorporated under the laws of Canada or a province.

¹² Government of Canada, S.C. 2001, c. 26, *Canada Shipping Act, 2001* (as amended 30 July 2019), sections 46 and 58.

Although TC records show changes in the vessel's registration history up until 2004, TC has no record of the change in ownership in 2017, the proposed name change, or the measurement survey.

TC keeps records of any stability assessments, inspection records, and records of participation in the Small Vessel Compliance Program (SVCP). However, TC has no record of a vessel inspection for the *Sarah Anne* during or since its construction in 1980.

1.9 Vessel stability

The stability of a vessel is its ability to right itself after being heeled over by external forces such as wind, waves, or fishing operations once the external force has ceased acting on the vessel. New or modified fishing vessels over 9 m in length, fishing vessels of more than 15 gross tons (GT) and harvesting capelin or herring, or vessels fitted with anti-roll tanks are required by TC regulations to have stability assessments.¹³ These assessments help crews determine safe operating limits, such as minimum freeboard and maximum cargo loads, as well as safe sequences for loading and stowing cargo and gear; they also help crews manage consumables and free-surface effects. These regulations also require that the information provided in these assessments must be easily accessible, clearly understandable, and relevant to the vessel's operation.

As an existing vessel, the *Sarah Anne* did not require a stability assessment, but it did require adequate stability to safely carry out fishing operations.¹⁴ The investigation was unable to determine whether a stability assessment had ever been completed. The vessel records available to the crew did not include a stability assessment or general arrangement drawings.

1.9.1 Stability assessment

The fundamental purpose of any stability assessment is to determine whether a vessel has sufficient reserve stability to reduce the risk of capsizing or sinking during normal operations. A stability assessment is calculated for a stationary vessel in completely calm water. Such an assessment is a tool that harvesters can use when assessing stability under actual operating conditions, including the effects of wind, waves and fishing operation. However, passing a stability assessment does not guarantee protection from capsizing.

To investigate the role stability may have played in the occurrence, the TSB conducted a full stability assessment following TC's requirements¹⁵ (Appendix A). Because the *Sarah Anne* was not recovered, the stability assessment was done on a model based on a sister ship.

¹³ Transport Canada, C.R.C., c. 1486, *Fishing Vessel Safety Regulations* (as amended 13 July 2017), subsection 3.48(1).

¹⁴ *Ibid.*, subsection 3.45 and subsection 3.46(2).

¹⁵ Transport Canada, C.R.C., c. 1486, *Fishing Vessel Safety Regulations* (as amended 13 July 2017), subsection 3.50(1), which refers to International Maritime Organization, *International Code on Intact Stability, 2008* (as amended 01 January 2020).

This model was modified to match the last known configuration of the *Sarah Anne*. The stability assessment analyzed the vessel's lightship condition and 4 operating conditions, each of which was at a different time in the voyage and had a specific estimated weight of the catch, consumables and gear on board.

The TSB stability assessment found that the model vessel failed at least one stability criterion in each of the operating conditions examined. Failing these stability criteria does not mean that a vessel would suddenly capsize when operating in that condition. However, it means the vessel would be operating with a reduced ability to right itself after being heeled over by external forces and would be at increased risk of capsizing.

1.10 Life-saving appliances

In Canada, stability-related accidents and accidents in which fish harvesters go overboard account for 87% of fatalities in the fishing industry.¹⁶ If a vessel suddenly capsizes, there is no time to prepare, and all crew members may enter the water at the same time. Therefore, no crew members remain on board to facilitate a rescue. Typically, all crew members are dressed in work clothes. Without time to send a distress call, don immersion suits or life jackets, or manually deploy a life raft, crew members have to rely on equipment they are wearing, which may include a personal locator beacon (PLB), or on the automatic deployment of a life raft and emergency position indicating radio beacon (EPIRB) to help survive until assistance arrives.

Entering cold water, especially water below 15 °C, may trigger an initial cold water shock response, which causes the person in the water to gasp for air. Wearing an immersion suit, a personal flotation device (PFD), or lifejacket may prevent drowning during initial cold water shock by keeping a person's mouth away from the surface of the water, preventing water ingestion when gasping or breathing erratically.

Cold water shock is followed by cold incapacitation, which reduces the ability to swim or hold onto a flotation device. Hypothermia can occur after 30 minutes of immersion; activities such as swimming and trying to retrieve flotation devices or board a life raft increase heat loss and speed up the onset of hypothermia. This can lead to further incapacitation and death if the person is not rescued.

For people in water to be rescued, others need to know that they need assistance, and need to be able to find them. While the people in the water wait for rescue, protection from the elements is essential to survival (Table 2).

¹⁶ TSB Marine Investigation Report M09Z0001, Safety Issues Investigation into Fishing Safety in Canada.

Table 2. The effect of life-saving equipment on survival at sea in different stages of cold water immersion and rescue (Source: TSB)

Stage of immersion/rescue	Life raft	Immersion suits	Lif jackets/PFDs	No equipment
Cold water entry	Reduced or no exposure time in water	Enters water	Enters water	Enters water
Initial cold water shock	Prevents/reduces cold water shock response	Prevents onset of cold water shock response and keeps people afloat	Keeps head/mouth above surface when gasping	Gasping, water intake, cardiac response
Psychological response	Reduces threat to life, potentially reducing stress response	Reduces threat to life, potentially reducing stress response	Some reduction in threat to life, may reduce stress response	Immediate threat to life, stress exacerbates cold water shock response
Cold water incapacitation	Prevents/reduces cold effects	Delays onset of cold effects	Keeps people afloat after loss of swimming ability and dexterity	Erratic breathing, loss of swimming ability, shivering
Hypothermia	May significantly delay effects if people remain dry	May significantly delay effects if people remain dry	Hypothermia onset – reduced chance of survival	Hypothermia onset – unlikely to survive
Rescue from distress signal*	Likely to survive	Likely to survive	Reduced chance of survival	Unlikely to survive
Delayed rescue (no distress signal)	Reduced chance of survival	Reduced chance of survival	Unlikely to survive	No chance of survival

* Signal may include radio communications sent during emergency preparations, PLBs, or hand-held or float-free EPIRBs.

1.10.1 Life-saving equipment

While harvesting snow crab, the *Sarah Anne* made Class 2 near coastal voyages within 25 NM from shore. For this type of voyage and size of vessel, the *Fishing Vessel Safety Regulations* (FVSR) require the carriage of lifejackets and PFDs. Lifejackets are designed for vessel abandonment, and PFDs are designed for continuous use while working on deck. Both federal¹⁷ and provincial¹⁸ regulations require fish harvesters to wear PFDs or lifejackets if a risk to harvesters is present. However, many fish harvesters continue to work on deck without wearing a PFD, stating that it is not practical, normal, or necessary to use one.¹⁹ The *Sarah Anne* met the requirements of the FVSR by carrying multiple lifejackets on

¹⁷ Transport Canada, C.R.C., c. 1486, *Fishing Vessel Safety Regulations* (as amended 13 July 2017), section 3.09.

¹⁸ Government of Newfoundland and Labrador, NLR 5/12, *Occupational Health and Safety Regulations, 2012*, section 466.

¹⁹ TSB Marine Investigation Report M09Z0001, Safety Issues Investigation into Fishing Safety in Canada, stated that fish harvesters often underestimate the risk of falling overboard.

board. However, the crew members were not wearing PFDs, lifejackets, or immersion suits when their bodies were found.

The FVSR also require, for vessels less than 12 m in length on near coastal Class 2 voyages, a life raft with sufficient capacity to carry the number of persons on board, or an EPIRB and immersion or anti-exposure work suits for each person on board if the water temperature is less than 15 °C.²⁰ Life rafts must be stored in a manner that allows them to float free if the vessel sinks and must be serviced periodically.²¹ The *Sarah Anne* was fitted with a 6-person inflatable life raft without a hydrostatic release unit that would permit the raft to float free if the vessel sank. There was no record of when the last servicing had been completed. None of the safety equipment that was on board the *Sarah Anne* was located after the occurrence.

1.10.2 Distress alerting

When a vessel rapidly capsizes and sinks, the survival of the crew often depends on successfully transmitting a distress signal to SAR resources. The equipment a fishing vessel is required to carry²² to communicate a distress signal depends on the vessel's length, voyage type, and distance from shore. Such equipment includes:

- a watertight flashlight
- pyrotechnic devices (rockets and flares)
- a signalling mirror
- a sound-signalling device
- a 2-way radio communication system
- an EPIRB

At the time of the occurrence, the *Sarah Anne* was required to carry a VHF radio that was capable of receiving and transmitting voice communications using DSC.²³ A VHF-DSC radio has a distress alert button that, when pressed for 5 seconds, can transmit a digital distress alert to other VHF-DSC radios within range. However, unless the radio is assigned a

²⁰ Transport Canada, C.R.C., c. 1486, *Fishing Vessel Safety Regulations* (as amended 13 July 2017), subsection 3.28(1).

²¹ *Ibid.*, section 3.29.

²² *Ibid.*, sections 3.27 and 3.28.

²³ Transport Canada, SOR/2000-260, *Ship Station (Radio) Regulations*, 1999 (amended 19 December 2017), paragraph 13(1)(c). On 28 October 2020, the new *Navigation Safety Regulations* repealed 9 regulations, including the *Ship Station (Radio) Regulations*. Paragraph 209(3)(d) of the *Navigation Safety Regulations, 2020* now requires a vessel of less than 8 m in length engaged on Class 2 near coastal voyages to carry either a float-free emergency position indicating radio beacon (EPIRB), a manually activated EPIRB, a personal locator beacon (PLB), or a waterproof portable VHF handheld radio with DSC capability. If a PLB is carried, it must be worn by the person in charge of the navigational watch or, if that is not practicable, stowed so that it is readily accessible for immediate use if the vessel must be abandoned.

Maritime Mobile Service Identity through registration with an approved organization, such as Innovation, Science and Economic Development Canada, pressing the distress alert button will not send a distress call. As well, as previous TSB investigations have shown, crew members may not be able to manually transmit a distress signal in an emergency situation because of lack of time, inability to access the distress alerting device, or competing priorities.²⁴ The *Sarah Anne's* VHF-DSC radio was not registered and there is no indication that any distress message was transmitted by voice on the day of the occurrence by VHF radio or cellphone.

At the time of the occurrence, the *Ship Station (Radio) Regulations* also required that the *Sarah Anne* carry an EPIRB that did not need to be float-free. EPIRBs and PLBs²⁵ are radio transmitters that, when activated, send a distress signal to the local Rescue Coordination Centre or MRSC through a global network of satellites. The investigation determined that an EPIRB was registered under the vessel's former name (*Ann Lorie*) and a former owner, and that it was not on board at the time of the occurrence. There was no record of any other EPIRB or PLB on board on the day of the occurrence.

Although the crew carried cellphones on board, no distress calls were received by authorities prior to the occurrence.

1.11 Vessel monitoring

If distress alerting measures are unavailable or have failed, vessel monitoring systems may indicate that a vessel is in distress. Although in Canada these tools do not initiate a distress alert,²⁶ they are often used by SAR authorities to determine the last known position of an overdue vessel. In Canada, the following systems exist.

Vessel monitoring system (VMS). The VMS used by DFO to monitor the location of vessels is a satellite-based, near real-time, positional tracking system. DFO requires some fish

²⁴ TSB marine investigation reports M15P0286, M14A0289, M14P0121, M12W0062, M12M0046, M11M0057, M10M0042, and M10M0007.

²⁵ EPIRBs and PLBs function on the same satellite system but, unlike EPIRBs, PLBs are not specifically for marine use and can be used for emergencies during non-marine recreational activities.

²⁶ Some countries, such as Iceland use VMS (or the lack of a VMS signal) as a means of distress alerting. See G. Geirsson, FAO Fisheries and Aquaculture Circular No. 1053, *Case Study of the Icelandic Integrated System for Monitoring, Control and Surveillance* (2011), at <http://www.fao.org/3/i2099e/i2099e.pdf> (last accessed 09 March 2022).

harvesters to equip their vessels with a VMS unit as a condition of their licence.^{27,28} No VMS unit was installed on the *Sarah Anne*, nor was it a required condition of the snow crab licence.²⁹

Automatic identification system (AIS). AIS transponders transmit the vessel's position, identification, course, speed, and other information using a VHF signal that can be received by antennas within line of sight on ships, shore stations, or satellites. TC requires AIS transponders for fishing vessels 20 m or more in length.^{30,31}

AIS was originally designed for and continues to assist in preventing collisions. Advancements in AIS technology now allow global vessel monitoring and safety messaging. As well, AIS is being added to EPIRBs and other emergency transmitters. The *Sarah Anne* was not equipped with an AIS, nor was it required to be. The absence of an AIS on the *Sarah Anne* decreased the ability of nearby vessels with AIS to know the vessel's identity or detect the vessel's presence.

Finding: Other

Voluntary carriage of AIS transponders by fishing vessels of all sizes would increase vessel visibility and provide up-to-date information to local commercial traffic and those ashore who actively monitor a vessel's voyage.

Vessel traffic services (VTS). VTS helps maintain the safety of life at sea and the safety and efficiency of navigation, and protects the marine environment from potential adverse effects of commercial traffic. To accomplish this, VTS provides essential information to the vessels in the area of service through marine VHF radio channels. To help with this responsibility, Placentia Bay VTS has access to AIS, and has multiple VHF-DSC radio towers covering Placentia Bay and radar towers covering the traffic lanes.

A vessel's report to VTS includes the vessel's name, position, destination, and estimated time of arrival at the destination or next report, such as a calling-in point. If a vessel does not report, and does not respond to attempts by VTS to communicate or is not located by

²⁷ Fisheries and Oceans Canada, *Snow Crab – Newfoundland and Labrador Region* (Integrated Fisheries Management Plan), section 7.3.8, at <https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/snow-crab-neige/2019/index-eng.html> (last accessed 09 March 2022)

²⁸ Fisheries and Oceans Canada, "Commercial fishery requirements," at <https://www.dfo-mpo.gc.ca/fisheries-peches/sdc-cps/index-eng.html> (last accessed 09 March 2022).

²⁹ Although DFO's Integrated Fisheries Management Plan for snow crab in Newfoundland and Labrador indicates that the use of these systems was fully implemented in 2004 for all full-time and supplementary fleets, they are mainly for vessels over 40 feet in length.

³⁰ Transport Canada, SOR/2020-216, *Navigation Safety Regulations, 2020* (last amended 23 June 2021), subsection 118(1).

³¹ On the day of the occurrence, only 1 fishing vessel in the area under 10.7 m used an AIS transponder.

others at the destination, a notification is sent to the MRSC in St. John's 1 hour after the reporting time.

Fishing vessels over 24 m in length and of more than 150 GT are required to participate in VTS,³² but the services can be used by vessels of any size. The vast majority of fishing vessels in Placentia Bay are less than 24 m. A survey by the Fish, Food and Allied Workers in 2008 found that 44% used the Placentia Bay VTS.³³ The *Sarah Anne* did not participate in VTS, nor was it required to do so.

1.11.1 Placentia Bay commercial traffic

On the day of the occurrence, the *Sarah Anne* was fishing snow crab near the entrance to the Placentia Bay traffic lanes. The investigation studied the passage of commercial vessel traffic on the day of the occurrence. Placentia Bay VTS records showed that 2 larger commercial vessels were active near the fishing grounds between 1030 to 1600. During that time period, the closest either vessel came to the *Sarah Anne*'s 4th string of traps was 3.8 NM.

The investigation examined the possibility of a vessel collision as a factor in the disappearance of the *Sarah Anne* and reviewed the following data: Placentia Bay VTS records, traffic voice recordings, underwater acoustic recordings, CCG drift modelling scenarios, crew recovery and trap locations, and accident debris fields.

1.12 Transport Canada responsibility for fishing vessel safety

The development and oversight of policies and programs regarding commercial fishing vessel safety is the responsibility of TC. The regulatory regime for commercial fishing vessels is based on vessel length and tonnage; all vessels are required to undergo a tonnage measurement when they are registered in order to identify which safety standards the vessel must meet.

The safety of fishing vessels, such as the *Sarah Anne*, that are not more than 24.4 m in length and of not more than 150 GT, is regulated under the FVSR. According to the CSA 2001 and the FVSR, the authorized representative (AR) is required to ensure compliance with the regulations, for example by maintaining the vessel, machinery, and equipment in a safe operating condition, and keeping maintenance records.

If TC has reasonable grounds to believe that the design, construction, or equipment of a fishing vessel adversely affects its safe operation or seaworthiness in its area of operation, it

³² Transport Canada, SOR/189-98, *Vessel Traffic Services Zones Regulations* (as amended 01 July 2007).

³³ Fish, Food, and Allied Workers, 2007, "Co-existence? Fishing Activity and Tanker Traffic in Placentia Bay", in *Newfoundland and Labrador Refining Corporation: Environmental Impact Statement, Vol 4: Socio-economic Volume 2*, pp. 275–290, at <https://www.gov.nl.ca/ecc/projects/project-1301/> (last accessed 09 March 2022)

may request that the AR establish that the vessel meets the requirements.³⁴ There is no certification inspection required for fishing vessels of not more than 15 GT, and the FVSR do not refer to TC inspection³⁵ or registration requirements.

The voluntary Small Vessel Compliance Program for fishing vessels (SVCP-F) offers owners of registered vessels detailed guidance notes on completing a compliance report³⁶ which includes all regulatory requirements specific to fishing vessels of not more than 15 GT.³⁷ This program is meant to help owners and operators meet their compliance obligations. The owner of the *Sarah Anne* did not participate in the SVCP-F.

Data on the effort spent by TC on regulatory oversight and enforcement is not readily available by type of vessel. In addition to oversight, TC has a role in providing information to promote safety and seaworthiness.

While TC regulates compliance requirements of vessels, a fishing vessel is also a workplace, where occupational health and safety is provincially regulated.³⁸ Therefore, in this occurrence the Occupational Health and Safety division of Digital Government and Service NL was responsible for the occupational health and safety of crews on board fishing vessels based in Newfoundland and Labrador.

1.12.1 Registration information

Registering a vessel with TC establishes a point of contact between TC and a vessel owner, and allows TC to know that a Canadian vessel is operating and what type of vessel it is. Current and accurate vessel information given at registration allows TC to provide the ARs with safety oversight through risk-based inspections, surveillance, and enforcement activities. Registration also allows TC to communicate safety messages such as updates to regulations, reminders of safety action required, and any other information relevant to an AR's operations directly to ARs. A current vessel registration also gives ARs access to programs and initiatives such as the voluntary SVCP. Finally, accurate registration provides SAR coordinators with vessel information that is useful in an emergency and in any subsequent TSB investigations.

³⁴ Transport Canada, C.R.C., c. 1486, *Fishing Vessel Safety Regulations* (as amended 13 July 2017), sections 3.03 and 3.04.

³⁵ At the time of the occurrence, inspection requirements were defined in the *Vessel Certificates Regulations* (Transport Canada, SOR/2007-31, *Vessel Certificates Regulations* [repealed 28 June 2021]).

³⁶ Transport Canada, TP 15356E, *Small vessel compliance program (SVCP) – Guidance notes for the detailed compliance report for small fishing vessels not more than 15 gross tonnage* (February 2018).

³⁷ Nationally, TC has created 538 notices of participation for the SVCP-F since the program began in 2017 (4% of TC registered fishing vessels of less than 15 GT). However, there is no database to track enrollment to determine how many of those participating are actually fishing vessels.

³⁸ See section 1.15: Active TSB recommendations.

Internationally, the need for current and accurate vessel registration is recognized, and vessel registration is linked to fishing licenses. For example, in Alaska, a copy of the current registration must be submitted with the application for a fishing vessel license. In South Africa, owners must apply for both a safety certificate and a fishing vessel license, and the valid period of the fishing vessel license is tied to that of the safety certificate. In the United Kingdom, all fishing vessels must be inspected before they can be registered, every 5 years thereafter, and when ownership changes. Additionally, the owner of each of these fishing vessels must sign a certificate annually, to state that the vessel complies with safety requirements.

As early as 1987, a CCG report highlighted the connection between safety considerations and the granting of fishing licenses.³⁹ More recently, a 2012 report by the Canadian Council of Professional Fish Harvesters pointed out the poor quality of data collected by TC and DFO and called for the government departments to improve this situation by better coordination.⁴⁰ As well, in 2018, the Standing Senate Committee on Fisheries and Oceans recommended that TC and DFO initiate the regulatory or legislative changes required to implement the steps identified to harmonize and rationalize the process used by federal entities to license commercial vessels and increase the safety of those operating and working on those vessels.⁴¹

Failure to register a vessel is a violation of section 46 of the CSA 2001,⁴² and can result in an administrative monetary penalty. Between 2016 and April 2021, TC had issued only 1 administrative monetary penalty for a violation of this section to an owner of a fishing vessel.

Vessels of less than 15 GT must be registered in either the Small Vessel Register or the Canadian Register of Vessels;⁴³ differences between the registers are shown in Table 3. Once all of the registration requirements have been met, the vessel is listed in a register and a certificate of registry is issued.⁴⁴ The certificate includes a description of the vessel, its tonnage, its activity type, its official number, and the names and addresses of the vessel's owner(s) and AR.

³⁹ Canadian Coast Guard, TP 8694E, *A Coast Guard study into fishing vessel safety* (October 1987).

⁴⁰ Canadian Council of Professional Fish Harvesters, *Planning Fish Harvester Marine Safety Training: Transport Canada Regulatory Training Needs Assessment* (2012).

⁴¹ Standing Committee on Fisheries and Oceans, *Atlantic Canada's marine commercial vessel length and licensing policies – working towards equitable policies for fishers in all of Atlantic Canada* (Library of Parliament, June 2018).

⁴² Government of Canada, S.C. 2001, c. 26, *Canada Shipping Act, 2001* (as amended 30 July 2019), section 46.

⁴³ A vessel that requires a mortgage must be registered with the Canadian Register of Vessels.

⁴⁴ Government of Canada, S.C. 2001, c. 26, *Canada Shipping Act, 2001* (as amended 30 July 2019), subsection 54(1).

Table 3. Comparison of the 2 national Transport Canada vessel registers (2021)

Register	Tonnage restriction	Vessel identifier	Valid period	Renewal fee	How licence is renewed	Number of fishing vessels not more than 15 GT registered	Number of vessel suspensions between April 2016 and April 2021
Small Vessel Register	Only for vessels of less than 15 GT	Official number; no names	5 years	\$50	Manually	2485	1582
Canadian Register of Vessels	None	Official number and unique name	3 years	\$0	Automatically	10 823	290

The CSA 2001 lists a number of reasons why a vessel registration may be suspended, including failure to report a change in owner or AR.⁴⁵ Because TC sends notices to ARs to renew their registration before the certificate expiry date, AR contact information should be kept current. However, if the AR does not renew the certificate of a vessel in the Canadian Register of Vessels, it is automatically renewed with no change to registration information.⁴⁶ Many vessels in this register require TC inspections, providing another mechanism for monitoring and correcting inaccurate registration information. In contrast, if the certificate of a vessel registered in the Small Vessel Register is not renewed, a vessel suspension is issued and is not removed until the renewal form is submitted. During the Canadian Marine Advisory Council fall meeting in 2021, TC reported on planned modernization initiatives for the vessel registry, which it expects will simplify and streamline the registration process.⁴⁷

The 1582 suspensions issued in the Small Vessel Register (Table 3) were mainly due to owners of fishing vessels not renewing their vessel registration with TC before the expiry date. The reason for a suspension in the Canadian Register of Vessels is not captured in the register's database.

At the time of the occurrence, the PFHCB did not encourage harvesters with vessels that do not require a TC inspection to register with TC. Furthermore, the Canadian Council of Fish

⁴⁵ Ibid., subsection 60(1).

⁴⁶ In 2021, Transport Canada was proposing changes to vessel registry fees that would require all vessels to proactively apply for a renewal.

⁴⁷ Transport Canada, "Welcome to the Navigation and Operations Standing Committee," presented at the fall 2021 Virtual National Canadian Marine Advisory Council (29 November 2021).

Harvesters, which represents 17 fishing associations in all regions of the country, states in its materials that TC registration is not needed for vessels of less than 15 GT:

Two-thirds of all fishing vessels are very small at less than 15 gross tons (GT) (below the size for mandatory Transport Canada registration), with only 2.5% over 100 GT.⁴⁸

1.13 Fisheries and Oceans Canada Conservation and Protection Program

DFO's Conservation and Protection Program promotes and verifies compliance with fisheries legislation, regulations, policies, and management measures; as well, the program enforces compliance when required. Tools to verify and enforce compliance include licensing, licence conditions, patrols, dockside reports, aerial surveillance, VMS, and at-sea observer reports. Generally, DFO has requirements before, during, and after fishing operations.

For example, DFO requires that

- all harvesters hold a fisher's registration card or a provincial or territorial fisher's certificate⁴⁹ before participating in commercial fishing operations,
- fishing vessels be registered with DFO before being issued a licence, and
- the operator or vessel hold a licence for each species fished, including quotas and other conditions.

In Newfoundland and Labrador, the PFHCB is a non-profit organization responsible for the professionalization of fish harvesters in the province. DFO recognizes registration with the PFHCB as a provincial certification⁵⁰ and issues fishing licences only to harvesters who are PFHCB certified as Level II professional fish harvesters. The requirements to maintain that provincial certification (e.g., training) are managed by the PFHCB and not by DFO.

To achieve Level II certification, a fish harvester must have either recognized experience from before 1998 or a minimum of 5 years' fishing experience and recognized training courses equivalent to approximately 120 days of training. This requirement is intended to ensure that commercial fish harvesters have a minimum level of experience and training. DFO remains responsible for ensuring fish harvesters hold valid certification when they are fishing.

⁴⁸ Canadian Council of Professional Fish Harvesters, *Transport Canada Regulatory Training Needs Assessment*, at http://www.fishharvesterspecheurs.ca/system/files/products/Final_Report_English.pdf (last accessed 09 March 2022).

⁴⁹ Fisheries and Oceans Canada, SOR/86-21, *Atlantic Fishery Regulations, 1985* (as amended 14 May 2021), subsection 14(1).

⁵⁰ Fisheries and Oceans Canada, *Fisheries Licensing Policy Newfoundland and Labrador Region*, Part 1: General licensing policy, section 1: Registration of fish harvesters, at <https://www.dfo-mpo.gc.ca/reports-rapports/regs/licences-permis/nfld-Labrador-tn-labrador-eng.htm#toc1> (last accessed 09 March 2022).

The primary focus of DFO's conservation and protection efforts is on verifying compliance with license requirements to accurately report fishing-related activities, and the detection of unreported or unmonitored landings. The conservation, sustainable use, and management of marine resources are guided by species-level Integrated Fisheries Management Plans (IFMP).⁵¹ The snow crab IFMP details the enforcement efforts for the Newfoundland region. In 2017, there were 14 149 total enforcement hours:

- 7449 hours of Fishery Officer patrol
- 624 vessel checks
- 31 charges laid and 54 warnings issued for snow crab fishery violations
- approximately 150 hours of air surveillance

1.14 **Collaboration between federal departments**

TC, DFO, and the CCG are directly involved in the fishing industry through the regulations and programs they provide. TC is responsible for regulating the safety of fishing vessels. DFO is responsible for the management of fisheries to ensure the sustainability of the resource and an economically viable industry, taking due regard of fish harvesters' safety. The CCG, a special operating agency within DFO, is responsible for the safety, security, and accessibility of Canada's waterways, including providing services for maritime SAR.

Because actions taken by one organization to fulfill its mandate may have an impact on another component of the fishery and affect the safety of fish harvesters, a memorandum of understanding (MOU)⁵² was signed in 2006 between TC, DFO, and the CCG to facilitate collaboration on commercial fish harvesters' safety at sea. The MOU states that each participating organization can establish principles to promote a safety culture. These principles can be considered when developing rules, regulations, policies and plans.

The MOU suggests that the parties meet to discuss possible joint or shared databases for DFO and TC fishing vessel registration information and DFO fishing licences. TC continues to maintain multiple databases for fishing vessels and DFO maintains different regional databases. TC and DFO had not created a shared database at the time of writing this report. However, DFO and TC reported they were developing a stand-alone national database for registration information on fishing vessels from both systems, as well as a national report on this information.

⁵¹ Fisheries and Oceans Canada, *Snow Crab – Newfoundland and Labrador Region* (Integrated Fisheries Management Plan), section 7.3.8, at <https://www.dfo-mpo.gc.ca/fisheries-peches/ifmp-gmp/snow-crab-neige/2019/index-eng.html> (last accessed 09 March 2022).

⁵² Fisheries and Oceans Canada and Transport Canada, *Memorandum of Understanding between Fisheries and Oceans Canada (DFO) and Transport Canada (TC) regarding Safety at Sea of Commercial Fishers*. The original was signed on 06 November 2006, and the document was updated in 2015 and 2021.

In 2000, TC's vessel registration office identified that DFO was issuing licences to fishing vessels without first confirming that they were registered with TC.⁵³ In 2011, an initiative was started in the DFO Pacific region in which DFO asks to see a valid TC registration for the fishing vessel before issuing a licence; no other validation of compliance with safety regulations is needed. In 2018, a new region was formed in the Arctic where DFO requests confirmation of TC vessel registration as part of licensing requirements.

Also in 2018, DFO began collaborative efforts with TC to identify fishing vessels in both departmental databases and identify where there are registration gaps. The initiative began with a pilot project in the Quebec region, which is now complete. Work is now underway to make these links on a national level to ensure that every vessel that is registered with DFO to fish commercially is also duly registered with TC.⁵⁴ As part of this work, collaborative efforts are also focusing on industry awareness to inform harvesters that vessel registration is required with both DFO and TC.

Overall, TC has thousands fewer fishing vessels actively registered in the Atlantic Region than DFO does. In an effort to quantify the gap between registries, the TSB requested the number of vessels less than 35 feet in length that were registered in Newfoundland and Labrador in 2020. TC reported that 744 fishing vessels with a registered length of less than 10.7 m⁵⁵ had an active registration. DFO reported 4803 commercial fishing vessels, a difference of more than 4000 vessels.

1.15 Active TSB recommendations

Small fishing vessels⁵⁶ represent more than 99% of the entire Canadian fishing fleet of vessels registered with TC. For the majority of these small fishing vessels, such as the *Sarah Anne*, there is no requirement for stability assessments or for crew to be provided with adequate stability information based on a stability assessment. Following the occurrence involving the large fishing vessel *Caledonian*,⁵⁷ the Board considered that crews on fishing vessels need adequate stability information to enable them to determine safe

⁵³ Transport Canada, Innovative Interdepartmental Pilot Project for Fishing Vessels Registration (2P3INP), Quarterly report (Q2 2020).

⁵⁴ DFO has identified that TC small vessel registrations increased by 30 percent (approximately 750 vessels) in 2021, in TC's Small Vessel Register alone.

⁵⁵ DFO's statistics include a category for vessels less than 35 feet in length, which is equivalent to 10.7 m. TC and DFO do not use the same methodology to measure vessel length.

⁵⁶ Small fishing vessels are those of less than 150 GT and less than 24.4 m in length.

⁵⁷ TSB Marine Investigation Report M15P0286.

operating limits and ensure that day-to-day operations are conducted safely. The Board therefore recommended that

the Department of Transport require that all small fishing vessels undergo a stability assessment and establish standards to ensure that the stability information is adequate and readily available to the crew.

TSB Recommendation M16-03

The Board also considered that fish harvesters often operate in harsh physical and environmental conditions, and the risk of going overboard is high. TSB investigations have shown that wearing a PFD increases the chance of survival when people enter the water. The Board therefore also recommended that

the Department of Transport require persons to wear suitable personal flotation devices at all times when on the deck of a commercial fishing vessel or when on board a commercial fishing vessel without a deck or deck structure and that the Department of Transport ensure programs are developed to confirm compliance.

TSB Recommendation M16-05

Since these recommendations were issued, the TSB has followed up annually with TC on action being taken to address them. At the time of report writing, TC's most recent responses had been received in December 2021. The Board considered both responses to recommendations M16-03 and M16-05 to be Unsatisfactory^{58,59}.

1.16 Previous recommendations

On 27 November 1998, while crossing from Les Escoumins to Rimouski, Quebec, the *Brier Mist* swamped and sank some 10 NM offshore. The bodies of 2 persons were recovered, and 3 crew members remained missing at the time the investigation report was issued.⁶⁰

Following its investigation, the Board considered that all fish harvesters should have a distress alerting capability that does not rely on human intervention. It further considered that fish harvesters forced into the water or survival craft should be able to continuously

⁵⁸ TSB Recommendation M16-03: Stability assessments and adequate stability information for all small fishing vessels (issued December 2016), at <https://www.tsb.gc.ca/eng/recommandations-recommendations/marine/2016/rec-m1603.html> (last accessed 09 March 2022).

⁵⁹ TSB Recommendation M16-05: Wearing of suitable PFDs at all times while on the deck of a fishing vessel (issued December 2016), at <https://www.bst-tsb.gc.ca/eng/recommandations-recommendations/marine/2016/rec-m1605.html> (last accessed 09 March 2022).

⁶⁰ TSB Marine Investigation Report M98L0149.

update SAR coordinators with their location for more rapid rescue. The Board therefore recommended that

the Department of Transport require small fishing vessels engaged 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 *Navigation Safety Regulations, 2020*, which were published in October 2020, require all vessels engaged on near coastal, Class 1 voyages or vessels that are more than 12 m in length on a near coastal, Class 2 voyage to have a float-free EPIRB, and all vessels that are 12 m or less and engaged on near coastal, Class 2 voyages to carry a float-free EPIRB, or a manually-activated EPIRB, or a 406 MHz PLB, or a portable VHF-DSC/GPS radio. In March 2021, the Board considered the response to Recommendation M00-09 to be Fully Satisfactory.⁶¹

Following the same investigation, the Board made other recommendations for the safety of fish harvesters. The Board believes that life rafts should be easy to release when the vessel sinks, given that the chances of survival when abandoning a vessel depend on launching life rafts, and considering the extremely difficult conditions in which such abandonments often occur on small fishing vessels. The Board therefore recommended that

the Department of Transport alert builders and owners of fishing vessels to the need for the liferafts on all vessels to be stowed with a launching system fitted with a release mechanism that allows the inflatable life raft to be easily released when the vessel sinks.

TSB Recommendation M00-07

In April 2005, the Board considered the response to Recommendation M00-07 to be Fully Satisfactory.⁶² However, a residual risk remains for vessels that are required to carry life rafts, given that TC has no mechanisms in place to ensure that life rafts are float-free. As well, alerting owners to this safety issue is difficult when there is no means to ensure that vessel owner information is current and accurate.

1.17 Previous TSB occurrences

From February 2010 to July 2020, TSB data shows 20 occurrences, resulting in 42 fatalities (21 from 2018 to 2020), which involved the capsizing or sinking of small fishing vessels less than 12 m in length. In each of these occurrences, the vessel was not equipped with an

⁶¹ TSB Recommendation M00-09: Emergency position indicating radio beacons (issued March 2001), at <https://www.bst-tsb.gc.ca/eng/recommandations-recommendations/marine/2000/rec-m0009.html> (last accessed 09 March 2022).

⁶² TSB Recommendation M00-07: Liferaft release mechanisms (issued December 2000), at <https://www.bst-tsb.gc.ca/eng/recommandations-recommendations/marine/2000/rec-m0007.html> (last accessed 09 March 2022).

EPIRB and no other distress signal was received by SAR resources (see Appendix B for some examples of these occurrences).

1.18 TSB safety issue investigation into fishing safety in Canada

From 2009 to 2012, the TSB conducted a comprehensive safety issue investigation (SII) which culminated in the release of the report *Safety Issues Investigation into Fishing Safety in Canada*.⁶³

The SII provided an overall, national view of safety issues in the fishing industry, revealing complex relationships and interdependencies among these issues. The SII identified 10 significant safety issues that are interconnected and require attention, including the following issues that were found in the occurrence involving the *Sarah Anne*:

- Stability
- Fisheries resource management
- Life-saving appliances
- Regulatory approach to safety
- Training
- Safety information
- Safe work practices

1.19 TSB Watchlist

The TSB Watchlist identifies the key safety issues that need to be addressed to make Canada's transportation system even safer.

Commercial fishing safety is a Watchlist 2020 issue. The Board placed commercial fishing safety on the Watchlist in 2010. Every year, the same safety deficiencies on board fishing vessels continue to put at risk the lives of thousands of Canadian fish harvesters and the livelihoods of their families and communities. Between 2018 and 2020 there were 45 fish harvester fatalities on fishing vessels of all sizes and all types of occurrences, the highest fatality count in a 3 year period in more than 20 years. This occurrence demonstrates the continued need for coordinated regulatory oversight of commercial fisheries, to support ARs and masters in taking ownership of safety, as well as the need for behavioural changes in the use of PFDs among all harvesters.

⁶³ TSB Marine Investigation Report M09Z0001: Safety Issues Investigation into Fishing Safety in Canada.

ACTIONS REQUIRED

Commercial fishing safety will remain on the Watchlist until there are sufficient indications that a sound safety culture has taken root throughout the industry and in fishing communities across the country, namely:

- Federal and provincial authorities coordinate regulatory oversight of commercial fisheries to eliminate any existing gaps.
- Transport Canada publishes and promotes user-friendly guidelines on vessel stability designed to reduce unsafe practices.
- Fish harvesters are familiar with and adopt the new stability guidelines and the 2017 Fishing Vessel Safety Regulations and their change in practice is reflected in TSB investigations and focus group consultations with the industry.
- Spurred by the leadership of industry and safety advocates, there is marked and widespread evidence—notably in TSB investigations—of behavioural changes among fish harvesters in the use of flotation devices, immersion suits, emergency signalling devices, and safe work practices.

2.0 ANALYSIS

An analysis of the traffic patterns in the area and the known details of the *Sarah Anne* and its crew did not reveal any indication that the vessel was struck or otherwise affected by a larger commercial vessel.

The *Sarah Anne* could not be found and is presumed to have sunk. The investigation could not determine with certainty what caused the vessel to lose stability and sink. This analysis will therefore focus on personal life-saving equipment, distress alerting, vessel stability, and vessel registration.

2.1 Placentia Bay traffic

The exact location of the presumed sinking cannot be determined. However, an approximate location can be derived using the last known position of the vessel and the location of the 4th string of traps.

This investigation used the automatic identification system (AIS) tracks of the 2 commercial vessels that were on a voyage near the occurrence location between 1030, when the *Sarah Anne* was last seen, and 1829, when a Fisheries and Oceans Canada (DFO) surveillance flight observed another snow crab vessel near the *Sarah Anne*'s last known position. During that time period, the closest either of the 2 vessels approached the position of the *Sarah Anne*'s 4th string of traps was 3.8 nautical miles (NM).

Drift modelling scenarios were then run by the Canadian Coast Guard (CCG) using its Canadian Search and Rescue Planning program (CANSARP) based on the known locations and times when the crew were recovered. The drift predictions were compared to the known commercial vessel tracks, but the crew were not recovered from an area that would be expected if a collision had occurred along either of those tracks.

On the day of the occurrence, an underwater acoustic recorder, meant to record marine mammals, was stationed 34 NM away in Ship Cove, Avalon Peninsula, Newfoundland and Labrador. Analysis of underwater acoustic recordings was performed by the Royal Canadian Navy's Acoustic Data Analysis Centre. Merchant vessel traffic and marine mammal vocalizations appeared on the readouts, but no sounds suggestive of a collision, such as abrupt engine shut-offs, explosions, sounds of metal scraping, or other events were identified.

Although there were multiple reports of debris by those involved in the search the first evening after the occurrence, little debris was recovered because the search for possible survivors was prioritized. The debris that was found in the search area was not structural, but rather items that would have been loose on deck.

Finding: Other

The investigation looked at multiple sources of information to explain the loss of the *Sarah Anne*. Overall, there was no indication that the *Sarah Anne* was struck by a larger commercial vessel.

2.2 Sudden capsizing

Without any vessel, witnesses, or record of communications, the investigation was unable to determine the exact sequence of events, or how long the crew members were in the water before they drowned or before they were recovered.

Given that the crew members were found in work clothes, they were likely working on deck without personal flotation devices (PFDs), and did not have time to don any additional personal life-saving equipment. Additionally, no emergency communications were received and the life raft was not deployed; these points all indicate that the vessel capsized suddenly. Other factors that support a sudden capsize scenario are the parted buoy line, the nearby group of traps from the 4th string of gear, and the crew being unaware of the vessel's safe operating limits due to the lack of stability assessment.

Finding as to causes and contributing factors

It is likely that the vessel capsized suddenly, resulting in all crew members entering the water unexpectedly.

2.3 Vessel stability

Stability is the ability of a vessel to right itself. Formal stability assessments are not required for the vast majority of existing fishing vessels,⁶⁴ including the *Sarah Anne*. Nonetheless, all fishing vessels must have adequate stability to undertake their intended operations. TC may also require the authorized representative (AR) to demonstrate the adequacy of the vessel's stability.

The TSB performed a stability assessment on a model of a sister ship modified to match the last known configuration of the *Sarah Anne*. The assessment showed that the *Sarah Anne* was likely operating outside its static stability limits and that the ship's stability would have deteriorated as the gear and catch were added (Appendix A).

The stability assessment of the vessel model examined different operating conditions in a static state. However, the *Sarah Anne* operated in a dynamic state, under the influence of external forces such as wind, waves, and fishing operations. Consequently, while at sea the vessel's stability was likely compromised to a greater degree than the TSB's assessment indicates. Specifically, the effects of the changing wave period, increasing wave height, potential weight on the hauler, and weight and free-surface effects of water on deck or in the bilge could all have had a negative effect on the *Sarah Anne's* stability.

⁶⁴ An existing vessel means a fishing vessel that is not new. (Source: Transport Canada, C.R.C., c. 1486, *Fishing Vessel Safety Regulations* [as amended 13 July 2017])

Without the benefit of a stability assessment, the crew would have relied only on previous experience to make decisions about safe operating limits. When the vessel was last sighted, it had taken on approximately 725 kg of snow crab and 2 strings of traps, weighing approximately 500 kg each, for a combined weight of about 1700 kg. Given that string 3 of traps was never located, those traps (500 kg) were likely on board at the time of the occurrence. On the previous voyage, when strings 1 and 2 caught 1791 kg of crab, strings 3 and 4 had not been hauled, giving those strings 6 additional days in the water. The investigation determined that it would be reasonable to expect that string 3 alone could have contained the remaining quota of 1000 kg.

Therefore, the total weight of the *Sarah Anne's* load at the time of the occurrence was approximately 3200 kg; this includes the 1700 kg on board mid-trip, the 3rd string of gear, and the remaining quota.

On this voyage, the plan was to catch the remaining 2020 quota and retrieve all 4 strings of gear, resulting in an approximate load of 3700 kg. This is roughly 1200 kg greater than the master's previous experience with snow crab fishing in this area and on this vessel since 2019.

Under TC regulations, masters and ARs are responsible for ensuring that a vessel is seaworthy for its intended voyage. A stability assessment provides guidance to the crew on how to determine the vessel's load and freeboard limits.

Finding as to causes and contributing factors

Since there was no formal stability assessment of the vessel, the crew made operating decisions without knowing the vessel's actual safe operating limits, which may have negatively affected the vessel's stability and led to it capsizing and sinking.

As shown in this occurrence, tools such as stability assessments are not always used or available to ensure that a vessel is seaworthy for its intended voyage. In 2016, the TSB recommended that all small fishing vessels undergo a stability assessment (Recommendation M16-03). However, these assessments are still not required for the majority of fishing vessels. In December 2021, TC indicated that it recognizes the risk in the fishing industry and that it "remains committed to working with industry to ensure that stability information is adequately and readily available, and to monitor compliance through the mandatory and risk-based inspection process", but indicated that no further regulatory action to address this recommendation will be taken.⁶⁵ Many harvesters operating vessels that do not have a stability assessment will not be aware of their vessel's safe operating limits and run the risk of life-threatening accidents.

⁶⁵ TSB Recommendation M16-03, Stability assessments and adequate stability information for all small fishing vessels (issued December 2016), at <https://www.tsb.gc.ca/eng/recommendations-recommendations/marine/2016/rec-m1603.html> (last accessed 09 March 2022).

2.4 Life-saving equipment

Whether or not required by regulations, fish harvesters should consider their own safety and wear protective equipment such as PFDs or anti-exposure work suits when working on deck. The *Fishing Vessel Safety Regulations* (FVSR) require the carriage of lifejackets designed for abandoning the vessel. As well, PFDs are required for on-board safety. However, the FVSR do not require that PFDs be worn unless the safety of the crew is jeopardized. Given that PFDs are not required to be worn at all times, it is likely that they, and lifejackets, will be stored on board and inaccessible to the crew if the vessel capsizes suddenly.

The TSB has found numerous similar occurrences in which harvesters have entered the water without a PFD, and has therefore recommended to Transport Canada (TC) that fish harvesters be required to wear a suitable PFD at all times when on the deck of a commercial fishing vessel regardless of whether a risk to harvesters is identified. This recommendation (TSB Recommendation M16-05) is still active. As this occurrence demonstrates, the lack of PFD use continues to be a causal factor in harvester fatalities.

PFDs and lifejackets are designed to provide additional flotation, and to increase a person's chances of survival until they can get into a life raft, reducing exposure to the elements while awaiting rescue. While waiting to board a life raft, persons in the water are affected by cold water immersion, which progressively worsens their ability to board the life raft once it is ready. Wearing a PFD increases a person's chances of survival by preventing water ingestion during the cold water shock and cold incapacitation stages, and so improves the wearer's chances of boarding a life raft once it is deployed.

The *Sarah Anne's* life raft was secured on the top of the wheelhouse without a hydrostatic release unit; it was typical to use straps to secure the life raft to its cradle and the life raft would therefore have required manual deployment. Because the *Sarah Anne* likely lost stability and capsized quickly, the crew may not have had the opportunity to manually deploy a life raft. The life raft was not found during the SAR efforts; it likely sank with the vessel.

Finding as to causes and contributing factors

Without critical pieces of life-saving equipment for flotation and protection from environmental conditions, the crew members remained in the cold water, likely unassisted, and drowned.

2.5 Distress alerting and vessel monitoring

In a rapid capsizing emergency, especially in cold water and far from shore, the crew's survival increases with a successful transmission of a distress signal to local vessels or search and rescue (SAR) resources. In this occurrence, SAR resources did not receive a distress call. A very high frequency–digital selective calling (VHF-DSC) radio was fitted on board, but was not programmed with a Maritime Mobile Service Identity. As no distress

signal was received by SAR authorities or by other vessels, the search and rescue operation was initiated only after the vessel was reported overdue.

Finding as to risk

If operators of a VHF-DSC radio do not have the radio programmed with a Maritime Mobile Service Identity for emergency use, it will not function as intended in an emergency and will not alert authorities, significantly reducing the possibility of rescue.

Previous TSB investigations have found that carrying a float-free emergency position indicating radio beacon (EPIRB) can contribute to saving lives, because it automatically sends a distress signal once it is released from its housing and floats upright. Other than float-free EPIRBs, all other distress alerting devices required by regulation rely on a crew member to initiate the distress signal. Even if it takes only seconds to operate, manually activated equipment such as an EPIRB or a VHF-DSC radio may become inaccessible or non-operational if a vessel suddenly capsizes. No distress signal was received from the *Sarah Anne*.

Vessel operators may choose to use an external system to allow others to monitor their voyage. They may participate in vessel traffic services or equip their vessel with an AIS. These systems were not used by the *Sarah Anne*.

Finding as to causes and contributing factors

No distress signal was received from the *Sarah Anne* and the voyage was not actively monitored by any external system. This resulted in a delay in the SAR response of several hours after the crew likely entered the water, severely reducing the crew's chances of survival.

From February 2010 to July 2020, at least 15 occurrences, resulting in 34 fatalities, involved the capsizing or sinking of small fishing vessels less than 12 m in length. More than half of the fatalities happened in the final 3 years of that period, indicating an increase in the frequency of fatalities.

2.6 Commercial fishing vessel registration

All commercial fishing vessels must be registered with TC. This registration establishes a primary point of contact between TC and a vessel owner; it allows TC to know that a vessel is operating and gives TC the opportunity to provide safety oversight and guidance to vessel owners. Vessels must also be registered separately with DFO. TC and DFO systems for vessel registration are separate and no consistent national approach exists to ensure that basic information for any vessel is the same in both regulators' registers. The DFO register is significantly more accurate and complete in all regions, given there is an annual requirement to renew. DFO uses a mix of enforcement options to promote and maintain compliance with licensing requirements. Fish harvesters therefore ensure their licence requirements are met before going fishing.

This investigation identified a difference of approximately 4000 vessels in 2020 registrations between DFO and TC in Newfoundland and Labrador. There are multiple reasons for the disparity:

Enforcement/oversight. In Newfoundland and Labrador's snow crab fishery alone, DFO has documented hundreds of annual vessel checks with dozens of charges and warnings issued for violations regarding fishing-related regulations. In contrast, TC does not have data readily available to describe its safety oversight efforts in the fishing industry. In the last 5 years, in all of Canada, TC has issued only 1 administrative monetary penalty for failure to register a vessel accurately. As a result, there are effectively no consequences for failing to register a vessel with TC and there are no incentives to do so.

Registration renewal. For a vessel registered in the Canadian Register of Vessels, failure to respond to TC's renewal notice prompts an automatic renewal with existing registration information. That is, if ARs ignore the certificate's expiry date, there are no apparent consequences, and therefore vessel information such as ownership and name may not be kept current. For a vessel registered in the Small Vessel Register, failure to pay the renewal fee before the expiry date and to respond to the notice results in a suspension of the certificate. The difference in these systems is clear: in the last 5 years more than 60% of fishing vessels in the Small Vessel Register had their certificates suspended for non-renewal, versus less than 3% of fishing vessels in the Canadian Register of Vessels. Without the requirement for a periodic inspection or an active renewal to prompt updates to registry information, TC may overlook small fishing vessels in the Canadian Register of Vessels.

Collaboration. In 2000, TC noticed that DFO was issuing licences to commercial fishing vessels without confirming their registration with TC. In 2006, a memorandum of understanding between TC and DFO suggested the parties meet to discuss the possibility of a joint or shared database for fishing vessel registration information and DFO fishing licences. In this occurrence, changes concerning the *Sarah Anne's* ownership and name were accurately registered with DFO, but not with TC.

Through the TC/DFO Safety at Sea initiative, officials are identifying vessels that are not registered and authorized representatives are being advised to register with TC Vessel Registry. The initiative is currently active in the Atlantic provinces. Although TC and DFO believe these regional initiatives are succeeding, verification of TC registration is not consistent across all regions and the issue still exists over 20 years later.

Awareness. In Newfoundland and Labrador, there is a widespread misconception within the fishing industry that because a fishing vessel of less than 15 GT does not require periodic inspections, TC is not involved with such vessels and they do not need to be registered with TC.

This registration issue with small fishing vessels in Newfoundland and Labrador indicates that TC is not making a strong enough effort to identify all active commercial fishing vessels. Identification is needed for TC to be able to advise vessel owners about why vessel

registration is important to their safety. TC was unaware of approximately 4000 vessels operating in Newfoundland and Labrador, leaving these vessels without any safety oversight by the regulator and potentially complicating search and rescue efforts for these vessels.

Regulations prescribe a minimum level of safety; for regulations to be effective, they must be known, understood, and followed. If the vessels are not known to TC, the regulator is unable to create awareness, provide education, or enforce compliance.

Finding as to risk

If fishing vessels are not registered in a TC register, and there are no mechanisms in place to ensure the accuracy of the register information, there is a risk that fish harvesters will not know about, understand, or adhere to regulations intended to increase fishing safety.

Masters have been and continue to be ultimately responsible for their own safety and the safety of the vessel and its crew.⁶⁶ However, in reality, because fishing vessels of less than 15 GT are not inspected for certification and the Small Vessel Compliance Program for fishing vessels (SVCP-F) is not mandatory, the level of compliance is unknown and unsafe conditions could develop and result in accidents.

Because TC was unaware of any of the changes to the vessel's registration, the owner of the *Sarah Anne* did not receive information directly from TC and could not participate in the SVCP-F. Furthermore, a random or risk-based inspection would not likely have been conducted.

2.7 Safety issues in the fishing industry

The TSB's safety issue investigation (SII) into fishing safety in Canada, conducted from 2009 to 2012, categorized actions affecting safety into 10 significant safety issues, which were further analyzed, and found that there are complex relationships and interdependencies among them.⁶⁷ In this occurrence, 7 of the 10 significant safety issues were present. Those not discussed in previous sections are shown here (Table 4). The TSB hopes to motivate members of the fishing community to work together to transform current fishing practices into safer behaviours and practices.

The following practices and procedures relating to the significant safety issues identified in the SII were also evident in this occurrence but not necessarily fully analyzed in this investigation.

⁶⁶ Government of Canada, S.C. 2001, c. 26, *Canada Shipping Act, 2001* (as amended 30 July 2019), sections 106 to 114.

⁶⁷ TSB Marine Investigation Report M09Z0001: Safety Issues Investigation into Fishing Safety in Canada.

Table 4. Circumstances of this occurrence related to the significant safety issues identified in the safety issue investigation into fishing safety in Canada (M09Z0001)

Significant safety issue	SII findings related to the significant safety issue	Related circumstances in this occurrence
Fisheries resource management	Harvesters can compromise vessel stability when they operate vessels in conditions for which they were not intended.	The vessel was intended to fish lobster near shore. The fishing grounds in this occurrence were 25 NM from shore. Snow crab traps stack more efficiently than lobster traps, allowing space for more catch and increasing the potential weight on the deck of a vessel.
	DFO has no national policy to address fishing safety.	DFO’s mandate is primarily focused on the health of the marine resources.
Regulatory approach to safety	Harvesters use face-to-face consultations to fully understand how regulations apply to their specific fishery.	The opportunities for face-to-face consultations with TC were limited, given that the vessel was not correctly registered and that the Canadian Council of Fish Harvesters stated on its website that vessels of less than 15 GT, which are not required to be inspected for certification, did not need to be registered with TC.
	There can be considerable time between when a safety deficiency is identified and when a new regulation is implemented.	The TSB identified the need for vessels to have automatic distress alerting equipment in 2000, and the new regulations came into force in 2020, 20 years later.
Training	Harvesters rely on experience to identify, assess, and manage risk.	Although the master had extensive fishing experience, he had no formal stability training. Harvesters do not necessarily acquire the technical proficiency necessary to fully understand the principles of stability.
	Harvesters generally conduct their business based on knowledge, skills, and attitude gained primarily through experience.	The master did not hold a TC certificate of competency. Knowledge gained through experience may not include advances in technology and the benefits of devices such as EPIRBs and AIS.
Safe work practices	Harvesters 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.

2.7.1 Interdependency of safety issues

Fish harvesters often consider fishing a dangerous occupation and accidents inevitable, no matter what precautions they take.⁶⁸ The interconnectedness of significant safety issues and the multiple complex systems within which the fishing industry operates were highlighted

⁶⁸ TSB Marine Investigation Report M09Z0001: Safety Issues Investigation into Fishing Safety in Canada.

in the SII and are among the reasons fishing safety has been slow to improve, despite the efforts of those responsible for it.

However complex, these systems can be influenced to improve fishing safety.

Safety advocates in the fishing industry have been moving toward recognizing and addressing their own safety responsibilities and there has been continued effort to improve fishing safety and save lives. Safety regulations for fishing vessels are being updated, TC and DFO are working together on some initiatives, safety associations continue to provide training and guidance material and to interact with fish harvesters, and some fish harvesters' behaviours have become more safety-conscious. However, these efforts are not coordinated, planned, or consistent across regions. Furthermore, fish harvesters are not necessarily familiar with these efforts to improve fishing safety, or do not necessarily apply these efforts to their operations.

Unsafe work practices, lack of life-saving equipment, and failure to take ownership of safety continue to lead to fatal fishing accidents. In this occurrence, the investigation could not determine with complete certainty the causal factors involved in the vessel's disappearance. However, there were a number of contributing factors involved in the loss of life: no distress call was received, no life raft was available to the crew, PFDs were not worn, the vessel was not monitored by a third party, the vessel was not equipped with an EPIRB, and the stability limits of the vessel were not known to the crew.

Finding as to risk

The safety of fish harvesters will be compromised until the complex relationships and interdependencies among safety issues are recognized and addressed by the fishing community.

3.0 FINDINGS

3.1 Findings as to causes and contributing factors

These are conditions, acts or safety deficiencies that were found to have caused or contributed to this occurrence.

1. It is likely that the vessel capsized suddenly, resulting in all crew members entering the water unexpectedly.
2. Since there was no formal stability assessment of the vessel, the crew made operating decisions without knowing the vessel's actual safe operating limits, which may have negatively affected the vessel's stability and led to it capsizing and sinking.
3. Without critical pieces of life-saving equipment for flotation and protection from environmental conditions, the crew members remained in the cold water, likely unassisted, and drowned.
4. The voyage of the *Sarah Anne* was not actively monitored by any external system and no distress signal was received. This resulted in a delay in the SAR response of several hours after the crew likely entered the water, severely reducing the crew's chances of survival.

3.2 Findings as to risk

These are conditions, unsafe acts or safety deficiencies that were found not to be a factor in this occurrence but could have adverse consequences in future occurrences.

1. If operators of a very high frequency–digital selective calling radio do not have the radio programmed with a Maritime Mobile Service Identity for emergency use, it will not function as intended in an emergency and will not alert authorities, significantly reducing the possibility of rescue.
2. If fishing vessels are not registered in a Transport Canada register, and there are no mechanisms in place to ensure the accuracy of the register information, there is a risk that fish harvesters will not know about, understand, or adhere to regulations intended to increase fishing safety.
3. The safety of fish harvesters will be compromised until the complex relationships and interdependencies among safety issues are recognized and addressed by the fishing community.

3.3 Other findings

These items could enhance safety, resolve an issue of controversy, or provide a data point for future safety studies.

1. Voluntary carriage of automated identification system transponders by fishing vessels of all sizes would increase vessel visibility and provide up-to-date information to local commercial traffic and those ashore who actively monitor a vessel's voyage.
2. The investigation looked at multiple sources of information to explain the loss of the *Sarah Anne*. Overall, there was no indication that the *Sarah Anne* was struck by a larger commercial vessel.

4.0 SAFETY ACTION

4.1 Safety action taken

4.1.1 Transportation Safety Board of Canada

Registration raises awareness of the vessel to Transport Canada (TC), affording an opportunity for improved safety oversight by the regulator, including providing the owner access to safety initiatives and programs. In addition, accurate and up-to-date registration also provides search and rescue authorities critical information about the vessel and its owner in the event of emergency situations.

In August 2021, the TSB issued Marine Safety Advisory Letter 02/21 to the Canadian Council of Professional Fish Harvesters regarding information on the council's website stating that fishing vessels of less than 15 gross tons were below the size for mandatory Transport Canada registration. No response was received.

4.2 Safety action required

On 25 May 2020 shortly after midnight, the fishing vessel *Sarah Anne*, with 4 people on board, departed St. Lawrence, Newfoundland and Labrador, to fish snow crab in Placentia Bay. The Marine Communications and Traffic Services Centre in Placentia, Newfoundland and Labrador, received an overdue report at 1945 that evening. A search was launched using several vessels and aircraft. The bodies of 3 crew members were recovered the following day. The body of the 4th crew member was recovered from the shore on 06 June 2020. The vessel was not found.

There were a number of contributing factors involved in the loss of life: no distress call was received, no life raft was available to the crew, personal flotation devices (PFDs) were not worn, the vessel was not monitored by a third party, the vessel was not equipped with an emergency position indicating radio beacon (EPIRB), and the stability limits of the vessel were not known to the crew.

The investigation also revealed that thousands more commercial fishing vessels were registered with Fisheries and Oceans Canada (DFO) in the Atlantic Region than were registered with TC. That is, DFO was issuing a license to harvest marine resources commercially without verification that the vessel was correctly registered with TC, the department responsible for surveillance of safety requirements.

Commercial vessels must be registered with TC, even those that are not inspected for certification.⁶⁹ Vessel registration with TC is not only a legislative requirement of the

⁶⁹ Vessels of less than 15 GT have been required to be registered with TC since 2007, when the provisions of the *Canada Shipping Act, 2001*, came into force. However, this is not well understood within the fish harvesting community, as indicated in Marine Safety Advisory Letter 02/21. Most of the fishing vessels in Newfoundland and Labrador and across Canada are of less than 15 GT (in Newfoundland and Labrador, 82% are in the smallest DFO category of vessels less than 35 feet, and approximately 4000 of these were not registered).

Canada Shipping Act, 2001, but also it gives TC the opportunity to provide safety oversight and guidance to vessel owners regarding their responsibility for compliance. In addition, up-to-date registration data mean accurate information is available to search and rescue authorities, and reliable data are available for safety regulators and other organizations in the marine safety system.

Harvesters are more likely to comply with regulatory requirements related to harvesting resources, partly because DFO upholds its mandate robustly through licence conditions and enforcement measures for non-compliance. In contrast, TC's less robust enforcement regime means that there are no such direct incentives to register with TC, nor to keep registration information up-to-date. In addition, the investigation identified that communication with fish harvesters in regard to the requirement for registration with TC is inconsistent and not always well understood.

Internationally, the importance of current and accurate vessel registration with the safety regulator has also been recognized, and many countries link fishing vessel licenses to vessel registration and inspection. In Canada, the connection between safety considerations and the granting of fishing licenses has long been recognized,^{70,71} but has not been adequately addressed. Driven largely by initiatives⁷² created by regional staff, efforts are underway within both TC and DFO to address the issue. Nationally, TC and DFO report that they are each changing their database structures to include the other department's unique registration number. However, without any enforceable requirements, these initiatives remain an informal arrangement and are not a permanent solution. DFO can continue to issue licenses to harvest marine resources on vessels that do not have a current and accurate TC registration. Since DFO is a part of the Government of Canada, issuing a licence may give fish harvesters the impression that they have satisfied all government requirements before conducting commercial operations.

In many countries, including Canada, one solution to coordinating service delivery when an issue falls under the responsibility of one or more departments has been a "whole of government" or "horizontal government" approach.⁷³ This approach was developed in

⁷⁰ Canadian Coast Guard, TP 8694E, *A Coast Guard study into fishing vessel safety* (October 1987).

⁷¹ Standing Committee on Fisheries and Oceans, *Atlantic Canada's marine commercial vessel length and licensing policies – working towards equitable policies for fishers in all of Atlantic Canada* (Library of Parliament, June 2018).

⁷² In the Pacific region, since 2012, DFO has been requesting that harvesters show that their fishing vessel has been registered with TC before DFO issues a fishing licence. In the Quebec region, after a successful pilot project in 2020, TC receives weekly reports of changes in vessel information from DFO and TC staff in the region are following up on all unregistered fishing vessels.

⁷³ J. Halligan, F. Buick and J. O'Flynn, "Experiments with joined-up, horizontal and whole-of-government in Anglophone countries," in *International Handbook On Civil Service Systems*, ed. A. Massey (Edward Elgar Publishing Ltd., 2012), at https://crawford.anu.edu.au/pdf/staff/janine_oflynn/2012/chapter-5-experiments-

response to situations where issues are interdependent, such as the safety of the fishing industry, and where the government's objectives cannot be achieved unless 2 or more departments begin working together.⁷⁴ For the Canadian fishing industry, this means TC and DFO must work together to ensure that fish harvesters meet all requirements before they can operate commercially. Given that fish harvesters have more frequent contact with the Government of Canada through DFO, a key step in advancing commercial fishing safety will be using this relationship to promote regulatory compliance with TC safety requirements.

If fishing vessels are not registered in a TC register, and there are no mechanisms in place to ensure the accuracy of the register information, there is a risk that fish harvesters will not know about, understand, or adhere to regulations intended to increase fishing safety. Given that current and accurate TC registration is the first step in safety oversight of commercial fishing vessels, the Board therefore recommends that

the Department of Fisheries and Oceans require that any Canadian vessel that is used to commercially harvest marine resources have a current and accurate Transport Canada registration.

TSB Recommendation M22-01

This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 16 March 2022. It was officially released on 18 May 2022.

Visit the Transportation Safety Board of Canada's website (www.tsb.gc.ca) for information about the TSB and its products and services. You will also find the Watchlist, which identifies the key safety issues that need to be addressed to make Canada's transportation system even safer. 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.

with-joined-up-horizontal-and-whole-of-government-in-anglophone-countries.pdf (last accessed 09 March 2022).

⁷⁴ H. Bakvis and L. Juillet *The Horizontal Challenge: Line Departments, Central Agencies and Leadership*. Canada School of Public Service (2004), at <https://publications.gc.ca/collections/Collection/SC103-1-2004E.pdf> (last accessed 26 January 2022).

APPENDICES

Appendix A – Stability assessment

Although an existing fishing vessel such as the *Sarah Anne* does not require a full stability assessment, the same vessel if new (more than 9 m in length without 2 fish-tight longitudinal divisions) is required to undergo a full stability assessment.⁷⁵ A full stability assessment must conform to International Maritime Organization's *International Code on Intact Stability, 2008*.⁷⁶ Therefore, the TSB carried out an assessment using a model based on a hull from a sister ship but modified to match the last known configuration of the *Sarah Anne*, following the requirements in the code.

The sister ship used for the hull model was of a similar age, built by the same boat builder to the same specifications, and unmodified. A 3-dimensional laser scan of the sister ship was taken to show the shape of the hull. Information about the construction and the mass distribution of the sister ship and estimated structural modifications on the *Sarah Anne* were used to determine the centre of gravity within that shape; differences were estimated from photos and interviews.

In any static stability assessment, calculations are made based on various standard loading conditions, which represent various stages of a vessel's voyage. Additional conditions can be added to show a vessel's stability performance when its operations fall outside of the standard loading conditions. Interviews and licensing documentation were used to determine what loading conditions could have been expected on the day of the occurrence. The TSB assessment of the model used the loading conditions shown in Table A1 when evaluating the vessel's static stability.

⁷⁵ Transport Canada, C.R.C., c. 1486, *Fishing Vessel Safety Regulations* (as amended 13 July 2017), section 3.48.

⁷⁶ Transport Canada, C.R.C., c. 1486, *Fishing Vessel Safety Regulations* (as amended 13 July 2017), subsection 3.5(1), referring to International Maritime Organization, *International Code on Intact Stability, 2008* (last amended 01 January 2020).

Table A1. Loading conditions for stability assessment of the Sarah Anne

Condition	Loading details
Lightship	<ul style="list-style-type: none"> • 0% fuel • 0 kg of ice • 0 kg of snow crab • 0 kg of gear (0 strings) • 0 crew
Departure (to retrieve traps)	<ul style="list-style-type: none"> • 100% fuel • 453 kg of ice • 0 kg of snow crab • 0 kg of gear (0 strings) • 4 crew
2 strings of gear and catch, as when last seen at 1000 on 25 May	<ul style="list-style-type: none"> • 60% fuel • 230 kg of ice • 725 kg of snow crab • 1000 kg of gear (2 strings) • 4 crew
3 strings of gear and catch*	<ul style="list-style-type: none"> • 40% fuel • 181 kg of ice • 1700 kg of snow crab • 1500 kg of gear (3 strings) • 4 crew
Planned load upon arrival in port for 25 May voyage	<ul style="list-style-type: none"> • 10% fuel • 113 kg of ice • 1700 kg of snow crab • 2000 kg of gear (4 strings) • 4 crew

* Since the 3rd string of gear was not located, this calculation assumed that the string was secured on board.

A stability assessment must identify downflooding points for the vessel. The hatch on the *Sarah Anne* was not watertight and whether the scuppers were open or closed on the day of the occurrence could not be determined. Therefore, the downflooding point was considered to be the top edge of the bulwark.

The hull model of the *Sarah Anne* was then heeled through a range of angles, and the righting lever⁷⁷ was determined at each angle. The limiting criteria were based mainly on the shape of the plotted righting lever curve and the resulting area underneath. This area represents the energy available to return a vessel to an upright position. Specifically, the standard limiting criteria in the *International Code on Intact Stability, 2008*, referenced in the *Fishing Vessel Safety Regulations*, are as follows:⁷⁸

- The area under the righting lever curve shall not be less than 0.055 metre-radians up to 30° of heel angle.

⁷⁷ The righting lever (which represents the relative locations of the centre of mass and the centre of buoyancy) is a measure of a vessel’s ability to return to an upright position when heeled.

⁷⁸ International Maritime Organization, *International Code on Intact Stability, 2008* (last amended 01 January 2020), Part A, Chapter 2, section 2.2.

- The area under the righting lever curve shall not be less than 0.09 metre-radians up to 40° of heel angle or the angle of downflooding.
- The area under the righting lever curve between the angles of 30 and 40° or the angle downflooding, if less than 40°, shall not be less than 0.03 metre-radians.
- The righting lever shall be at least 0.2 m at an angle of heel equal to or greater than 30°.
- The maximum righting lever shall occur at a heel angle not less than 25°.
- The initial metacentric height (GM) shall not be less than 0.15 m.

The stability assessment of the *Sarah Anne* found that the vessel failed at least 1 stability criterion in each of the operating conditions examined (Table A2).

Table A2. Results of the *Sarah Anne* stability assessment

Criteria	Lightship	Departure (to retrieve traps)	2 strings of gear and catch	3 strings of gear and catch	Planned load
Righting area up to 30° > 0.055 metre-radians	Pass	Fail	Fail	Fail	Fail
Righting area up to 40°/ downflooding > 0.09 metre-radians	Pass	Pass	Fail	Fail	Fail
Righting area from 30° to 40°/ downflooding > 0.03 metre-radians	Pass/Fail*	Fail	Fail	Fail	Fail
Righting lever at or above 30° > 0.2 m	Pass	Fail	Fail	Fail	Fail
Max righting lever > 25°	Pass	Pass	Fail	Fail	Fail
Initial metacentric height > 0.15 m	Pass	Pass	Pass	Pass	Pass

* Due to limited information available on the *Sarah Anne*, the TSB examined a reasonable range of vertical centre of gravity (VCG) estimates for the vessel as part of the stability assessment, to ensure the results remained consistent for the operating conditions. This criterion (righting area from 30° to 40°/ downflooding > 0.03 metre-radians) in the lightship condition was the only result to change within the range of VCGs.

Appendix B – Previous occurrences

The following are occurrences reported to the TSB that are similar to the *Sarah Anne* occurrence, with respect to the absence of emergency position indicating radio beacons (EPIRBs), and personal flotation device (PFD) use on small fishing vessels.

M20A0258 – In July 2020, a 6.36-m undecked fishing vessel that was not registered with Transport Canada (TC) sank rapidly while halibut fishing 3 nautical miles (NM) west-northwest of Sally’s Cove, Newfoundland and Labrador. A large wave came over the bulwark, and the bilge pump could not prevent the vessel from sinking. The vessel did not carry an EPIRB, and the crew were reported overdue later that day. Although the master had a PFD on board, he was not wearing it when he entered the water and did not survive, while the crew member who wore a PFD was rescued 20 hours after entering the water.

M19P0242 – In September 2019, the 9.1-m aluminum fishing vessel known as *Jamie Michelle Lynne*, with 4 people on board, was reported overdue 28 NM east of Hay River, Northwest Territories. The capsized vessel was found in October but the crew members were never found.

M18A0303 – In September 2018, the 11.5-m fishing vessel *Kyla Anne*, with 3 crew members on board, capsized while returning to port after a lobster fishing trip about 1 NM north of North Cape, Prince Edward Island. Only 1 crew member survived the capsizing by swimming to shore. Neither PFDs nor an EPIRB were on board at the time of the occurrence.

M18A0076 – In May 2018, a 5.79-m unnamed crab fishing vessel that was not registered with TC was found capsized 0.04 NM northeast of Beach Cove Point in Port Medway, Nova Scotia. The vessel’s 2 crew members were recovered and pronounced dead. The crew members were not wearing PFDs, and the vessel was not equipped with an EPIRB.

M18A0078 – In May 2018, a 8.69-m lobster fishing vessel *Ocean Star II*, with 3 crew members was reported capsized by a nearby fishing vessel. One crew member swam to shore and contacted 911, the other 2 crew members died. Although PFDs were on board, they were not worn by the crew at the time of the occurrence.

M16A0327 – In September 2016, the 6.7-m cod fishing vessel *Pop’s Pride* that was not registered with TC with 4 crew members on board, was reported overdue after it did not return to St. John’s, Newfoundland and Labrador. Two of the vessel’s crew members wearing PFDs were recovered and pronounced dead, while 2 others were not recovered and are presumed drowned. The vessel was not equipped with an EPIRB.

M15A0189 – In June 2015, the 7.1-m fishing vessel *CFV 130214* was reported overdue with 3 crew members on board while fishing snow crab in Placentia Bay, Newfoundland and Labrador. No distress communication was issued and the SAR response was initiated only when the vessel and crew were reported overdue. Subsequently the bodies of 3 crew members were recovered. The vessel was not found and was believed to have sunk. Although PFDs were on board at the time of the occurrence, none of the crew members were found wearing them. The vessel was not equipped with an EPIRB.

M14P0121– In June 2014, the 8.69-m fishing vessel *Five Star*, with 2 crew members on board, capsized and sank when the Dungeness crab catch stowed on deck shifted while the vessel was underway in adverse sea conditions near Kelsey Bay, British Columbia. The crew did not wear PFDs during normal fishing operations. One crew member swam to shore, but the other crew member was not recovered and was presumed drowned. The vessel was not equipped with an EPIRB.