Transportation Safety Board of Canada
Bureau de la sécurité des transports du Canada

TRANSPORTATION SAFETY

REFLEXIONS

Issue 21 – March 2004

MARINE

Special Issue on Fishing Vessels

Stability and Safety
Needed: More Knowledge about Safety
Downflooding and Sinking
Loose Fish Sank Ship

Canada

Special Issue on Fishing Vessels

2

Stability and Safety

9

Needed: More Knowledge about Safety

15

Downflooding and Sinking

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REFLEXIONS is a safety digest providing feedback to the transportation community on safety lessons learned, based on the circumstances of occurrences and the results of TSB investigations.

Pass it on!
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Contents

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Foreword

This publication of "REFLEXIONS" is specifically focussed on fishing vessel occurrences, in recognition of the degree of improvements to safety that can be obtained in this sector of the marine industry.

In December 2000, the Transportation Safety Board released a report on the loss of the Canadian fishing vessel *Brier Mist* and her five crew members. The report focussed on certain issues relating to maintaining the seaworthiness of fishing vessels and included an analysis based on an extensive review of our information systems. Updated information from this report shows that 11 862 Canadian fishing vessels were involved in accidents in 29 years, between 1975 and 2003, which resulted in 732 fatalities, 804 injuries, and the total loss of 2568 vessels.

Further, fishing vessels continue to represent half of all commercial vessel accidents, although accidents have declined since 1990. The study showed that the majority of the accidents occurred on the east and west coasts, close to shore. Small fishing vessel (i.e., less than 150 gross tons) shipping accidents have resulted in 479 fatalities, 320 of which were linked to uninspected vessels (i.e., less than 15 gross tons). Foundering and capsizing accidents resulted in over half of these deaths. Almost three-quarters of the accidents were linked to vessels less than 15 gross tons and caused 67 percent of the fatalities.

Accidents aboard ship (i.e., accidents to persons, not ships) represented 30 percent of the number of fatalities on fishing vessels between 1975 and 2003, and the major cause reported in the period up to 2000 was falling overboard (71 percent).

An analysis of collected data, more qualitative than quantitative, indicates that several unsafe conditions contribute to the cause of an accident or incident. Loading conditions, poorly secured hatch covers, scuttle covers and scuppers, and structural aspects are prominent.

As a result, the Board has issued several recommendations over the years related to watertight enclosures, survival craft, anti-exposure work suits, emergency position-indicating radio beacons (EPIRBs), bilge systems and water level detectors, survival training, etc.

We recognize that each fishing vessel accident has its own unique set of circumstances which led or contributed to an accident, but often a recurring theme or similar issues exist. The Board attempts to address each issue as it occurs, but is concerned that the safety action identified is not being received or acted upon sufficiently at the grass-roots level. This has been reflected in more recent investigations where recommendations were directed at improving the safety culture.

In the hope that fishers and their families will recognize situations that can be rectified on their vessels before a similar mishap occurs, this publication of "REFLEXIONS" concentrates, therefore, on fishing vessel occurrences.

There is much truth in the phrase "There, but for the grace of God, go I."

Please reflect upon and try to improve your particular methods of training and operation. We do not want to include ***you*** in future accident statistics.

Cap Rouge II in dry-land storage

Stability and Safety

The cumulative effect of several modifications increased the vessel's lightship weight, lowered the inherent effective freeboard, raised the centre of gravity and markedly reduced the transverse stability characteristics of the small fishing vessel *Cap Rouge II*. As a result, the vessel capsized and sank near the entrance of the main arm of the Fraser River on 13 August 2002. Two persons abandoned ship and climbed into a skiff being towed by the fishing vessel. Five persons, including two children, remained within the overturned hull and drowned. — Report No. M02W0147

Since its construction in 1974, the stability characteristics of the *Cap Rouge II* had been subject to change due to the installation of various combinations of equipment to suit different fishing modes. From 1987, when it was employed as a herring packer with the seine net and drum removed, until the time of the capsize, her stability characteristics were steadily reduced as more, heavier gear and seine nets were installed. The effects of these increases in weight were not monitored or assessed by a suitably qualified person, nor brought to the attention of Transport Canada (TC) inspectors as required between or during routine quadrennial inspections.

Section 24.71(2) of the Workers' Compensation Board of British Columbia (WCB) *Occupational Health and Safety Regulation*

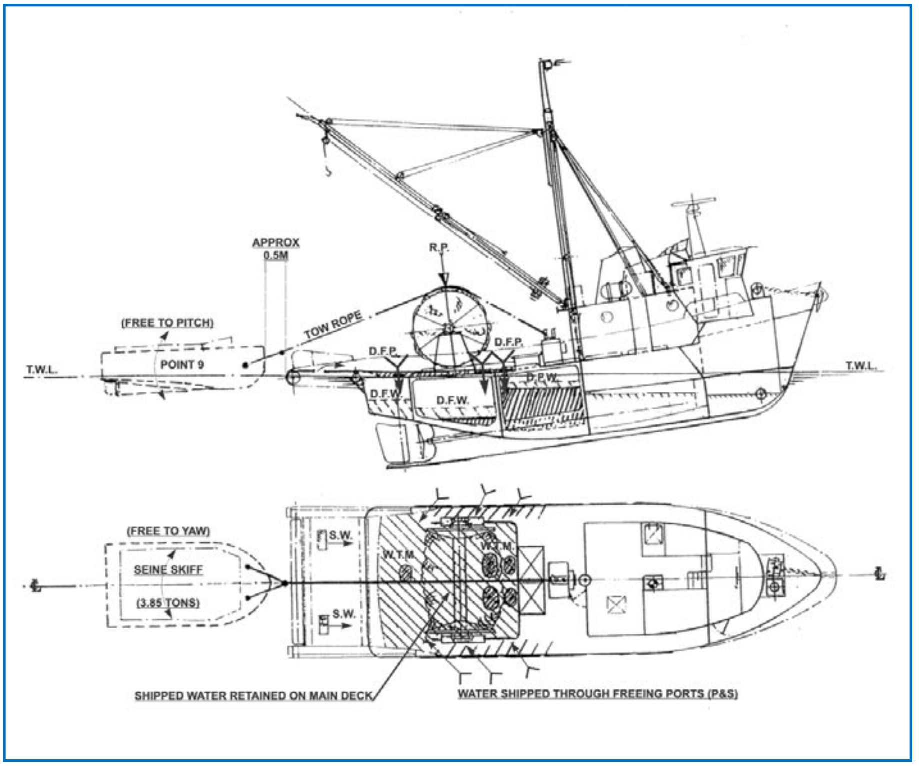
(OHS) also calls on owners to ensure that major modifications to their fishing vessels do not adversely affect stability, but gives no direction with regard to acceptable minimum stability criteria.

In this instance, a larger seine net was being employed, the weight of which was not verified until after the capsize, when it was found to be some 7.4 tonnes. This weight was somewhat heavier than the seine net usually carried, which weighed approximately 4.5 tonnes. The nets were routinely stowed on the power drum, located 1.75 m (5.67 ft) above the main deck, where their weight effectively raised the position of the vessel's centre of gravity.

Free Surface Effect

At the beginning of the return voyage from the fishing grounds, the forward fish holds were reportedly about two-thirds to three-quarters full and the after holds approximately one-eighth full. The freshwater tank was also in use and about half full. Consequently, at the time of the capsize, the relatively lightly loaded vessel was subject to detrimental effects due to free surfaces in five storage tanks, four hold compartments and the lazarette, in addition to water shipped and retained on deck.

In general, few fishers fully understand free surface effect.



Downflooding prior to capsize

In general, few fishers fully understand free surface effect, and fewer appreciate the substantial reduction of initial transverse stability that results when water, even a few centimetres (inches) deep, is shipped and retained on deck. When this occurs on a vessel with inherently low stability characteristics and is coupled with a significant loss of waterplane area when the deck edge becomes immersed, the sudden reduction in transverse stability can be catastrophic.

The unexpected and rapid heel to starboard and the inability to recover are typical of behaviour associated with the presence of extensive free surface effects acting in conjunction with inherently low transverse stability. The dynamic impact of any minor heeling moment in the prevailing confused sea conditions would, in the later stages of such heeling action, be sufficient to overcome any residual righting ability retained by the vessel.

Operational Practices and Awareness of Risk

The TSB has observed that many fishing vessel crew members do not fully appreciate that some of their day-to-day operating procedures may create unsafe conditions. A number of practices were observed that carried risks which were either not fully recognized or were accepted by the skipper. For example, the skipper considered the *Cap Rouge II* to be a "wet boat", indicating that it was not unusual to see water on deck or to have to pump out the lazarette. Water accumulating on the main deck and also downflooding contributes to a free surface effect, and thus, adversely affects the stability of the vessel. Operation of the vessel with the holds partially

***Cap Rouge II* alongside salvage barge**

filled indicates that, like most commercial fishers, the skipper did not fully understand the risks associated with a free surface effect.

A vessel's capability to remain safely upright requires its operator to have a sound understanding of the principles of ship stability and to apply them in a manner which takes into account the constantly changing circumstances both on board a vessel and in the surrounding environment. For example, it is necessary to monitor changes in the quantity and location of liquids held in fish hold tanks, fuel tanks, freshwater tanks, and oil tanks. It is also necessary to decide on the safest manner of stowing fish product and fishing gear, including nets, to assess the configuration of standing rigging, such as a boom, and to determine the safest manner of transporting a skiff. Knowledge of existing external factors, such as sea state, wind characteristics, and under-keel salinity, is also extremely important.

TC requires a Class 4 Fishing Master applicant to pass an oral examination on matters of general seamanship, which includes ship stability. The examiner is required to assess the candidate's "ability to use and interpret stability and trim data supplied to fishing vessels" and to assess other aspects of stability "in general terms and excluding calculations" or by demonstrating a "practical appreciation". Currently, many small fishing vessels are not provided with specific stability information and, if it is provided, it is not presented in a manner that is readily understood by fishers. As only basic knowledge is required, an awareness of what constitutes a dangerous situation is left to personal interpretation based upon the operator's own experience and the experience of others. Considering the number of accidents and incidents involving small fishing vessels, the required knowledge of vessel stability should not be relaxed for this level of certification.

Closure of Weathertight Openings

In this accident, the hinged door in the after end of the deckhouse was secured in the open position. The opening permitted the ingress of water into the deckhouse when the vessel heeled sufficiently to starboard. Consequently, significant reserve intact buoyancy, contributing to the vessel's righting ability, was lost. Closure of weathertight openings, such as deckhouse and accommodation doors, when operating at sea is important to prevent water from entering the vessel and for the safety of all persons on board. The TSB has conducted several investigations into marine accidents involving small fishing vessels in which the failure to maintain weathertight integrity has been identified as a causal factor.

Stability Approval for Small Fishing Vessels

There are approximately 20 000 small fishing vessels in service in Canada, 4500 of which are greater than 15 gross registered tons (GRT) and less than 150 GRT and are inspected by TC on a quadrennial basis. Because of the

Knowledge of existing external factors, such as sea state, wind characteristics, and under-keel salinity, is also extremely important.

The 15 500 vessels of less than 15 GRT are uninspected and are not required to meet any regulatory stability standard.

mode of fishing in which they are engaged, some of these vessels are currently required to comply with regulatory stability requirements. The 15 500 vessels of less than 15 GRT are uninspected and are not required to meet any regulatory stability standard, nor to have any basic stability data provided for the guidance of their operators.

Since 1990, TSB investigations into the capsizing, foundering or sinking of 47 inspected small fishing vessels of more than 15 GRT, and 29 uninspected vessels of less than 15 GRT, have shown that these occurrences were primarily due to inadequate intact stability or stability-related unsafe working practices. The majority of the inspected vessels and all of the uninspected vessels were not required to meet any regulatory stability standard.

Only those small fishing vessels engaged in fishing for herring or capelin are required to submit stability data for approval by TC. Stability data approval, in accordance with the *Small Fishing Vessel Inspection Regulations*, is based on exceeding the minimum criteria in STAB 4 of the *Stability, Subdivision and Load Line Standards* (TP 7301).

In order for the criteria to be verified, an extensive amount of vessel design information is required, including hull hydrostatics and righting lever curves, hold and tank capacities, and centres of gravity at several levels, together with weights and locations of all fishing gear on board. Furthermore, an inclining experiment must be completed in order to determine the vessel lightship weight and centre of gravity from which a comprehensive assessment of the vessel's stability characteristics may be generated.

Many older vessels have no design data or hull form information from which hydrostatics data may be derived. Furthermore, the adoption of new fish catch storage techniques on board existing small fishing vessels calling for holds to be filled with refrigerated or chilled sea water has, in some cases, led to a significant reduction in effective freeboard, reserve buoyancy, and related transverse stability. However, the adverse effects of this development on existing and new small fishing vessels are best addressed by the regulatory stability approval process, ensuring that a "worst loading condition" incorporating a maximum load condition meets the minimum stability criteria of STAB 4, and does not result in a loss of all reserve buoyancy.

In comparison, conducting a roll period test and a corresponding freeboard verification is a simple procedure and may be completed in port in approximately 15 minutes. While a roll period test only provides an estimate of the initial transverse metacentric height (GMt) related to the loading condition of the vessel at the time of the test, it does give an indication of stability relative to other vessels of similar size and type which have given satisfactory

Cap Rouge II **raised upright at the time of salvage**

service for some years. Any significant deviation from the normal range of GMt values will give a timely indication that an unsatisfactory transverse stability condition exists.

Consultations

In May 2003, TC sought to modernize stability requirements with a project based, in part, on input from the Standing Committee on Fishing Vessel Safety of the Canadian Marine Advisory Council (CMAC). Given the ongoing loss of lives and vessels, the need for developing and introducing appropriate stability requirements for all small fishing vessels has been recognized. A comprehensive program has been set in motion to evaluate and assess the impact of new proposed safety standards developed from the results of stability experiments and tests conducted on a representative sample of some 30 vessels of the small fishing vessel fleet, many of which are below 15 GRT.

The preliminary results of these studies are expected to be reported at CMAC meetings scheduled for November 2003 and the spring of 2004. Review and analysis of the collected data, intended to define appropriate minimum stability criteria related to various sizes of vessels and their operational characteristics, are to be completed by September 2004. Timely approval and acceptance of the proposed, new criteria by TC and industry stakeholders are scheduled so that the results may be incorporated in the new *Fishing Vessel Safety Regulations* due for implementation in 2006.

The Board is encouraged by the initiation of this project to determine and extend the application of appropriate stability standards for all small fishing vessels and notes that TC is in the process of actively addressing a major safety risk to which crews of small fishing vessels have been and continue to be exposed. Until such time as new small fishing vessel safety regulations are introduced, the Board recommended that:

The Department of Transport require all new inspected small fishing vessels of closed construction to submit stability data for approval. ***— M03-05, issued November 2003***

and that:

The Department of Transport require all existing inspected small fishing vessels currently without any approved stability data be subjected to a roll period test and a corresponding free-board verification not later than their next scheduled quadrennial inspection. ***— M03-06, issued November 2003***

Promoting Safe Practices Aboard Fishing Vessels

Since 1993, TSB statistics show that about 50 percent of all vessels involved in shipping accidents have been fishing vessels. In that period, 493 Canadian fishing vessels have been lost, and 76 fishers lost their lives. In many of these occurrences, unsafe practices, which served to compromise the vessel's watertight integrity and stability, have contributed to the occurrence. These occurrences are typical of situations where the level of risk during fishing operation rises gradually over time.

Such unsafe practices are not carried out with the intention of jeopardizing the safety of the vessel and crew. Rather, they are carried out by indi-

Working deck of *Cap Rouge II* showing west coast salmon seine net wrapped on net drum

viduals who mean to operate their vessels in a safe manner but who, for a number of reasons, do not fully appreciate the risks associated with such practices.

In general, people tend to underestimate risk. In order to assess the level of risk associated with an activity, there is a need to be aware of the severity and probability of negative outcomes.

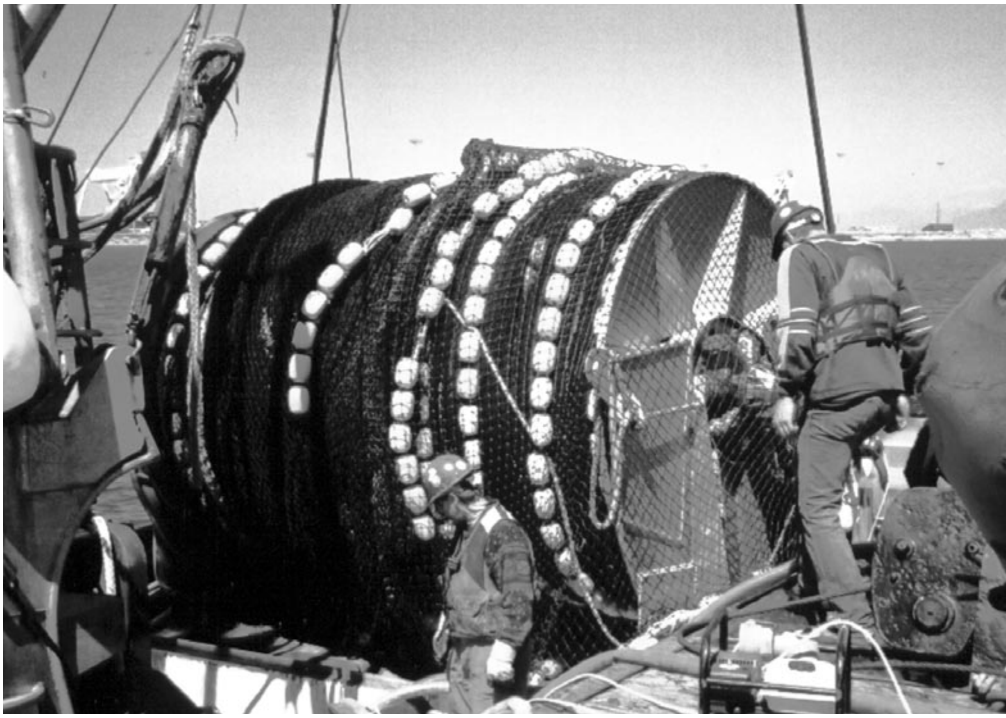
In general, people tend to underestimate risk.

Within the Canadian fishing industry for example, while an average of some 49 vessels are lost every year, they represent only a small proportion of the 20 000 small fishing vessels in operation. As such, there is a high probability of a vessel safely completing each voyage. Each successive voyage safely completed increases an individual's perception that the probability of an accident is low. Consequently, the more comfortable an individual becomes, the more likely unsafe practices may be carried out, placing vessel and crew at greater risk. Therefore, efforts to eliminate unsafe practices on board small fishing vessels are required, focussing on changing fishers' attitudes toward the risks involved.

Increasing an individual's motivation to adopt safe practices would best be achieved through a concerted effort to change actual behaviour in conjunction with a program to educate fishers on the risks involved in their operation. In this way, the justification for adopting safe practices will change from one which is externally imposed to one stemming from internal acceptance. Previous efforts to change attitudes within other modes of transportation have relied upon such an approach. For example, consider the effectiveness over the last two decades in changing attitudes toward seat belt use and greater passenger safety.

Existing efforts to promote the adoption of safe practices within the fishing industry, through education and awareness programs, have shown limited success. As demonstrated by this accident, there continue to be occurrences involving fishers who, although having attended training courses, persisted in the use of unsafe practices. Therefore, formal training for fishers may not always achieve its objective of promoting practical application of classroom theory. Possible reasons for this include a lack of perceived relevance of course content or a method of delivery which does not provide sufficient application of the subject matter.

It is essential that any education and awareness program which aims to promote safety employ educational techniques which are most likely to impart useful knowledge to operators so that they will make use of that knowledge and, consequently, reduce the risk of accidents. Adult learning principles indicate that adults learn best when learning activities reflect their



Close-up view of seine net on the net drum

Stern of *Cap Rouge II* showing solidly constructed stern ramp extending beyond the transom

individual learning style, take advantage of previous experience, relate to their everyday world, and simulate real situations.

Since 1990, the TSB has issued a number of safety communications[1] addressing deficiencies related to stability awareness, unsafe on-board working practices, structural modifications, and loss of watertight integrity. To address these deficiencies, a number of measures have been instituted, including publications, ship safety bulletins, audio visual aids, and training workshops. In spite of these efforts, accidents associated with those deficiencies continue to occur. The Board, therefore, continues to be concerned with the lack of real progress.

In 2003, the Board's report (TSB Report No. M01L0112) of an occurrence involving the small fishing vessel *Alex B. 1* stated "only through a concerted and overarching effort to change the existing paradigm within the fishing industry, and specifically establish a true safety culture within it, can the risks to fishers be reduced to acceptable levels." The Board recommended that:

[The Department of Transport], in coordination with Fisheries and Oceans Canada, fisher associations and training institutions, develop a national strategy for establishing, maintaining and promoting a safety culture within the fishing industry. ***— M03-02, issued September 2003***

Given that attitudes and beliefs toward risk form the basis of an effective safety culture, the Board recognizes that developing this safety culture will require a long-term effort to promote positive attitudes toward safety within the fishing community. Therefore, given that there is a need to initiate a change in attitude among fishers as demonstrated by this occurrence, and facts supporting Recommendation M03-02, the Board further recommended that:

The Department of Transport, in collaboration with the fishing community, reduce unsafe practices by means of a code of best practices for small fishing vessels, including loading and stability, and that its adoption be encouraged through effective education and awareness programs.
— M03-07, issued November 2003

REFLEXION

Structural modifications can seriously affect your vessel's stability. Being unaware of stability issues can seriously affect your health.

A combined hinged hatch cover and door on the centreline at the after end of the wheelhouse

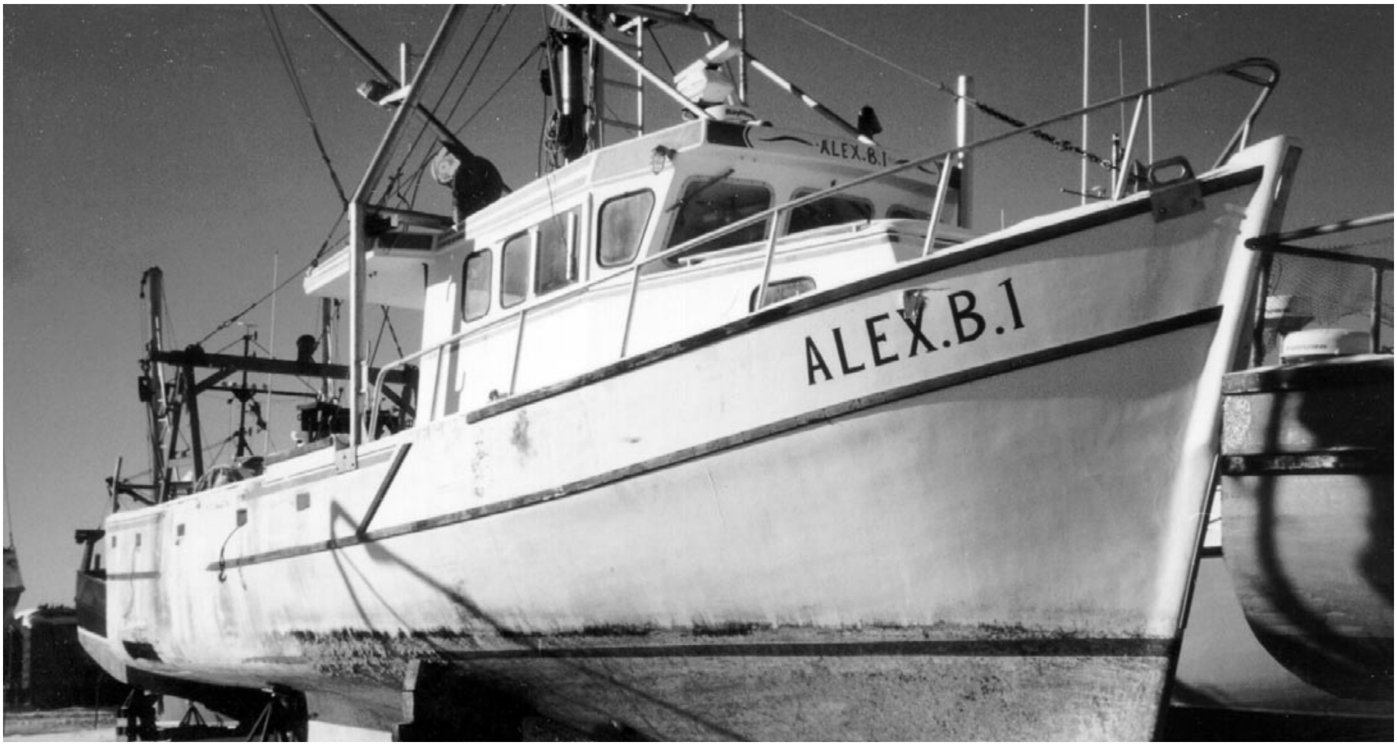
1. M94-32, M96-13, M96-14, M00–06.

The *Alex B. 1* (October 2001)

Needed: More Knowledge about Safety

In most cases, the more severe the consequences of an accident, the more attention it will attract, and the greater will be the call for change. On the other hand, innumerable events occur from day to day which, because they have become so commonplace or because they caused no fatalities, are soon forgotten. The major water ingress in the scallop dragger *Alex B. 1* off Havre-Saint-Pierre, Quebec, on 29 September 2001, falls within the latter category. Even though there were no serious consequences, the investigation revealed numerous safety deficiencies that have a direct impact on commercial fishing across Canada. — Report No. M01L0112

The *Alex B. 1*, with a crew of five onboard, was dragging for scallops off Samuel Island (known locally as Niapisca Island) when, while on his rounds in the engine compartment, the operator observed that there was about 20 cm of water in the bilge, despite the fact that the automatic bilge pump was running. He immediately switched on a second bilge pump and, five minutes later, the compartment was drained. When the operator returned to the engine compartment about one half-hour later, he again observed an ingress of water. This time, the water was 35 cm deep, high enough to touch the main engine. He again started the second bilge pump, then went to inspect the fish hold. This compartment, which is normally dry, now contained about 40 cm of water. The operator examined the lazarette and noted that the water level, at a depth of about 60 cm, was much higher than



The *Alex B. 1*

usual. The operator then started the two remaining electric bilge pumps, one in the fish hold and the other in the engine compartment.

The water level in the engine compartment was such that the engine stopped.

The operator kept close watch on the water ingress while the crew shucked the catch. He quickly noted that the pumps were not keeping pace with the flooding and decided to haul in the drag and make for Havre-Saint-Pierre. Once the drag was stowed in its cradle, the *Alex B. 1* made full speed ahead while the crew bailed water from the compartments with buckets. About one-half nautical mile from the wharf at Havre-Saint-Pierre, the water level in the engine compartment was such that the engine stopped. The *Alex B. 1* was towed to shore near the wharf by a nearby vessel after the operator broadcast a distress call on his VHF radio telephone.

Substantial Wear on the Hull

Examination of the vessel revealed substantial wear on the hull in way of the lazarette. These patches of excessive wear were in way of the drag hoist pulleys that were mounted on the stern A-frame. The fibreglass coating was worn through, and there were deep gouges in the wood planking. There was a hole, approximately 10 cm in diameter, in the wood planking on the port side. The scallop drag on the *Alex B. 1* was a conventional fishing rig, quite heavy and cumbersome to handle. The drag was hoisted aboard and redeployed twice every hour. Consequently, every time the rig was hoisted aboard or deployed, it came into contact with the hull. To protect against the resultant abrasion, protection is applied to the hulls of fishing vessels where the fishing gear touches the hull. Various types of protection are used: on steel hulls, steel or rubber half-rounds are installed; wooden hulls are protected by a second layer of planking, a thick coating of fibreglass, or pads made of Teflon or rubber. All of these protective devices have proven to be effective for shielding the hull against repeated contact with the fishing gear. Apart from a thin coating of fibreglass that completely covered the hull, the *Alex B. 1* had no additional protection in way of the lazarette. In five months of fishing activity, the hull had been compromised to the extent that the integrity of the vessel and the safety of the crew were greatly diminished.

Vessel Converted

Fishers select their vessels based on the terms and conditions of the fishing licence issued to them by the Department of Fisheries and Oceans (DFO). The licence specifies the species and catch quota. Sometimes fishers apply for a different licence and/or buy a different fishing vessel. As a result, a fisher's vessel may no longer be suitable for the species sought. Since each fishery generally requires a specific type of gear, operators are then compelled to convert their vessels depending on the type of licence they hold, with the result that a vessel may well need a major alteration in the days and weeks following the purchase of the craft.

In five months of fishing activity, the hull had been compromised to the extent that the integrity of the vessel and the safety of the crew were greatly diminished.

The owner of the *Alex B. 1* purchased his vessel in similar circumstances. The existing gear had to be modified for dragging scallops in accordance with the owner's licence. Under the *Small Fishing Vessel Inspection Regulations* (SFVIR), had the vessel not been modified, the regular inspection would have been required in 2002. However, since the vessel underwent major alterations in 2001, it should have undergone a regular inspection following the modifications. Given that the inspectors in the regional Transport Canada Marine Safety (TCMS) office at Sept-Îles had not been notified of the modifications, an inspection of the vessel was not scheduled in 2001.

Damage, port side

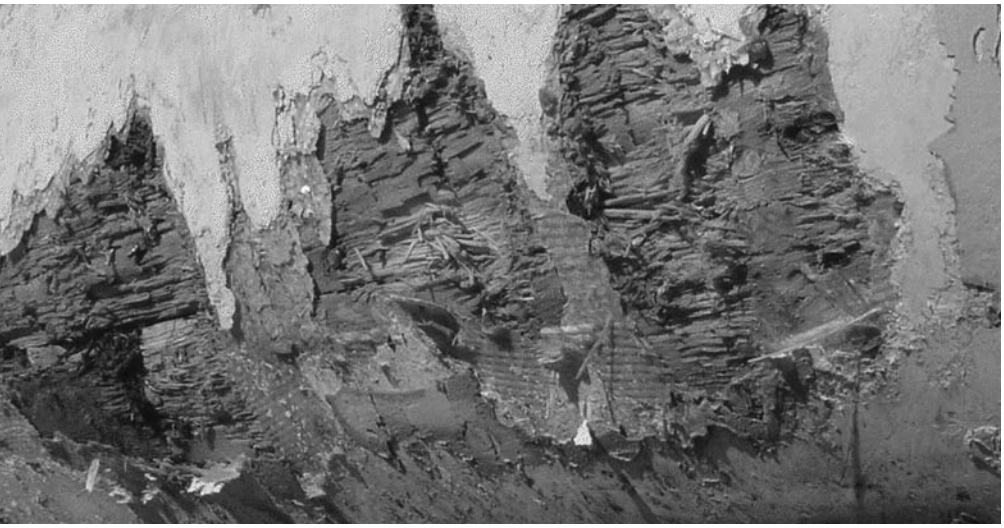
Bulletins Less Effective than Anticipated

The many *Ship Safety Bulletins* issued over the years on various aspects of safety in the fishing industry, specifically regarding major alterations to fishing vessels, have been less effective than anticipated. Many fishers forthrightly acknowledge not knowing the requirement to report structural modifications. Since the home port of many fishing vessels is located at some distance from the nearest TCMS regional office, the fishers are not able to profit from the expert knowledge that inspectors could provide on major alterations. Moreover, the scattered geographical distribution and remote locations of fishers contribute to their isolation and make it more difficult to contact them and, thus, establish a rapport with inspectors.

Not having received notification from the owner of the *Alex B. 1*, the Inspection Division of Transport Canada was unable:

- to do a safety inspection subsequent to the major alteration;
- to assess the effect of the major alteration on the vessel's seaworthiness; and
- to confirm that the vessel was suitable for dragging scallops.

In this occurrence, the vessel was not seaworthy when it put to sea; the transverse bulkheads were no longer watertight, the hull protection was not adequate given the fishing gear used, and the major alteration had not been inspected



Damage, starboard side

by an approved authority. Moreover, there were too many persons on board.

Fishing is a high-risk occupation. In the United States for example, the statistics for 1996 indicate that the mortality rate among fishers was over 40 times higher than the national average[2]. Further,

> Lack of awareness of certain risks may also be an important concern for some groups of fishermen. Most fishermen are well aware that fishing is a hazardous profession, but they may not be receiving timely and clear information on the link between certain acts or omissions and resultant deaths, injuries and illnesses. For some, a tendency to downplay risks may also serve to filter out safety messages and reduce the impact of safety initiatives[3].

Fishing is a high-risk occupation.

New Safety Training Requirements

Transport Canada (TC), in collaboration with industry groups such as the Canadian Council of Professional Fish Harvesters, has developed new requirements for mandatory safety training for operators and crews of fishing vessels and other small commercial vessels. These courses, entitled MED (Marine Emergency Duties) A3 and MED A4, have been designed specifically for fish harvesters and operators of small commercial vessels previously exempt from mandatory training.

TC has introduced changes in the *Crewing Regulations* (section 21) that specify crew be familiarized with the ship and their duties, as well as effective co-ordination of their activities when performing duties vital to safety or the prevention or mitigation of pollution. It is with these regulatory changes, together with new mandatory MED A3 and MED A4 training for fishers, that TC has stated it hopes will help create a safety culture on board Canadian commercial fishing vessels.

While these actions undoubtedly are steps in the right direction, a safety culture does not evolve spontaneously from a regulatory framework. While training is one element in the foundation of a true safety culture, MED A3 and MED A4 can only be considered an absolute minimum for the survival of a fisher in a distress situation. This training, covering lifesaving, abandonment, survival, firefighting, emergency response, regulatory and environmental issues, seamanship, vessel operations, weather and rescue – all in eight hours – cannot be considered a viable base on which a safety culture can be inculcated or sustained.

A safety culture does not evolve spontaneously from a regulatory framework.

A Convergence of Elements Is Needed

As knowledge and values evolve, so do standards by which acceptable risks are measured and what must be done to reduce that risk. In order to achieve a true safety

2. International Labour Organization (ILO), *Safety and Health in the Fishing Industry*, 1999.
3. *Ibid*.

culture in the Canadian fishing industry, several elements must converge, including:

- Training fishers on stability and seaworthiness
- Enhancing risk and hazard awareness of fishers
- Training fishers on fatigue awareness
- Effective safety communications
- Disseminating lessons learned
- Just (blameless) culture
- Reporting culture
- Integrating fisheries management into the safety model
- Continuous improvement targets established (and revised as necessary)

Safety Culture

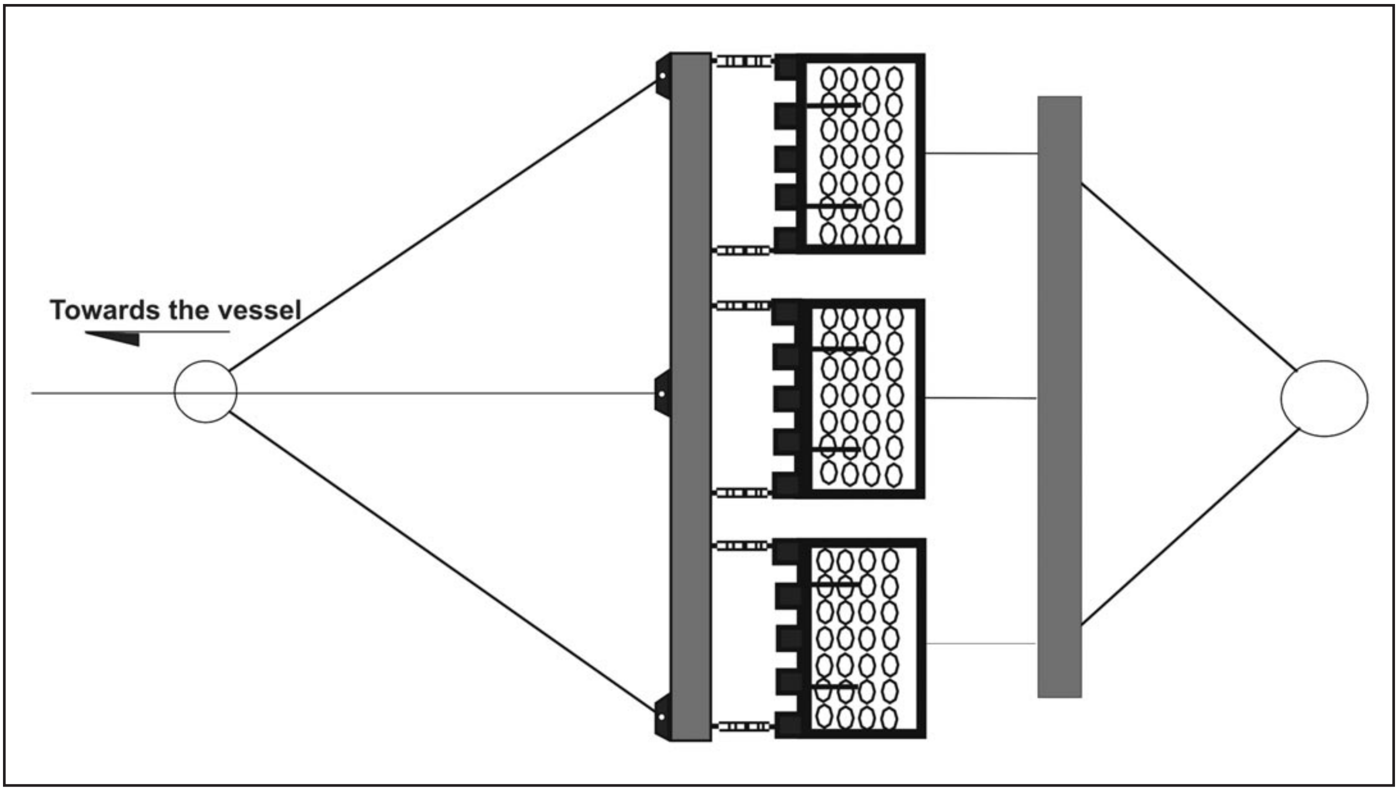
The Board is encouraged by the new and reinvigorated means of communication with fishers through such initiatives as: national and regional Canadian Marine Advisory Council (CMAC) Standing Committees on Fishing Vessel Safety; town hall meetings; federal or provincial working groups as with the Workers' Compensation Board of British Columbia (WCBBC); coordination with DFO in regard to harnessing the database of fishing vessel licence holders; reprinting and distributing copies of the *Small Fishing Vessel Safety Manual*; and the production and distribution (spring 2003) of a booklet entitled "Alerting, Detection and Response". The Board will continue to monitor the progress of these communication initiatives. The Board notes, however, that the training of fishers is a patchwork throughout the country. Although encouraged by the new requirements for MED A3 and/or MED A4, this training is long overdue and is a minimum for survival, not for the foundation of a safety culture. Certain provinces have taken the lead in the training of fishers. Even in these cases, the Board is concerned that certain aspects of the trade that affect safety, such as stability and seaworthiness, hazard and fatigue awareness, are not covered. Only through a concerted and overarching effort to change the existing paradigm within the fishing community, and specifically establish a true safety culture within it, can the risks to fishers be reduced to acceptable levels. The Board therefore recommended that:

Transport Canada, in coordination with Fisheries and Oceans Canada, fisher associations and training institutions, develop a national strategy for establishing, maintaining and promoting a safety culture within the fishing industry. ***— M03-02, Issued May 2003***

Water Level Alarms

The Board notes that TC is aware of the problem concerning the lack of water level alarms in fishing vessels and that ongoing work at the International Maritime

Location of damage on starboard side



The scallop drag

Organization (IMO) may eventually lead to improvements in this regard. However, the Board is concerned that, in the interim, without a requirement for such equipment, such as is required in British Columbia, fishing vessels in the rest of Canada will continue to be unduly at risk for undetected flooding.

Consultations

The Board is encouraged that TC is conducting a review of the process, which has been established by the TCMS Quebec regional office, whereby changes in the ownership status of fishing vessels (as reported by the regional Registrar of Ships) are brought to the attention of regional inspection personnel, with a view to adopting a similar process nationally. The TSB will continue to monitor the progress of this risk reduction measure.

The Board is encouraged by the ongoing regulatory reform process conducted by TC and the review of the inspection requirements for fishing vessels, in particular, the requirements for those vessels not exceeding 15 tons (gross tonnage). The Board will continue to monitor the outcome of this reform and the review of inspection requirements.

REFLEXIONS

Fishing vessels, like clothing or cars, need alterations from time to time. Seeking advice from someone who is experienced in such matters can save you embarrassment and perhaps your life.

The more you know about safety, the better equipped you are to improve it. What are you doing to improve your safety knowledge?

Downflooding and Sinking

Failure of a liquid refrigerant pump on the shrimp factory freezer trawler *Fame* was the first in a series of events which eventually resulted in the downflooding and sinking of the vessel about 21 hours later. The 24 crewmembers had abandoned ship and were rescued by nearby fishing vessels.
— Report No. M01N0020

The *Fame* departed Argentia, Newfoundland, on 13 April 2001, en route to the fishing grounds in the Labrador Sea, approximately 117 nautical miles northeast of Belle Isle, Newfoundland. The vessel arrived at its destination and commenced fishing for shrimp. At 1500 on 18 April 2001, a loud bang was heard which was followed by an abrupt shutdown of the main engine and an electrical blackout of the vessel.

The engineer on watch was on the factory deck at the time of the power failure and electrical blackout and immediately went to the engine room to investigate the cause. Upon entering the engine room, he encountered a thick, fog-like atmosphere and almost immediately became dizzy and disoriented. He left the engine room, returned to the factory deck, and collapsed on deck for a short period. He collapsed twice more as he made his way to the chief engineer's cabin.

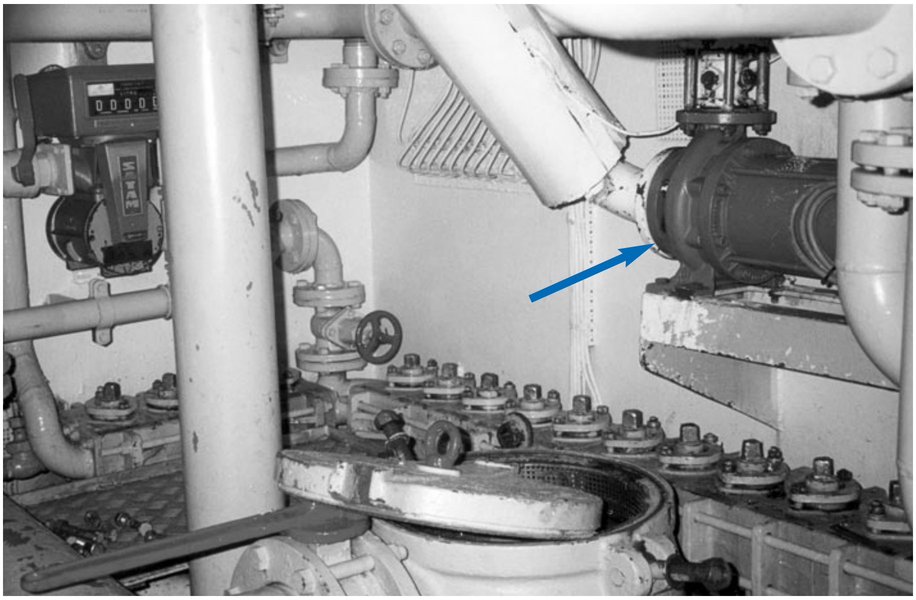
The chief engineer went to the engine room, and he, too, encountered the heavy, fog-like atmosphere. He decided to enter the engine room without a self-contained breathing apparatus (SCBA), but had only descended three or four steps when he was forced out by the smell of the vapour. He was soon met by the other watchkeeping engineer, who only stuck his head through the opened engine room door before being forced to withdraw.

It was at first assumed that there had been an engine room fire and that the halon smothering gas had self-released and extinguished the fire. About an hour later, it was decided that someone enter the engine room, using SCBA; an engineer entered the space alone to take a quick look. During his brief trip into the upper engine room, he saw no sign of fire or heat. He did, however, report feeling very cold and that his skin felt like it was burning.

A short time later, two engineers wearing SCBA entered the engine room and conducted a more extensive inspection of the upper landing area. When they exited the space, they reported that there was no indication of fire, but that they felt very cold and that their skin had a burning sensation. After this visit, the two engineers returned to the engine room to examine the lower levels; they discovered that, while there was no sign of fire, the standby (starboard) liquid refrigerant pump was totally destroyed. As a precautionary measure, they closed all the sea suction valves when in the engine room.

Refrigerant Displaced the Oxygen

At the time of the occurrence, the vessel's main and auxiliary electrical power was being provided by a shaft alternator powered by the main engine. In the event, the expanded refrigerant acted as an asphyxiant, causing the suffocation of the main engine by displacing oxygen within the engine room. When the main engine shut down, all main as well as auxiliary electrical power was lost.



Port liquid refrigerant pump

The master, now aware that the fog-like atmosphere in the engine room was refrigerant gas and that it would not dissipate quickly, started to negotiate a tow from one of the other vessels fishing in the immediate area.

No Sense of Urgency

Despite the fact that the blackout left the vessel in a vulnerable position, a decision was made not to contact the Canadian Coast Guard (CCG). Two hours later, this decision was re-affirmed. The vessel remained blacked out.

As wind and sea conditions were favourable, and the vessel had only a slight starboard list (which was reportedly normal for this vessel), there was no sense of urgency, and the decision was made to wait until a tow was available. Throughout the evening and night, the two engineers made hourly trips into the engine room to check the bilges for water, but none was detected. On one of these visits, an unsuccessful attempt was made to start one of the auxiliary generators. The factory deck was also monitored by the crew. During this period, no additional water, other than that on the factory deck at the time of the blackout, was noticed.

When the main engine shut down, all main as well as auxiliary electrical power was lost.

At approximately 0400 on 19 April 2001, the wind started to pick up and, by 0500, had reached an estimated 25 to 30 knots, and the sea height had increased to two metres. At 0500, the vessel's starboard list, which had remained at a steady 3° to 4°, quickly increased to 8° to 10°. Given the windage of the vessel and the sea conditions, this was not considered unusual, but another visit was made to check the engine room bilges.

Between 0500 and 0630, the list increased to an estimated 18° to 20°.

No water was detected there, but some was noticed on the starboard side of the factory deck.

Between 0500 and 0630, the list increased to an estimated 18° to 20°. At 0534, the vessel issued a urgency message, indicating that it had no power, was drifting with a starboard list, and had no pumps to discharge the water from the tween-deck space. At 0730, a fishing vessel in the area was requested to take the vessel in tow. As the tow was being connected, two of the engineers went to the engine room to once again check the bilges for water. Finding none, another attempt was made to start an auxiliary generator on an upper level of the engine room. This time, the generator started and electrical power was restored.

Water on the Factory Deck

Upon leaving the engine room, and with the factory deck now illuminated, the engineers entered the fish processing area and noticed water on the starboard side of the factory deck, which was estimated to be 1.7 metres deep. An attempt was made to pump the water out using three starboard side wastewater discharge pumps, but since their starter boxes were under water, this was not possible. A further attempt was made to de-water the factory deck using a spare electric submersible pump, but this effort also failed.

At approximately 0800, the vessel again lost electrical power and blacked out. The SCBA air supply was also close to running out, and the engineers left the factory deck for one final time, leaving the engine room door open. With the vessel now under tow, the list increased to 28° to 30°, and, at approximately the same time, a rescue aircraft arrived and dropped four portable salvage pumps. As the air drop was being carried out, the situation was considered critical, and the decision was made to abandon ship.

At 0845, 21 crewmembers wearing immersion suits abandoned ship into two liferafts and were picked up by a nearby fishing vessel. The three remaining crewmembers abandoned ship into a fast rescue craft (FRC) from another fishing vessel in the area.

Vessel Sinking Sequence

In the absence of any record of damage to the wave gate drain, offal, turbot fishing, and galley waste chutes closing devices, or any other structural hull failure affecting the watertight integrity of the vessel, the most likely source of the ingress of seawater onto the factory deck was through one or more of the overboard discharge valves in the starboard side shell plating of the factory tween-deck.

The most likely source of the ingress of sea water onto the factory deck was through one or more of the overboard discharge valves.

After pumping power was lost, it is likely that entrained discarded fish material and other waste debris remaining in the piping system, settled and became lodged in the non-return discharge valves, causing them to malfunction. The absence of anti-syphon loops in the pump discharge piping inboard of the shipside valves, would have also contributed to the ingress of seawater through the valves onto the factory deck.

***Fame*, pronounced list**

As the weather deteriorated, the vessel rolled more due to the increasing seas and was heeled by the wind force, causing all of the existing loose water on the factory deck to gravitate to starboard. The water also flowed toward the after end of the deck because the partially loaded vessel was already trimmed slightly by the stern. The initial slight ingress of water through the partially obstructed starboard-side discharge valves increased when they were more deeply submerged as the immobile and wind-heeled vessel rolled to starboard. The weight and free-surface effects of seawater accumulating on the starboard side of the factory deck increased the angle of heel and reduced the remaining righting ability of the vessel on that side.

The *Fame* settled deeper in the water and continued to trim more and more by the after end as the weight of shipped water increased.

Shortly before the *Fame* was abandoned, the level of water at the after end of the factory deck was seen to have reached the battened-down, engine room starboard side escape hatch, some 1.67 metres above the factory deck level. As the vessel rolled, the flooding also extended across the after end of the factory deck abreast the open engine room door in the port side casing.

As the trim by the stern increased, the shipped water downflooded over the coaming of the door in the engine room port side casing, and immediately gravitated to the starboard side of the engine room of the heeled vessel. The accumulation of water in the engine room further increased the after trim and angle of heel, and continued until the after starboard quarter of the weather deck became completely immersed.

The additional downflooding through newly immersed deck openings and ventilators, etc. (which had not been effectively sealed to prevent or retard this) at the after end of the weather deck increased the rate at which seawater accumulated in the under-deck compartments at the after end of the vessel. The *Fame* settled deeper in the water and continued to trim more and more by the after end as the weight of shipped water increased. Such a cycle was maintained until at 1250 the vessel lost all reserve buoyancy and sank stern first.

Immersion Suit Problems

Eleven immersion suits were made by one manufacturer, and 13 were by another. During the donning of one of the suits, the teeth of the front zipper separated, rendering the suit unserviceable. There were several spare suits available onboard, and one of them was used without further incident. It was subsequently learned that there were two other problems with the immersion suits during the occurrence. Specifically, one crewmember complained his left foot got wet, while a second crewmember reported that his suit was equipped with two right mitts.

At the request of the TSB, a three-step test plan, consisting of a visual inspection, a zipper examination and a leakage test, was carried out by the manufacturer. The visual inspection revealed that all 10 suits showed signs of use, and that one suit was, in fact, fitted with two right mitts. However, this nonconformity would not have precluded the crewmember from using the gloves for thermal protection. The zipper examination yielded no anomaly. Eight of the 10 suits failed the leakage test; using a soapy water solution, any detectable leak, no matter how minor, constituted a failure. The leaks ranged from pinhole size leaks in the outer shell to abrasions on the boot. The minor leaks, although not desirable, would have had a negligible effect on the flotation properties or thermal protection of the suit. The larger leaks in way of the scuffs on the boots were most likely caused by the crewmembers during lifeboat and fire drills or the actual abandoning of the vessel.

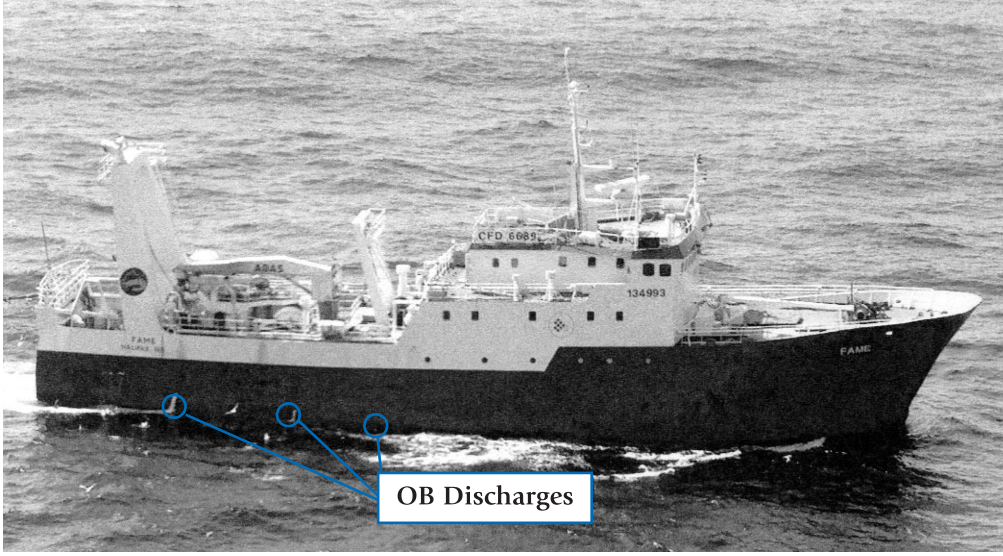
The suit manufacturer advised that the OC 4001 model (as used) was later replaced by the OC 8001 model, which includes more robust, moulded one-piece boots and improved wrist seals. This model is also intended for more constant wear.

Safety Action

Delay in Calling for Assistance
A Marine Safety Information letter (No. 06/02) was sent to the CCG, and copied to Transport Canada (TC), on 07 August 2002.

Department of Fisheries and Oceans
The Search and Rescue Branch of the CCG reviewed and updated the 2003 edition of the *Radio Aids to Marine Navigation* (RAMN), page 4-33 "Alerting the Search and Rescue Authorities (Marine Safety Circular No. 892)", which describes why early alerting is necessary and also gives operational guidance for masters of vessels in distress or urgent situations. The 2003 edition of Notice to Mariners, Section 28, was also reviewed and updated by the addition of a new paragraph, titled "Importance of Early Notification of a Potential Distress".

Transport Canada
TC drew attention to *Ship Safety Bulletin* No. 06/2001, issued on 08 August 2001, titled *Global Maritime Distress and Safety System and Guidance on Important Operational Procedures*. This issue was to inform mariners of a number of radio operational procedures essential for safety. Annex 3 of the Bulletin (Section 1) clearly identifies the need for an early alerting of search and rescue, and that (Section 2) it is essential to enable shore-based facilities to respond without delay to any situation which constitutes, or has the potential to constitute, a danger to life. Time lost in the initial stages of an incident may be crucial to its eventual outcome. TC advised that the CCG RAMN, Annual Edition 2001, Part 4-*General Procedures*, re-iterates the need for early alerting, and to help ensure maximum dissemination and availability of this information, the material will be published in the 2002 edition. This publication is required to be carried aboard all vessels fitted with a ship radio station.



Overboard discharge valves

Anti-syphon Loop
A Marine Safety Information letter (No. 07/02) was sent to TC on 07 August 2002. In their initial response, TC did not specifically address the anti-syphon issue. However, they advise that they are developing a new construction standard for fishing vessels which would include piping systems and overboard discharges. Discussion on the new standard was to take place at the Canadian Marine Advisory Council meeting in May 2003, but specific aspects were to be addressed later during the Regulatory Reform Process when proposals regarding anti-syphon arrangements will be tabled.

Immersion Suits
The manufacturers of the OC 4001 and OC 8001 immersion suits improved the construction of the OC 4001 suits to permit more constant use. Stored immersion suits require periodic on-board visual inspections. It is recommended that, after each emergency use, the suit be subjected to an air pressure test.

The United States has submitted a recommendation to the International Maritime Organization for guidelines respecting periodic testing of stored immersion suits. Air pressure tests, at intervals not exceeding three years, have been suggested or more frequently for suits over 10 years of age. The Board will monitor this initiative.

REFLEXION

If Search and Rescue authorities are not advised of a problem, they cannot react. Is it not better to be safe rather than sorry?

Profile of FV *Alain-Josée*

Loose Fish Sank Ship

Too much fish on the open deck of the small fishing vessel *Alain-Josée* coupled with bad weather resulted in the swamping of the vessel off Pointe-Sapin, New Brunswick on 05 September 2001. There were no injuries to the three crew members. — Report No. M01M0100

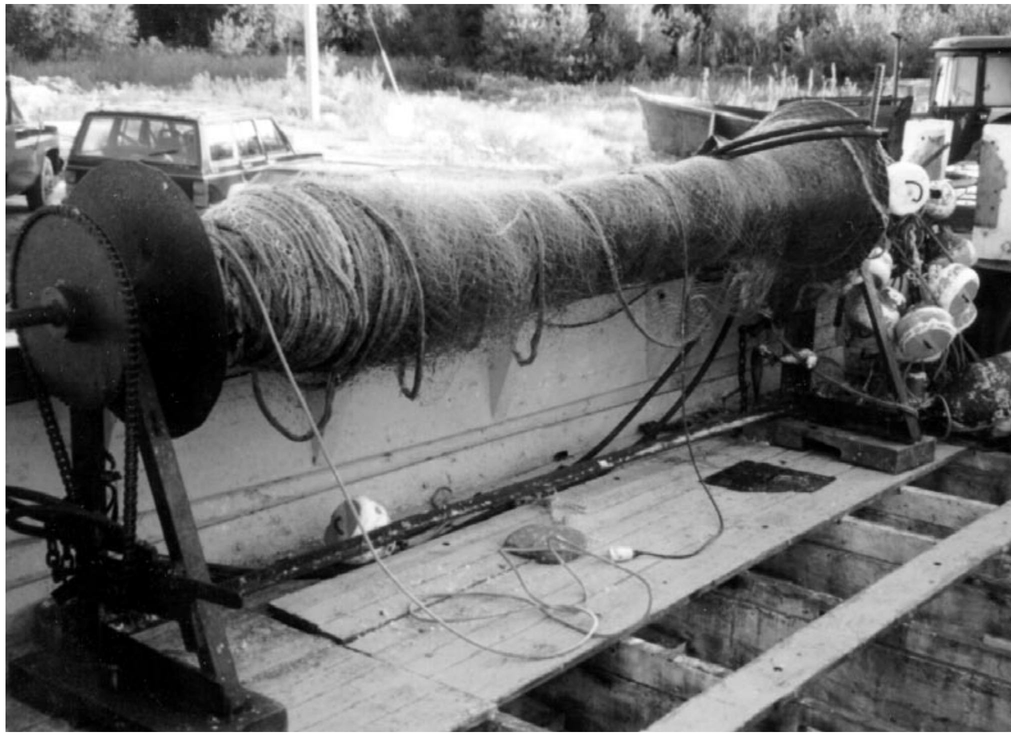
That morning, after a night of fishing, the amount of fish caught was equivalent to about 80 barrels, or about nine tonnes. Only 7.5 percent of the total catch was contained in secured fish boxes. The bulk of the herring (8.4 tonnes) was loose on deck, free to move as the vessel pitched and rolled. Unlike some other open-decked herring boats, the deck of the *Alain-Josée* was not equipped with portable wooden pen boards, which are slid into vertical stanchions attached to the deck and at the perimeter of the well deck. These pen boards are arranged such as to divide the well deck both longitudinally and transversely into small penned areas to contain the catch, thus dramatically reducing the movement of the herring on deck. Had such an arrangement been used on the *Alain-Josée*, it would have increased the vessel's stability and improved its behaviour at sea.

Given that the weather had worsened during the night and given the large quantity of herring on deck, the crew decided to return to port. A vessel fishing nearby was invited to take the catch from two of the *Alain-Josée* nets remaining in the water.

The Weather Worsened

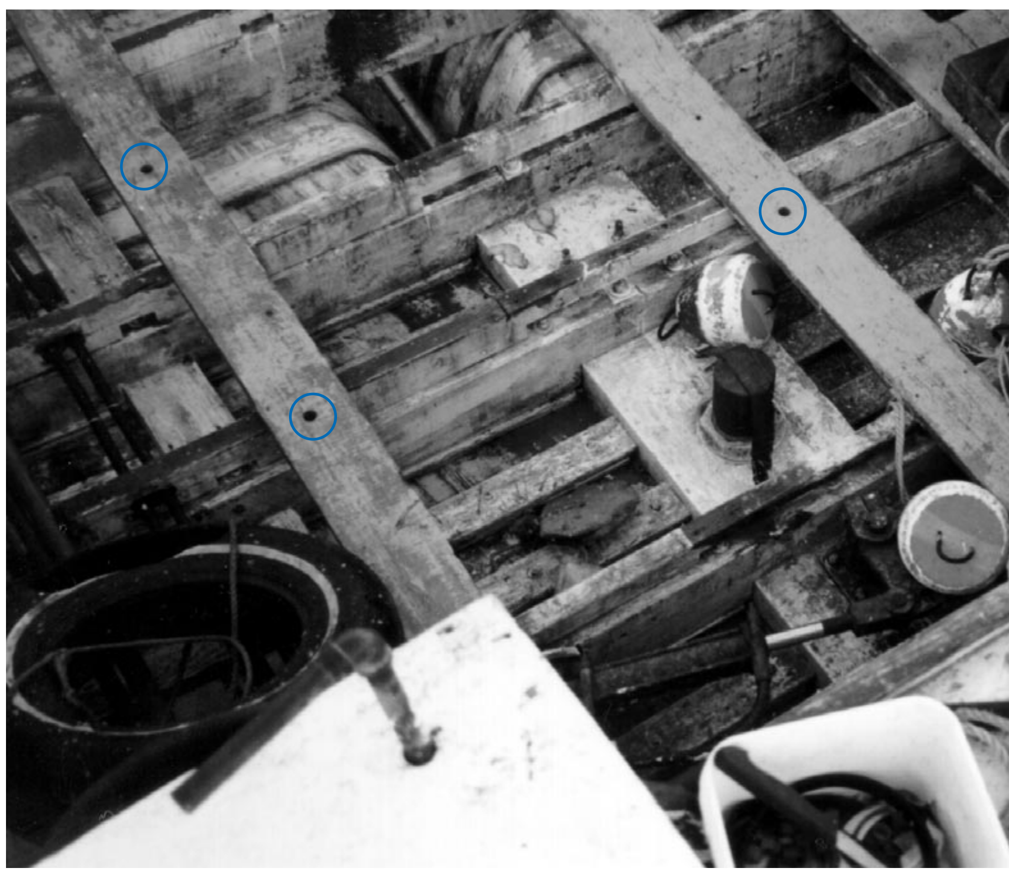
During the homeward voyage, winds gusted from the NNE at 15 to 20 knots, and the seas began to build. At approximately 0630, winds had increased to about 20 to 25 knots with wave heights reaching three to five metres; a wave came over the stern and flooded the loaded well deck. The crew started shovelling the herring over the side, but another wave lifted the stern. The vessel broached, shipping more water over the starboard bulwark.

The bulk of the herring (8.4 tonnes) was loose on deck.



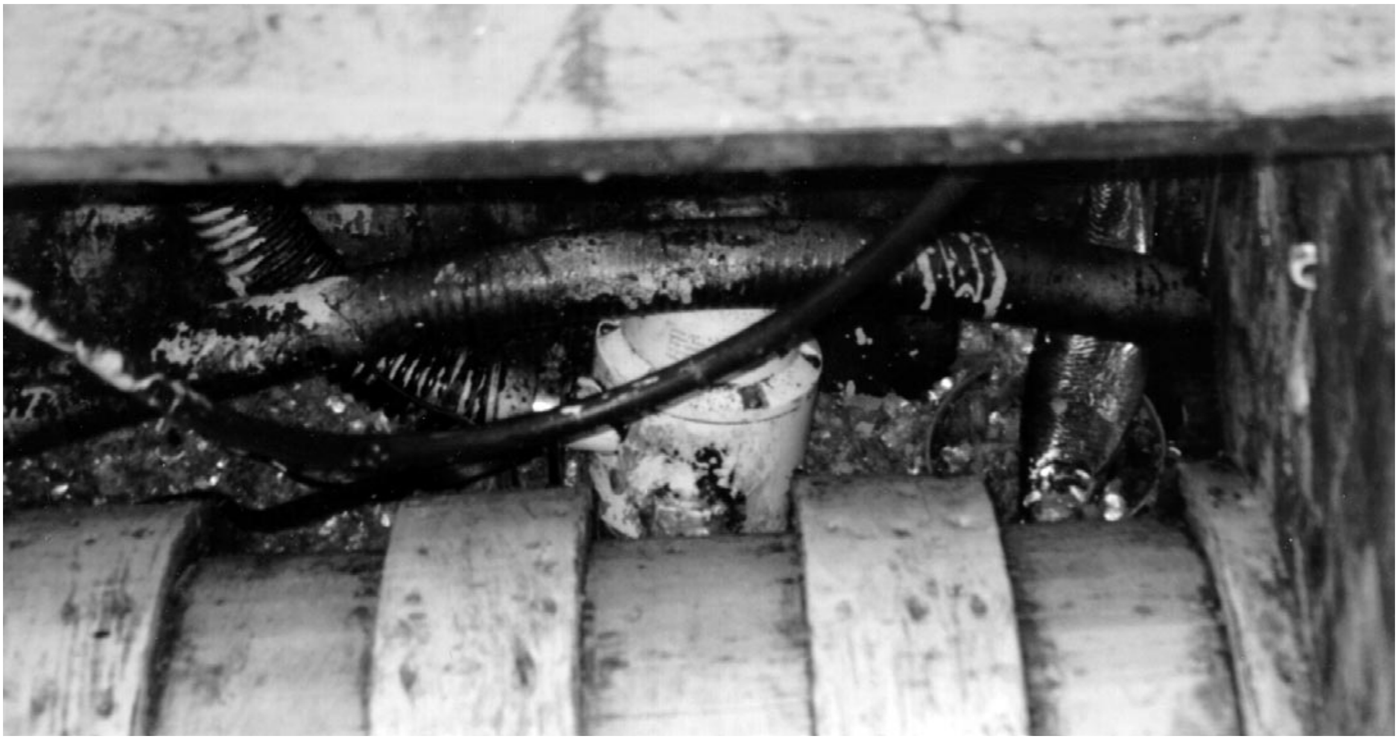
Net drum, starboard side

A submersible electric bilge pump, located at the bottom of the void space below the well deck, was pumping normally on automatic mode. The gasoline-powered pump in the wheelhouse was started, but reportedly, no water was in the bilge to pump, and the unit was shut down. Water which accumulates on deck while fishing is drained into the bilge through holes in the well deck planking. The three-quarter-inch holes, distributed at intervals on the well deck, are considered, from experience by the owner/operator, to be adequate to drain water encountered during normal fishing operations.



Drain holes in deck

The deck drainage system may work adequately when handling lobsters or shellfish.



Electric bilge pump

During the occurrence, with a dense load of herring on deck, the fish covered the small and widely spaced drain holes, which prevented a large quantity of shipped seawater from getting down to the bilges, where it could be pumped out.

The water on deck combined with the herring to form a fluid deck load, rendering the *Alain-Josée* unstable. When the vessel broached after the first wave, the fish moved to the starboard side, causing the vessel to list. Thus, more waves washed over the starboard rail and swamped the vessel.

The water on deck combined with the herring to form a fluid deck load.

The fishing vessel *Joshua D.* was close by and was called to assist. It manoeuvred alongside the *Alain-Josée*, from which the three crew members jumped to safety. They were not wearing lifejackets.

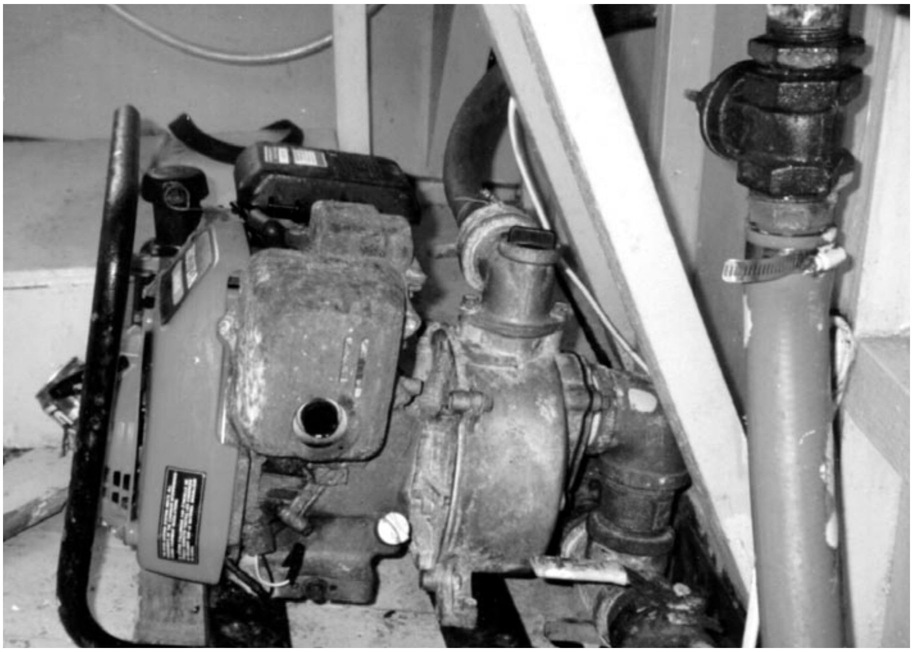
Vessel Design Versus Type of Fishery

In recent years, Cape Island type vessels, such as *Alain-Josée*, have been engaged in fisheries for which they were not originally designed, encouraging them to carry heavier deck loads, causing reduced freeboards and resulting in lower margins of safety in rough weather. Also, design features, such as deck drainage systems, which may have worked effectively in a particular type of fishery, can have a detrimental impact upon a vessel's safety or fitness for its intended use while engaged in another type of fishery.

The *Alain-Josée* and similar vessels of 15 gross tons or less are not required to submit stability data for approval by Transport Canada (TC) either when newly built, or when they change in order to operate in a different type of fishery with increased loads. Consequently, an operator may not be aware that the increase in load, with corresponding decrease in freeboard, may be hazardous, resulting in the vessel being overwhelmed by the sea.

Pumping Equipment

The Board also noted in this report that the gasoline-powered pump in the wheelhouse was a Honda model WN20. The pump's gasoline engine exhausts directly into the wheelhouse, where fuelling of the unit by hand also takes place. This poses a risk of asphyxiating the operator conning the vessel and/or causing a fire within the compartment. Honda portable pumps have given rise to safety issues in the past. Due to their dissimilar metal components and galvanic corrosion problems, these pumps are not recommended for use with sea water. A Ship Safety Bulletin (SSB 98-04) was issued by TC relating to the suitability of portable pumping equipment for the marine environment. The owner/operator of the *Alain-Josée* reported having heard of Ship Safety Bulletins, but had never received one.



Gasoline-powered pump

Honda portable pumps are not recommended for use with sea water.

Consultations

In partnership with the Department of Fisheries and Oceans (DFO), TC and stakeholders were discussing the possibility of distributing safety-related material, such as Ship Safety Bulletins, using the DFO database of fishing vessel licence holders.

In November 2002, a discussion paper on Proposed Draft Stability Requirements was circulated at the Canadian Marine Advisory Council, for review and comment, with regard to regulatory revision, requiring some form of stability assessment for all fishing vessels. Attention is being directed at fishing vessels of less than 15 gross tons and of “open type” construction. New proposals are put forward addressing stability and associated seaworthiness issues, such as overloading, stowage of loose cargo, downflooding and watertight integrity, reserve buoyancy and drainage.

Fishing Vessel Occurrence Statistics

by Region for the Last 10 Years 1994 to 2003 Inclusive

	Total	Western	Central	Laurentian	Maritimes	Newfoundland	Arctic	Foreign Waters
Total Number of Accidents	**3130**	**1319**	**31**	**166**	**931**	**657**	**12**	**14**
Shipping Accidents								
By Type of Accident	**2884**	**1232**	**27**	**151**	**877**	**582**	**6**	**9**
Collision	109	44	4	8	40	10	0	3
Capsizing	74	38	2	6	16	10	0	2
Foundering/Sinking	240	81	9	24	83	41	1	1
Fire/Explosion	441	171	2	17	148	103	0	0
Grounding	821	487	9	30	231	60	2	2
Striking	181	130	0	11	24	16	0	0
Ice damage	91	1	0	7	4	78	1	0
Propeller/Rudder/ Structural damage	242	35	1	9	110	86	1	0
Flooding	552	200	0	27	187	137	0	1
Other	133	45	0	12	34	41	1	0
Accidents Aboard Ship	**246**	**87**	**4**	**15**	**54**	**75**	**6**	**5**
Vessels Involved in Shipping Accidents								
By Vessel Flag	**2987**	**1278**	**30**	**159**	**916**	**589**	**6**	**9**
Canadian	2871	1184	30	159	910	573	6	9
Foreign	116	94	0	0	6	16	0	0
Vessels Lost								
By Gross Tonnage	**451**	**174**	**5**	**28**	**149**	**90**	**2**	**3**
1600 grt and over	2	0	0	0	0	2	0	0
150 to 1599 grt	6	1	0	0	1	4	0	0
60 to 149 grt	53	17	0	5	16	15	0	0
15 to 59 grt	138	40	0	10	51	34	1	2
Less than 15 grt	179	77	2	9	71	19	0	1
Unknown tonnage	73	39	3	4	10	16	1	0
Fatalities	**172**	**54**	**11**	**16**	**46**	**34**	**9**	**2**
Shipping Accidents	112	37	9	13	22	23	8	0
Accidents Aboard Ship	60	17	2	3	24	11	1	2
Injuries	**307**	**136**	**2**	**16**	**51**	**92**	**7**	**3**
Shipping Accidents	105	61	0	4	19	19	2	0
Accidents Aboard Ship	202	75	2	12	32	73	5	3
Incidents								
By Type of Incident	**510**	**311**	**4**	**29**	**91**	**71**	**1**	**3**
Close-quarters situation	163	107	3	4	35	12	0	2
Engine/Rudder/Propeller	226	131	1	16	40	36	1	1
Cargo trouble	3	1	0	0	1	1	0	0
Personal Incidents	15	6	0	0	5	4	0	0
Other	103	66	0	9	10	18	0	0

1994 – 2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Number of Accidents	444	396	346	334	265	299	265	260	243	278
Shipping Accidents										
By Type of Accident	**417**	**377**	**317**	**307**	**246**	**271**	**231**	**237**	**230**	**251**
Collision	25	11	6	8	8	12	9	8	12	10
Capsizing	9	15	9	10	8	3	6	4	5	5
Foundering/Sinking	36	40	27	28	12	23	23	21	11	19
Fire/Explosion	60	58	53	44	35	37	33	55	28	38
Grounding	115	106	99	78	65	77	76	63	74	68
Striking	31	22	11	23	28	16	9	15	13	13
Ice damage	10	8	14	17	9	6	3	2	1	21
Propeller/Rudder/ Structural damage	28	28	36	25	13	30	21	7	29	25
Flooding	80	70	51	59	53	56	42	58	42	41
Other	23	19	11	15	15	11	9	4	15	11
Accidents Aboard Ship	**27**	**19**	**29**	**27**	**19**	**28**	**34**	**23**	**13**	**27**
Vessels Involved in Shipping Accidents										
By Vessel Flag	**444**	**389**	**322**	**319**	**251**	**280**	**238**	**246**	**238**	**260**
Canadian	423	372	308	308	243	273	227	232	232	253
Foreign	21	17	14	11	8	7	11	14	6	7
Vessels Lost										
By Gross Tonnage	**75**	**72**	**52**	**51**	**41**	**39**	**30**	**44**	**20**	**27**
1600 grt and over	0	0	0	0	0	0	0	0	1	1
150 to 1599 grt	0	0	1	0	0	2	1	2	0	0
60 to 149 grt	6	6	5	6	5	5	3	8	2	7
15 to 59 grt	19	24	21	15	13	7	11	13	5	10
Less than 15 grt	31	31	17	19	13	20	14	16	10	8
Unknown tonnage	19	11	8	11	10	5	1	5	2	1
Fatalities	**32**	**17**	**17**	**16**	**18**	**15**	**13**	**18**	**14**	**12**
Shipping Accidents	25	15	10	9	14	7	5	10	9	8
Accidents Aboard Ship	7	2	7	7	4	8	8	8	5	4
Injuries	**33**	**30**	**33**	**24**	**27**	**35**	**36**	**26**	**32**	**31**
Shipping Accidents	13	13	11	4	11	10	7	10	18	8
Accidents Aboard Ship	20	17	22	20	16	25	29	16	14	23
Incidents										
By Type of Incident	**69**	**49**	**30**	**26**	**30**	**54**	**66**	**83**	**44**	**59**
Close-quarters situation	28	21	14	10	10	9	15	21	12	23
Engine/Rudder/Propeller	28	17	6	6	10	32	40	43	17	27
Cargo trouble	0	1	1	0	0	0	0	0	1	0
Personal Incidents	1	3	3	2	1	1	2	1	0	1
Other	12	7	6	8	9	12	9	18	14	8

The majority of vessels listed under unknown tonnage are suspected of being less than 15 grt.

Marine Occurrence Statistics

	2003	2002	1998-2002 Average
Total Marine Accidents	**541**	**485**	**537**
Shipping Accidents	**476**	**449**	**477**
Collision	24	15	17
Capsizing	11	14	11
Foundering/Sinking	30	26	32
Fire/Explosion	64	53	67
Grounding	117	129	128
Striking	76	72	80
Ice damage	28	2	7
Propeller/Rudder/Structural damage	38	43	32
Flooding	49	52	61
Other	39	43	43
Accidents Aboard Ship	**65**	**36**	**60**
Vessels Involved in Shipping Accidents	**521**	**483**	**519**
Cargo	17	23	26
Bulk carrier/OBO	48	57	63
Tanker	15	9	13
Tug	33	24	36
Barge	29	32	30
Ferry	24	21	23
Passenger	40	26	22
Fishing	260	238	251
Service vessel	27	19	26
Non-Commercial	15	20	17
Other	13	14	12
By Vessel Flag	**521**	**483**	**519**
Canadian (Non-fishing)	211	192	198
Canadian (Fishing)	253	232	241
Foreign	57	59	80
Vessels Lost (By Gross Tonnage)	**31**	**32**	**43**
1,600 grt and over	2	2	1
150 to 1,599 grt	1	1	2
60 to 149 grt	7	4	5
15 to 59 grt	11	7	11
Less than 15 grt	8	12	17
Unknown tonnage	2	6	7
Fatalities	**18**	**28**	**34**
Shipping Accidents	9	19	21
Accidents Aboard Ship	9	9	13
Injuries	**89**	**78**	**81**
Shipping Accidents	29	42	26
Accidents Aboard Ship	60	36	56
Reported Incidents (Mandatory)	**221**	**174**	**201**
Close-quarters situation	60	29	44
Engine/Rudder/Propeller	81	57	80
Cargo trouble	3	5	5
Personal incidents	14	8	6
Other	63	75	66

All five-year averages have been rounded.
Occurrence data do not include pleasure craft except when the latter are involved in an occurrence with a commercial vessel.
The majority of vessels listed under unknown tonnage are suspected of being less than 15 grt.
(2003 figures are preliminary as of 29 January 2004 and subject to change.)
Source: Transportation Safety Board of Canada.

Investigations

The following information is *preliminary* on all of the occurrences under investigation by the TSB that were reported between 01 January 2003 and 31 January 2004. Final determination of events is subject to the TSB's full investigation of these occurrences.

DATE	LOCATION	VESSEL (S)	TYPE	GRT	EVENT	OCCURRENCE NO.
FEBRUARY 2003 26	Near Buoy D-82, Batiscan, Saint Lawrence River, Que.	*Great Century*	Bulk carrier	38 426	Grounding	M03L0026
APRIL 15	Sault Ste Marie, Ont.	*Emerald Star*	Tanker	6262	Grounding	M03C0016
MAY 2	Near North Head, St. John's, Nfld.	*Sir Wilfred Grenfell* *Genney and Doug*	CCG-search and rescue Fishing	2404 346	Collision	M03N0047
3	Portuguese Cove, N.S.	*Shinei Maru No. 85*	Fishing	379	Grounding and taking water	M03M0040
12	Off Hood Point, Howe Sound, B.C.	*Queen of Surrey*	Passenger-vehicle	6969	Fire in engine room	M03W0073
13	5 nm SSW of Port Aux Basques, Nfld.	*Joseph and Clara Smallwood*	Passenger-vehicle	27 615	Fire on vehicle deck	M03N0050
JUNE 25	3 nm S of Petit-de-Gras, N.S.	*Silent Provider*	Fishing	73	Fire in engine room	M03M0077
SEPTEMBER 25	5 nm North of Heath Point, Anticosti Island, Que.	*Evan Richard*	Fishing	14	Foundering and grounding	M03L0124
NOVEMBER 8	Sand Heads, Fraser River, B.C.	*Cielo Del Canada*	Container	25 361	Grounding	M03W0237
DECEMBER 12	Anchorage St-Jean, Ile d'Orleans, Que.	*Yung Kang*	Bulk carrier	40 437	Grounding	M03L0148
22	Mission, Fraser River, B.C.	*Tiger Shaman* *Packmore 4000* *Mistral*	Tug Barge Yacht	31 1621 15	Collision	M03W0265

Final Reports

The following investigation reports were released between 01 January 2003 and 31 January 2004.

DATE	VESSEL(S)	EVENT	REPORT NO.
99-06-29	*Marabell 8*	Capsize	M99W0095
99-09-24	*Norwegian Sky*	Grounding	M99L0098
99-11-09	*Alcor*	Grounding	M99L0126
00-04-27	*Federal Fuji* *Tecam Sea*	Striking	M00L0039
00-06-01	*Algowood*	Structural failure	M00C0026
00-08-14	*Mersey Venture*	Uncontrolled descent of freight elevator	M00M0083
00-09-14	*Spirit of Vancouver Island* *Star Ruby*	Collision	M00W0220
00-10-08	*127606*	Capsize	M00N0089
00-10-26	*Pacmonarch*	Accidental release of lifeboat	M00W0265
00-10-31	*Mokami*	Grounding	M00N0098
01-03-22	*Kitano*	Container fire	M01M0017
01-04-01	*Hamilton Energy* *Provmar Terminal* *Utviken*	Striking	M01C0008
01-04-13	*Bowen Queen*	Malfunction of automatic steering control for right angle drives	M02W0061
01-04-19	*Fame*	Flooding and sinking	M01N0020
01-06-13	*Wascana II*	Taking water	M01W0116
01-08-11	*Windoc*	Striking	M01C0054
01-09-05	*Alain-Josée*	Swamping	M01M0100
01-09-29	*Alex B.1*	Major water ingress	M01L0112
01-11-16	*Cedar*	Grounding and taking water	M01L0129
02-08-13	*Cap Rouge II*	Capsizing and loss of life	M02W0147
02-02-03	*Thebaud Sea*	Fire in engine room	M01M0005

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