



Transportation
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of Canada

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du Canada

MARINE INVESTIGATION REPORT

M16C0014



Mechanical failure and sinking

Fishing vessel *Bessie E.*

Mamainse Harbour, Ontario

16 February 2016

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

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Summary

On 16 February 2016, at approximately 2000 Eastern Standard Time, the fishing vessel *Bessie E.* sustained an engine failure while returning to Mamainse Harbour, Lake Superior, Ontario, after a day of fishing. At the time, there were 5 people on board. While work was being carried out to restart the engine, the vessel drifted outside the harbour and closer to shore. The vessel touched bottom and the wind pushed it until it was parallel to the rocky shore. Everyone on board disembarked, and shortly afterward the vessel capsized and sank. The vessel was deemed a total loss.

Le présent rapport est également disponible en français.

Factual information

Particulars of the vessel

Table 1. Particulars of the vessel

Name of vessel	<i>Bessie E.</i>
Official number	188237
Port of registry	Port Dover, ON
Flag	Canada
Type	Fishing
Gross tonnage	12.66
Length overall	13.78 m
Draft at time of occurrence	1.06 m
Built	1957, Dunnville, ON
Propulsion	1 diesel engine (125 bhp) driving a single fixed-pitched propeller
Cargo	1000 kg of whitefish
Crew	5
Registered owner	Private owner, Batchawana Bay, ON

Description of the vessel

The *Bessie E.* (Figure 1) was a fishing tug engaged in commercial fishing operations on the Great Lakes, with a design typical of this type of vessel: constructed of all-welded steel, with a single-chine hull and a partially enclosed superstructure extending from bow to stern. The superstructure had 5 doors: 2 forward (one on each side), 2 aft (one on each side), and 1 large door at the stern. The main deck was made of steel, and the hull was not subdivided. The vessel was also equipped with 2 anchors, which were operated manually.

Figure 1. *Bessie E.*



The wheelhouse was located near amidships and could only be accessed from within the superstructure by means of a door on the port side. The navigation and communications equipment was arranged across the forward part of the wheelhouse and included the following: 2 global positioning systems (GPS); a magnetic compass; a radar; a depth sounder; and 2 very high frequency (VHF) radiotelephones, one of which had a digital selective calling (DSC) feature that was not registered with Innovation, Science and Economic

Development Canada for search and rescue purposes.¹ The port sidelight and screen were painted red and the starboard sidelight and screen were painted green.²

The main engine was located directly below the wheelhouse and was accessed via a door beside the wheelhouse door. The vessel had 4 fuel tanks, 2 on each side of the engine. The fuel tanks supplied the main engine and the diesel alternator via a main filter equipped with a water separator. The diesel alternator, used to provide electrical power to the vessel, was located aft on the port side.

The *Bessie E.* carried a survival craft³ that was powered by oars, 2 life buoys with ropes, 6 flares, 8 personal flotation devices (PFD)⁴, 3 anti-exposure suits, one emergency position indicating radio beacon (EPIRB)⁵ that was not registered,⁶ 3 fire extinguishers, 1 engine-driven deck wash pump, and 1 portable gasoline-powered fire pump.

History of the voyage

On the morning of 16 February 2016, at about 0700,⁷ the *Bessie E.* left Mamainse Harbour, Ontario (Appendix A), for the last day of the fishing season, with the master and 4 crew members on board. The master was planning to retrieve some gill nets⁸ that had been set approximately 15 nm north of Mamainse a few days before, and then lay up the *Bessie E.* until the next fishing season.⁹ The master monitored the weather on the VHF marine weather forecasts in the days prior to the occurrence and did not depart until the weather was

¹ A VHF-DSC radio must be registered and programmed with a Maritime Mobile Service Identity (MMSI) in order to ensure that identities are unique and available for search and rescue purposes. MMSI numbers are issued by Innovation, Science and Economic Development Canada (Transport Canada Ship Safety Bulletin 02/2002). With an unregistered VHF-DSC radio, search and rescue resources may not be provided with all the information required, and their response may not be as rapid, efficient, and coordinated.

² *Collision Regulations, C.R.C., c. 1416, Annex I, "Positioning and Technical Details of Lights and Shapes."* It could not be determined if the *Bessie E.* was required to have screens installed as the characteristics of its lights could not be examined after the occurrence. Nonetheless, when installed, screens should conform to the required standard of being painted matt black.

³ Subsection 2(1) of the *Life Saving Equipment Regulations* states that survival craft may be a "lifeboat, a rescue boat, an emergency boat, a suitable boat, a buoyant apparatus, a life raft or an inflatable rescue platform." In this occurrence, the vessel carried a "suitable boat."

⁴ Personal flotation devices are designed for constant wear and have limited capability to turn a person over so that their head is above water.

⁵ This beacon alerts search and rescue automatically when a vessel is in distress and contributes greatly to a faster search and rescue response.

⁶ With an unregistered EPIRB, search and rescue resources may not be provided with all the information required, and their response may not be rapid, efficient, and coordinated.

⁷ All times are Eastern Standard Time (Coordinated Universal Time minus 5 hours) unless otherwise specified.

⁸ Gill nets are vertical panels of netting normally set in a straight line.

⁹ Although the fishing season normally ends in November, the *Bessie E.* had continued to fish until February due to the exceptionally warm weather throughout the winter of 2015–2016.

favourable.¹⁰ At the time of departure, the wind was blowing off shore and there was minimal ice in the harbour.

At approximately 1600, after the crew had picked up the nets and retrieved about 1000 kg of fish, the vessel headed toward Mamainse and reached the harbour about an hour later. The wind had changed direction and was coming from the north; it had pushed ice into a pack in the harbour, filling it to the extent that the vessel could not get through to the berth.

After about 3 hours of attempting to reach the berth, the vessel could no longer move toward the harbour. The engine temperature began to rise and the master shut it down. He went into the engine room, added water to the engine cooling circuit, and restarted the engine. He also ordered the crew to move the totes containing the day's catch further towards the stern in order to trim the vessel by the stern and lower the propeller deeper into the water, below the ice. The master managed to turn the vessel in the direction of the open water and then used his satellite phone to call the harbour master for advice. The harbour master recommended that the master get the vessel out of the ice and navigate to another harbour further north where it could be secured until the ice had cleared.

The master had manoeuvred the vessel in the direction of the lake but not yet left the harbour ice when the swells began to increase and the vessel began to roll.¹¹ The engine shut down and the master attempted to restart it, without success. The master then went to the engine room to investigate the problem. As the vessel had a history of fuel supply issues, the master changed the main fuel filter on the main fuel supply line and attempted to restart it again without success.

To address the possibility that the air in the line was creating an air lock,¹² which had also happened before, the master bled the lines, replaced the primary and secondary fuel filters on the engine, and bled the lines again. After replacing the filters, the master successfully restarted the engine. At this time, it had been 1.5 hours since the engine had overheated and shut down. At some point while the master was in the engine room, a crew member told the master that the vessel was drifting towards the harbour.

By the time the master returned to the bridge, the vessel had drifted southwest outside of the harbour and was close to shore. After the engine was started and the position of the vessel was determined (close to shore in shallow waters), the vessel was underway but struck bottom almost immediately. The master was no longer able to manoeuvre the vessel because

¹⁰ For 14 February, winds were forecasted to be light and increasing to south at 20 knots late in the day. For 15 February, winds were forecasted to be from the south at 30 knots diminishing to southwest at 15 knots in the afternoon and then veering to northwest at 15 knots near midnight.

¹¹ Waves of 2 m had been forecasted for the beginning of the evening.

¹² Diesel engine fuel systems are susceptible to air locks in their fuel lines because standard diesel fuel injection pumps rely on the fuel being non-compressible. Common causes of air locks are air entering into the fuel line, air entering from the tank, fuel pipes that are too small, or inadequate routing of the piping.

the stern was touching the bottom and the wind pushed the vessel closer to the shore until it was parallel.

The vessel rolled in that position and began smashing against the rocks. Without donning flotation devices or issuing a distress call, the crew members jumped ashore from the vessel when the shore side of the vessel was lower, managing to stay clear of the rolling vessel. Shortly after the master jumped ashore, the vessel capsized. The crew then walked toward Mamainse Harbour. They crossed the harbour by walking on the ice and took approximately 1 hour to reach the fish processing plant on the mainland, where they obtained shelter and assistance. The following day, only a small portion of the hull was visible. There was no EPIRB signal received by JRCC. The vessel was deemed a constructive total loss.¹³

Environmental conditions

On the day of the occurrence, the wind was southwest at 10 knots, veering to north at 25 knots in the late afternoon. The weather conditions recorded at Caribou Island, Ontario,¹⁴ were winds from the northeast at 10 knots, increasing to 20 knots between 1600 and 2100. The average temperature was -2.5°C and the average wind chill was -8.0°C .

From 14 to 16 of February (the 2 days prior to and the day of the occurrence), the eastern section of Lake Superior, which includes Mamainse Harbour and the fishing grounds of the *Bessie E.*, was open water except for the southeastern section, where a total ice concentration of 9/10 was observed. This observation included the following conditions: 2/10 of medium lake ice in medium floes, between 4/10 and 8/10 of thin lake ice in small floes, and between 1/10 and 5/10 of new lake ice in floes of undetermined size.¹⁵

The actual wave heights on the day of the occurrence were unavailable because the eastern Lake Superior Ocean Data Acquisition System buoy had been removed for the winter. The wave heights were forecasted to be 0.5 m or less, building to 1 m near noon and to 2 m in the early evening.

Commercial fishery in Ontario

Overview

Ontario's commercial fishery is one of the largest freshwater fisheries in North America, supporting a total of \$33 million of economic activity, with 80% of that activity coming from

¹³ A vessel is deemed a constructive total loss when the cost of repairs plus the cost of salvage equal or exceed the value of the vessel.

¹⁴ Caribou Island is 5 nm west-northwest of Mamainse Harbour.

¹⁵ Observations of ice conditions are presented in a standardized international code and indicate ice concentration (measured in tenths), ice type or stage of development (new, thin, medium, thick, very thick), and form of ice (or size of floe).

Lake Erie.¹⁶ Fishing operations range from traditional small-scale one-person operations in an open boat hauling nets by hand to modern larger fleets of fishing vessels. A total of 457 fishing vessels are registered with TC in the province of Ontario, but it is not known how many of these vessels are actively fishing.

Batchewana First Nation

The master and crew of the *Bessie E.* were members of the Batchewana First Nation Band (the Band), which, at the time of the occurrence, consisted of approximately 3500 members living on 4 reserves. The Band maintains and asserts its rights according to the Robinson-Huron Treaty of 1850 to resources, resource sharing, and resource management within its traditional territory, including the commercial fishery. The treaty provides for “the full and free privilege to hunt over the territory now ceded by them and to fish in the waters thereof as they have heretofore been in the habit of doing.”¹⁷

In 2007, the Band created a Natural Resources Department. The goals of the Department were to manage the natural resources within the Batchewana First Nation territory in a sustainable manner and to promote the economic development of the community.

Fisheries management

The Band’s Natural Resources Department developed a sustainable fisheries harvest management plan that included policies and rules on commercial fisheries such as a monthly catch report system, monitoring, vessel registration, and commercial fishing permits.

In order to conduct fishing operations, the Batchewana fishermen require a permit issued by the Band’s Natural Resources Department. The Department issues permits for fish harvesting on Lake Superior to between 5 and 8 fishing tugs and 20 open fishing vessels annually. Once the permit is issued, the fishermen are required to conduct operations under the oversight of the Band’s Natural Resources Department.

Most of the other bands in the Great Lakes area conduct fishing operations under permits issued by the Ontario Ministry of Natural Resources and Forestry.

Oversight of fishing safety

The Band’s Natural Resources Department also had fishing safety rules in place that were mostly modelled after TC regulations and mandatory incident reporting, although it had not

¹⁶ Department of Fisheries and Oceans Canada, “Freshwater Fisheries – Catches and Landed Values by Species, by Province/Territory, 2014,” at <http://www.dfo-mpo.gc.ca/stats/commercial/land-debarq/freshwater-eaudouce/2014-eng.htm> (last accessed 29 May 2017).

¹⁷ Indigenous and Northern Affairs Canada, *Treaty Texts, Robinson Treaty Made in the Year 1850 with the Ojibewa Indians of Lake Superior Conveying Certain Lands to the Crown* (07 September 1850), p. 1, paragraph 3, at <http://www.aadnc-aandc.gc.ca/eng/1100100028978/1100100028982> (last accessed 29 May 2017).

received any reports of incidents in the past several years. The Band does not require specific training for fishermen, and the generation-to-generation transfer of learning and skills is the accepted common practice.

Ontario's *Occupational Health and Safety Act* applies to workers in the province, such as fishermen, who are not covered by the *Canada Labour Code*.¹⁸

According to federal authorities, all of the commercial fishing vessels and crew in Canada are required to meet the *Canada Shipping Act, 2001*¹⁹ (S.C. 2001, c. 26) (the Act) and its applicable regulations such as the *Small Fishing Vessel Inspection Regulations* and the *Marine Personnel Regulations*. The Act clearly sets out the responsibilities for safety that are incumbent upon the authorized representative,²⁰ the master, and the crew. Fishing vessel masters have been, and continue to be, ultimately responsible for their own safety, the safety of the vessel, and the safety of the vessel's crew members.

Vessel certification

The *Bessie E.* was registered²¹ in Canada in 1957 and that registration was maintained as required until the vessel changed ownership in November 2015. As a small fishing vessel not exceeding a gross tonnage of 15, the *Bessie E.* was subject to Part II of the *Small Fishing Vessel Inspection Regulations*, which sets out the requirements for lifesaving equipment, lights and signals, fire extinguishing equipment, and precautions against fire. Because it was a small fishing vessel, it was not required to undergo periodic inspections by Transport Canada (TC). The vessel did not hold a radio licence, nor was one required by regulation.

Personnel certification

The master had 23 years of fishing experience on the *Bessie E.* This was his first season as master. TC has no record of the master holding a marine certificate of competency as required by regulation as of 07 November 2010.²² The investigation was also not able to confirm that the master held the required Marine Emergency Duties certificate or Radio Operator's Certificate – Maritime at the time of the occurrence.²³ The master had not had any formal fishing or marine safety training, nor was there any readily available. The master had also never conducted emergency drills with the crew. The investigation found that the

¹⁸ Letter dated 12 February 2015 from the Ontario Ministry of Labour addressed to the TSB on the matter of Recommendation M99-02.

¹⁹ Government of Canada, *Canada Shipping Act, 2001* (S.C. 2001, c. 26), sections 106–114.

²⁰ According to subsection 14(1) of the *Canada Shipping Act, 2001*, every Canadian vessel must have a person (the authorized representative) who is responsible for acting with respect to all matters relating to the vessel that are not otherwise assigned to another person.

²¹ Government of Canada, *Canada Shipping Act, 2001* (S.C. 2001, c. 26), section 46.

²² Transport Canada, *Marine Personnel Regulations*, SOR/2007-115 (last amended 03 February 2017), paragraph 212(1)(c).

²³ *Ibid.*, Division 7, section 266.

master was not aware of the *Small Fishing Vessel Inspection Regulations* that applied to the *Bessie E.* at the time of the occurrence.

Most of the crew members had worked regularly on the *Bessie E.* for 20 years.

Fuel storage and distribution

No fuel company delivered fuel to Mamainse Harbour. Instead, the fishermen transported the fuel from Sault Ste. Marie to Mamainse in portable containers, and then transferred it into the vessel's tanks. Transferring fuel in this manner made it vulnerable to contamination by the introduction of water and particulate and/or microbial growth.

The *Bessie E.*'s fuel tanks were equipped with a shut-off valve at the fuel outlet in order to insulate the tanks. At the time of the occurrence, only the 2 port tanks were in use; the starboard tanks were empty, the valves were closed and the tanks could not supply fuel to the engine. The fuel tanks supplied the main engine and the diesel alternator via a main filter equipped with a water separator that was installed on the fuel pipe.

In addition, the original primary and secondary fuel filters were mounted on the main engine, and the engine was equipped with a small hand-operated fuel pump that could be used to bleed the fuel circuit of any residual air that might prevent the system from working properly.

The vessel had experienced problems with the engine fuel supply system prior to this occurrence. The vessel owner carried out his own repairs each time, but there was no documentation of issues encountered or repairs made. The fuel filters had been replaced in October and December 2015 and on the day before the occurrence. The replacement of fuel filters for marine diesel engines is usually recommended approximately every 200 hours. The fuel supply piping also experienced air locks.

Three to four years ago, the *Bessie E.* experienced an engine problem similar to this occurrence, and the vessel went aground. The vessel sustained extensive damage and the fuel system was refurbished with an additional filter and a rubber fuel priming bulb installed in the piping between the fuel tanks and the engine. However, the bottoms of the fuel tanks were never drained and the tanks were never cleaned.²⁴ Because no draining valves or plugs were installed on the tank, nor was there any access that would enable a crew member to clean it, it would not have been possible to drain or clean the tank.

²⁴ A standard practice is to drain the bottom of fuel tanks regularly, after the vessel has been stationary for a while and the sediment has fallen to the bottom. This is done to remove any water and/or sediment that may have accumulated.

Fuel installation standards

There are many standards readily available to vessel owners that can be followed in order to ensure that a vessel's machinery installation will operate as intended.

The *Marine Machinery Regulations* govern fuel installations on vessels and provide measures to ensure the safety of vessel operations. These regulations require provisions to ensure that fuel installations are configured in a manner that prevents leaking, overpressure, and overheating fuel.

Organizations such as the American Boat and Yacht Council provide standards for the design, choice of materials, construction, installation, repair, and maintenance of diesel fuel systems. For example, standard ABYC H-33 states that each metallic tank must be installed to allow for the drainage of accumulated water from the tank's surfaces when the vessel is in its static floating position.²⁵

Engine manufacturers are also a reliable source of information for vessel owners and operators. Complete installation manuals are available that detail, among other things, driveline alignment, instrumentation and monitoring systems, cooling, lubrication, and fuel. Manuals also explain the importance of fuel cleanliness; tank design and materials, including a draining feature and a means of access for cleaning the tanks; fuel line size, routing and materials; the types of filters that should be used depending on the fuel used; the fuel properties; and an explanation of the adverse effects that water and sediment have on fuel. These manuals also explain in detail what precautions should be taken when replacing filters.

Safety Issues Investigation into Fishing Safety in Canada

In June 2012, the Transportation Safety Board of Canada (TSB) released *Safety Issues Investigation into Fishing Safety in Canada* (SII), which provides an overall, national view of safety issues in the fishing industry, revealing a complex relationship and interdependency among these issues. The report highlights the variability in attitudes and behaviours related to safety across the Canadian fishing community. As well, due to the complexity and diversity of the fishing community, it was determined that no person, group, or government alone can address all of the issues or deal with the challenges that arise from the interconnectedness of the overall safety issues. The Board identified the following significant safety issues requiring attention: stability, fisheries resource management, lifesaving appliances, training, safety information, cost of safety, safe work practices, regulatory approach to safety, fatigue, and fishing industry statistics.²⁶

²⁵ American Boat and Yacht Council, ABYC H-33, "Diesel Fuel Systems."

²⁶ Transportation Safety Board of Canada Marine Safety Issues Investigation Report M09Z0001, *Safety Issues Investigation into Fishing Safety in Canada*.

Outstanding recommendations

On 20 September 1999, the Board issued Recommendation M99-02, as a result of the investigation of the serious injury of a crew member on 08 October 1996. While the small fishing vessel *S.S. Brothers* was hauling in a scallop rake off Yarmouth, Nova Scotia, a crew member attempted to climb over the unattended winch and fell; his right leg was crushed between the incoming wire and the winch barrel.

The investigation revealed that the overall safe operation of a vessel is governed by both federal and provincial regulations, and that provincial governments have the responsibility to ensure that the “business of fishing” is conducted in a safe manner.

The Board was also concerned that the complexity of the legislation can hinder effective compliance by fishermen in that it may not be easily understood (TSB Marine Investigation Report M96M0144). Thus, the Board recommended that

The provinces review their workplace legislation with a view to presenting it in a manner that will be readily understood by those to whom it applies, to help ensure that the enforcement mechanism and the regulatory regime complement each other.

TSB Recommendation M99-02

In February 2000, the Ontario Ministry of Labour initially responded that it would “forward this recommendation to the appropriate Ministry staff for consideration.” The Board reassessed the responses by the provinces to Recommendation M99-02 in February 2000 and rated the responses as Satisfactory Intent.²⁷ Following that assessment, the recommendation was made inactive.

On 01 April 2015, the Board reactivated the recommendation, reassessed the responses, and requested an update from all of the provinces. In February 2015, the Ministry of Labour of Ontario responded that Ontario’s *Occupational Health and Safety Act* applies to workers in the province, such as fishermen, who are not covered by the *Canada Labour Code*. The Ministry provided an update concerning workplace safety legislation as it applies to fishermen and fishing vessels. The Ministry stated that initiatives were taken to make regulations easier to understand, such as providing compliance guidance materials in plain language.

The Board reassessed the responses by the provinces to Recommendation M99-02 in October of 2016 and rated the responses as Satisfactory in Part.²⁸ The recommendation is still active.

²⁷ A Satisfactory Intent rating is assigned if the planned action, when fully implemented, will substantially reduce or eliminate the safety deficiency, and meaningful progress has been made since the recommendation was issued. However, for the present, the action has not been sufficiently advanced to reduce the risks to transportation safety. The TSB will monitor the progress of the implementation of the planned actions and will reassess the deficiency on an annual basis or when otherwise warranted.

²⁸ A Satisfactory in Part rating is assigned if the planned action or the action taken will reduce but not substantially reduce or eliminate the deficiency, and meaningful progress has been made since

Oversight of fishing safety

Oversight of commercial fishing safety is a complementary and shared responsibility between federal and provincial authorities and industry stakeholders. Efforts to improve fishing safety should be collaborative and must involve the fishermen themselves.

Federal

TC is the federal department with regulatory authority over marine transportation. TC regulates marine transportation by establishing marine safety programs and setting standards for vessel crew, registration, and inspection. Its main responsibilities, among others, are

- the regulatory regime, which includes the development of regulations and standards for vessels and crew in accordance with federal laws and policies;
- oversight, which includes issuing licences, certificates, registrations and permits, conducting audits, inspections and surveillance, and enforcement of regulations and standards; and
- outreach, which includes promoting safety and security as well as educating the public and increasing public awareness regarding these issues.

In Ontario, TC delivers its program from the regional offices in Sarnia, Thunder Bay, Kingston, Toronto, and St. Catharines. Currently, TC inspects 76 registered²⁹ fishing vessels³⁰ in Ontario. Although the Batchewana First Nation Band is subject to federal marine safety regulations, TC's statutory mandatory periodic inspection is only applicable to fishing vessels of more than 15 gross tonnage. Fishing vessels of less than 15 gross tonnage are not subject to statutory inspection; however, TC conducts risk-based monitoring inspections on this size of vessel. Attempts by TC to conduct risk-based monitoring inspections on the Batchewana First Nation Band vessels were not well received. Therefore, TC's program is not currently applied to the vessels or fishermen of the Band.

Provincial

The SII examined the various governance structures in place at the provincial level that provide oversight of safety in the fishing industry. In Canada, the jurisdiction of the provinces to regulate certain aspects of the commercial fishery, including those related to labour relations, workplace safety, and workers' compensation, has been recognized by

the recommendation was issued. The TSB will follow up with the respondent as to options that could further mitigate the risks associated with the deficiency. The TSB will reassess the deficiency on an annual basis or when otherwise warranted.

²⁹ A registered vessel may not be actively fishing; the vessel registry is updated every 5 years and it is the responsibility of the owner to inform the registrar of any change in the vessel's status.

³⁰ Not all of those are fishing commercially; they could be fishing, for example, for research or sport.

federal and provincial courts. The courts in Canada have ruled that the provinces have jurisdiction over certain aspects of fishing safety.³¹

Provincial legislation varies with respect to these issues, with some provinces taking a more proactive and comprehensive approach than others. British Columbia and Newfoundland and Labrador, in addition to their respective occupational health and safety acts and regulations, which apply to the business of fishing, also have fishing-specific workplace regulations. While the provinces of Nova Scotia and Quebec do not have fishing-specific workplace regulations, their occupational health and safety acts and regulations apply to the business of fishing and fishing vessels.

In Ontario, the Ministry of Labour sets, communicates, and enforces workplace standards, and is responsible for the majority of accident/incident prevention matters within the Ontario fishing industry. The Workplace Safety Insurance Board (WSIB) is responsible for the workers' compensation program. According to the Ministry's response to TSB Recommendation M99-02, the Ontario *Occupational Health and Safety Act* applies to workers in the province, such as fishermen, who are not covered by the *Canada Labour Code*.

Notwithstanding this response, the investigation raised doubts as to whether the Ontario *Occupational Health and Safety Act* is being applied to commercial freshwater fishing vessels. The Ministry of Labour defines fishermen as workers engaged in commercial aquaculture; therefore, other commercial freshwater fishermen in Ontario, who do not meet this definition, may not fall under its jurisdiction. The Ministry of Labour's primary means of prevention and oversight is to promote safety education and awareness through the work of 4 health and safety associations, each of which represents several provincial industries. The fishing industry is not one of them.

Although the WSIB administers a mandatory workers' compensation program to all the fishermen in Ontario who, by definition, are considered "workers" under the Ontario *Workplace Safety and Insurance Act, 1997*, its interventions within the fishing industry are limited. A fisherman who is an independent operator would not automatically be covered because that individual would not meet the definition of "worker" in the Ontario *Workplace Safety and Insurance Act, 1997*; this means that such an individual would only have WSIB coverage if they obtained optional insurance. In this occurrence, the master was not covered by the WSIB, but the crew members were.

Provincial workers' compensation boards can play a role in promoting safety within the fishing industry and in some provinces these boards actively support an industry-led safety association. The mandate of such associations is to enhance safety through education,

³¹ Two court decisions relate to this jurisdictional issue: *R. v. Mersey Seafoods Ltd.* 2008, NSCA 67, and *Jim Pattison Enterprises Ltd. v. British Columbia (Workers' Compensation Board)*, 2011 BCCA 35 (see CanLII at <https://www.canlii.org/en/ns/nsca/doc/2008/2008nsca67/2008nsca67.html> and <https://www.canlii.org/en/bc/bcca/doc/2011/2011bccca35/2011bccca35.html> respectively, last accessed 29 May 2017).

research, advocacy, communication, and increased awareness. The provinces of British Columbia, Nova Scotia, and Newfoundland all have fishing safety associations that share safety programs and ideas. For example, FishSafe's "Safest Catch" program, developed in British Columbia, has been expanded and delivered in Nova Scotia, Quebec, Prince Edward Island, and New Brunswick.

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 TSB Watchlist 2016 issue. As this occurrence demonstrates, further collaboration between governments and leaders in the fishing community is necessary to ensure that fishermen can and do work safely. Also, oversight of all commercial fishing operations would help to ensure that safety deficiencies are detected within fishing operations. Finally, more work is needed to improve the fuel system repairs that are carried out on board vessels.

Commercial fishing safety will remain on the Watchlist until

- new regulations are implemented for commercial fishing vessels of all sizes;
- user-friendly guidelines regarding vessel stability are developed and implemented to reduce unsafe practices;
- there is evidence of behavioural changes among fishermen regarding the use of personal flotation devices, EPIRBs, and survival suits, as well as of on-board safety drills and risk assessments being carried out; and
- there is concerted and coordinated action by federal and provincial authorities, leaders within the fishing community, and fishermen themselves to put in place strong regional initiatives and develop a sound safety culture in the fishing community.

Analysis

Factors leading to the bottom contact and sinking

As fuel was carried to the *Bessie E.* in portable containers and then transferred into the tanks, it was vulnerable to contamination such as the introduction of water and particulate and/or microbial growth. As a result, at the time of the occurrence, the fuel on board likely contained a substantial level of sediment that would have settled to the bottom of the vessel's fuel tanks. This scenario is also reinforced by the master's need to replace the fuel filters more often than usual around the time of the occurrence. The master had no means of draining or cleaning the tanks, which could have helped manage the level of contamination.

On the day of the occurrence, the winds had increased and changed direction, causing ice to block the entrance to the channel. When the master was unable to reach the berth and turned the vessel to navigate to another harbour, the swells increased and the vessel began to roll. It is likely that the rolling of the vessel disturbed the sediment at the bottom of the fuel tanks, causing it to clog the filters. This restricted the fuel supply to the vessel engine, contributing to the introduction of air into the supply system, and the eventual shutdown of the engine due to fuel starvation. When the master opened the system to change the filters, more air was introduced into the system. Because the system was difficult to bleed, this added to the time needed to restart the engine.

While the master was in the engine compartment trying to restart the engine, no anchor was deployed, so the vessel was free to drift. No one was tasked with monitoring the vessel's position, although at some point a crew member advised the master that the vessel was drifting towards the harbour. However, the vessel was in fact drifting outside of the harbour at the time. The master continued to work on the engine; by the time the master returned to the bridge after the engine was restarted, the vessel had drifted close to shore.

After the engine was started and the position of the vessel was determined (close to shore in shallow waters) the vessel was underway but struck bottom almost immediately. The master could no longer manoeuvre the vessel and it ended up rolling heavily parallel to the shore. The crew members did not don any type of personal flotation device (PFD); however, they managed to jump ashore one by one, timing their exit to the rolling motion of the vessel. Shortly after the master jumped ashore, the vessel capsized and sank.

Repair of fuel systems

A machinery deficiency or malfunction is the most common cause of accidents on fishing vessels. Of the 1772 occurrences reported to the Transportation Safety Board of Canada (TSB) between 2013 and 2015, 78% can be attributed to some kind of deficiency in the vessel's machinery. The Canadian Coast Guard, meanwhile, has documented 5649 occurrences

caused by machinery malfunction between 2005 and 2015.³² Machinery deficiencies can be attributed to factors such as poor maintenance, out-of-date equipment, incorrect operation, the age of the equipment, and a lack of automation. Although most failures do not compromise the vessel's safety on their own, they may be disastrous in combination with other factors such as bad weather or strong currents.

In this occurrence, fuel system repairs were done by the owner on an ad hoc basis in response to repeated deficiencies or failures experienced. For example, instead of determining and correcting the actual cause of the regular air locks in the fuel system, the previous master had installed a rubber fuel priming bulb that would help bleed the air from the fuel supply to the engine whenever an air lock was experienced. The installation of the priming bulb would not prevent a recurrence of the problem; it merely helped to manage the problem when it arose.

The inadequate repair of key equipment such as the fuel system puts the vessel, crew, and environment at risk. Also, conducting emergency repairs while at sea is risky due to the possibilities of adverse weather conditions, strong movements of the vessel, the need to conduct repairs quickly, a lack of adequate tools, and the person carrying out the repairs lacking the necessary skills required for the repair.

Therefore, if vessel fuel system repairs are not done correctly and are not performed by a qualified person, the safety of the crew, vessel, and environment may be at risk.

Oversight of fishing safety

The TSB's *Safety Issues Investigation into Fishing Safety in Canada* (SII) identified the need for governments and leaders in the fishing community to work collaboratively to establish regional governance structures aimed at ensuring that fishermen can and do work safely.

Across Canada, there are currently some promising coordinated initiatives that are aimed at instilling safe work practices. These coordinated efforts are helping fishermen realize that safety is an integral part of fishing operations.

Federal

Although the *Bessie E.* was not required to undergo periodic inspections by TC as per the *Small Fishing Vessel Inspection Regulations* due to its size, TC may conduct on-the-spot inspections of any commercial fishing vessel, including those operating under the Batchewana First Nation Band's permit. However, the investigation determined that there have never been any actions taken by federal authorities to ensure compliance with the applicable regulations for vessels fishing under that Band's permit because previous attempts to do so were not well received by the Band.

³² Canadian Coast Guard, email correspondence, 18 October 2016.

The following safety-critical deficiencies were found:

- It could not be confirmed whether the master held any marine certificates as required by the *Marine Personnel Regulations*.³³
- The vessel's emergency position indicating radio beacon (EPIRB) and very high frequency digital selective calling (VHF-DSC) radio were not registered as required by the *Life Saving Equipment Regulations* and the *Ship Station (Radio) Regulations, 1999*.³⁴
- Although the vessel carried PFDs, the *Small Fishing Vessel Inspection Regulations* require 1 lifejacket³⁵ per person.³⁶
- The screens for the port and starboard sidelights were not painted matt black as was required in the *Collision Regulations*.³⁷
- The materials used in adding the rubber fuel priming bulb were combustible; this did not conform to the requirement in the *Marine Machinery Regulations*.³⁸

Provincial

Federal and provincial courts have indicated that the provinces have the responsibility of regulatory oversight of the "business of fishing." However, Ontario's Ministry of Labour applies the *Occupational Health and Safety Act* only to fishing vessels that are registered with the Workplace Safety Insurance Board and where crew members meet the definition of a "worker."

Batchewana First Nation

The Batchewana First Nation Band independently attempted to ensure the safety of its vessels through the establishment of its Natural Resources Department, which initiated fishing safety rules and mandatory incident reporting. However, it had not received any reports of incidents in the past several years leading up to the occurrence. As well, the Band does not require any specific safety training.

³³ Transport Canada, *Marine Personnel Regulations*, SOR/2007-115 (last amended 03 February 2017), paragraph 212(1)(c).

³⁴ Transport Canada, *Ship Station (Radio) Regulations, 1999*, SOR/2000-260, section 9.

³⁵ Standard lifejackets are intended for use in emergency situations, such as abandoning the vessel, and turn individuals on their back in order to keep their face out of the water.

³⁶ *Small Fishing Vessel Inspection Regulations*, C.R.C., c. 1486 (last amended 01 July 2007), parts I and II.

³⁷ *Collision Regulations*, C.R.C., c. 1416 (last amended 29 January 2014), Annex I: Positioning and Technical Details of Lights and Shapes. It could not be determined if the *Bessie E.* was required to have screens installed as the characteristics of its lights could not be examined after the occurrence. Nonetheless, when installed, screens should conform to the required standard of being painted matt black.

³⁸ Transport Canada, *Marine Machinery Regulations*, SOR/90-264 (last amended 03 February 2017), Schedule XVI, item 3.

Coordination of safety initiatives

In Ontario, there are presently no coordinated initiatives intended to promote safe work practices among fishermen, such as those that could be provided by a safety association. If governments and leaders in the fishing community do not work collaboratively to ensure that fishermen can and do work safely, then fishermen may not employ safe working practices.

Furthermore, if there is no oversight for all commercial fishing operations to ensure regulatory compliance, there is a risk that safety deficiencies will not be detected within those fishing operations.

Safety issues in the fishing industry

The SII categorized actions impacting safety into 10 safety significant issues and found that there are complex relationships and interdependencies among them. These safety significant issues are further analyzed in the SII.³⁹ In this occurrence, at least 4 of these 10 safety significant issues were present. The following practices and procedures relating to these safety significant issues identified in the SII were evident in this occurrence:

Lifesaving appliances

Safety issues investigation findings	Relationship to this occurrence
Not all fishermen wear a PFD when working on deck.	None of the crew members donned a PFD while working on deck or while evacuating the vessel, despite the risk of falling into the water.
Not all fishing vessels carry an emergency position-indicating radio beacon (EPIRB), despite TSB Recommendation M00-09.	Although there was an EPIRB carried on the vessel, it was not registered and no signal was received after the vessel sank.

Regulatory approach to safety

Safety issues investigation findings	Relationship to this occurrence
There is a lack of awareness within the fishing community of new regulations.	Although the <i>Small Fishing Vessel Inspection Regulations</i> are not new and must be followed by all fishermen, the investigation found that the master of the <i>Bessie E.</i> was not aware of them.

³⁹ Transportation Safety Board of Canada Marine Safety Issues Investigation Report M09Z0001, *Safety Issues Investigation into Fishing Safety in Canada*.

Training

Safety issues investigation findings	Relationship to this occurrence
The benefits of regular emergency drills in reducing reaction time and increasing team coordination are not well recognized.	The master of the <i>Bessie E.</i> did not conduct emergency drills with the crew.

Safe work practices

Safety issues investigation findings	Relationship to this occurrence
There is a lack of focused training and hands-on practice to teach and reinforce safe work practices.	The common practice in the Batchewana First Nation Band is the generation-to-generation transfer of learning and skills. However, this training method did not reinforce the safe work practice of conducting safety drills.

Interdependency of safety issues

The safety of fishermen is compromised by numerous issues which are interconnected. The following safety issues share a complex relationship and were present in this occurrence:

- Training on emergency preparedness and drills
- Unsafe work practices
- The use and availability of lifesaving appliances
- Oversight of fishing safety

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

The safety of fishermen will be compromised until the complex relationship and interdependency among safety issues is recognized and addressed by the fishing community.

Findings

Findings as to causes and contributing factors

1. The winds increased and changed direction on the day of the occurrence, pushing ice into the channel entrance and causing it to become blocked; this prevented the *Bessie E.* from being able to return to port.
2. After the master was unable to reach the berth and turned the vessel with the intention of navigating to another harbour further north, the swells increased and the vessel began to roll.
3. The engine shut down as the rolling of the vessel in the prevailing seas most likely disturbed sediment in the fuel tanks. The sediment then clogged the fuel filters and resulted in a restriction of the fuel supply to the engine.
4. It is likely that the fuel in the vessel's tanks was contaminated with sediment as the tanks were never drained or cleaned, nor were they fitted with a means to do so.
5. The master changed the main fuel filter on the main fuel supply line and attempted to restart the engine again, without success. The filter replacement had caused an air lock in the engine fuel supply circuit that further delayed the restarting of the engine.
6. While the master continued to work in the engine room to restart the engine, the *Bessie E.* began to drift towards the shore and shallow water. The vessel was not being consistently monitored during that time and anchors had not been deployed.
7. By the time the engine was successfully restarted and the master reached the wheelhouse, the *Bessie E.* was nearly ashore. The master was no longer able to manoeuvre the vessel into deeper water because the stern was touching the bottom.
8. The wind pushed the *Bessie E.* until it was parallel to the rocky shore and rolling heavily; the 5 crew members managed to disembark before the vessel capsized and sank.

Findings as to risk

1. If vessel fuel system repairs are not done correctly and are not performed by a qualified person, the safety of the crew, vessel, and environment may be at risk.
2. If governments and leaders in the fishing community do not work collaboratively to ensure that fishermen can and do work safely, then fishermen may not employ safe working practices.
3. If there is no oversight for all commercial fishing operations to ensure regulatory compliance, there is a risk that safety deficiencies will not be detected within those fishing operations.

4. The safety of fishermen will be compromised until the complex relationship and interdependency among safety issues is recognized and addressed by the fishing community.

Safety action

Safety action taken

Transportation Safety Board of Canada

On 16 May 2017, the TSB sent Marine Safety Advisory Letter 02/17 to the Ontario Minister of Labour. The letter said that the investigation found safety-critical deficiencies on the vessel that breached a number of regulations and that there was inadequate safety oversight of the *Bessie E*. It also said that the investigation determined that the *Occupational Health and Safety Act* does not apply in practice to all Ontario fishermen.

This report concludes the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on 27 April 2017. It was officially released on 21 June 2017.

Visit the Transportation Safety Board'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 transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.

