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Transportation Safety Board of Canada

Bureau de la sécurité des transpc du Canada

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

Marine Occurrence Report

Swamping and Sinking

of the Small Fishing Vessel "E.L.M." in the Minas Basin, Nova Scotia 05 July 1993

Report Number M93M4022

TRANSPORTATION SAFETY BOARD
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Synopsis

In the early morning hours of 05 July 1993, in deteriorating weather conditions, the "E.L.M." abandoned a routine fishing trip in the Minas Basin, Nova Scotia, with the intention of seeking shelter. Shipping water heavily, the "E.L.M." subsequently swamped and sank while attempting to beach in shallow water. One of the crew members became trapped in the vessel's rigging and drowned; the two remaining crew members were rescued uninjured.

The Board determined that the "E.L.M." sank because structural changes carried out when the vessel was converted to stern trawling made her vulnerable to shipping seas and, in the prevailing rough weather, progressive flooding continued until all reserve buoyancy was lost.

Ce rapport est également disponible en français.

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1.0 Factual Information

1.1 Particulars of the Vessel

	"E.L.M."
Official Number	331351
Port of Registry	Shelburne, Nova Scotia
Flag	Canadian
Type	Small wooden fishing vessel, open construction[1]
Gross Tons[2]	10.93
Length (registered)	9.75 m
Breadth	3.84 m
Built	1971, Yarmouth, Nova Scotia
Propulsion	One 125 BHP Isuzu diesel engine, driving one fixed-pitch propeller
Owners	Minas Basin Dragging Company Ltd., Canning, Nova Scotia

1.2 Description of the Vessel

The "E.L.M." was a "Cape Islander" lobster fishing vessel of open construction converted in 1987 to a stern trawler for the flounder fishing industry.

The conversion involved the installation of additional fishing gear comprising a steel mast, boom, rigging, fishing gallows, stern roller, two hydraulically driven trawl winches, net reel, trawl doors, fishing warps and a net. The original non-watertight well deck was raised 0.35 m in way of the engine compartment and a fish landing platform was fitted at the stern. Additional 0.46 m-high bulwarks were constructed on top of the existing gunwales on the port and starboard sides, extending from midships to the stern and across the transom.

The "E.L.M." was fitted with two electrical pumps and carried one portable gasoline pump, all of which were of unknown capacity.

1.3 History of the Voyage

The "E.L.M." departed Upper Pereau, Nova Scotia, in the Minas Basin, at 1230[3] on 04 July 1993, on a routine 10-mile trip to the flounder fishing grounds on the tidal mud flats bordering the estuary of the Avon River, where she intended to fish for approximately 24 hours.

The weather on departure was calm with very good visibility, and the operator expected continuing good weather conditions. However, in the early hours of the following morning, 05 July, the wind began to increase in strength, blowing from the north against the ebb tide. Knowing that the seas would quickly become rough under these conditions, the crew decided to return to port. By 0500, the net had been brought in, adding about 300 kg of fish to the estimated 1,200 kg catch already on board. Initially, an attempt was made to reach the calmer waters in the lee of Cape Blomidon, Nova Scotia. However, this meant heading into the wind which, by this time, had

1 See Glossary for all abbreviations, acronyms, and definitions.

2 Units of measurement in this report conform to International Maritime Organization (IMO) standards or, where there is no such standard, are expressed in the International System (SI) of units.

3 All times are ADT (Coordinated Universal Time (UTC) minus three hours) unless otherwise stated.

increased to 30 knots. Furthermore, a very short, steep sea had built up, causing the vessel to roll and pitch excessively. As the "E.L.M." rolled, sea water began to wash over the gunwales on either side, draining into the bilges; the capacity of the three pumps on board was insufficient to cope with the ever increasing rate of flooding. It was decided to turn and head as fast as possible toward the nearest land, 0.75 mile away, in the hope that the vessel could be beached with the rapidly falling tide. As the "E.L.M." headed for shallower water with the wind now astern, she continued to ship water until she finally heeled to starboard, swamped and sank in three fathoms (5.5 m) of water at approximately 0520.

1.4 *Injuries to Persons*

One of the crew members drowned when the vessel sank; the two remaining crew members were rescued uninjured.

1.5 *Search and Rescue*

Radiotelephone (R/T) contact had been made with another fishing vessel in the area, the "DIXIE II". The worsening situation was made known and the "DIXIE II", in turn, notified the Rescue Co-ordination Centre (RCC) at Halifax, Nova Scotia, prompting RCC participation in a rescue effort. The "DIXIE II" followed the "E.L.M." toward the shore and was in the immediate vicinity when the sinking occurred. The "DIXIE II" rescued two crew members from the water; however, the third crew member had become trapped under the vessel's mast and boom and could not be reached as the vessel sank. The body was recovered later by Search and Rescue (SAR) technicians who were part of the RCC SAR effort. The uninjured survivors were transported back to Pereau by the rescuing vessel.

1.6 *Crew Experience and Qualifications*

The three crew members were related (a father, his son and the son's wife) and the fishing business was a family concern. It was usual for only two persons to operate the vessel, but the father was contemplating retirement and had accompanied the others in the capacity of adviser. The others would be taking over the operation of the vessel.

The father had spent 42 years in various types of vessels and had operated the "E.L.M" for the six years since the vessel's purchase and conversion in 1987. The son had 23 years' experience in various types of vessels, including three summers on the "E.L.M". The son's wife had limited experience, 1993 being her second summer of fishing, both spent on the "E.L.M".

None held formal marine qualifications nor were they required to by regulation, but the father held a Department of Transport (DOT) Fishing Master Certificate of Service, a certificate for which no evaluation of ability was required and which was issued in 1967 to existing, experienced fishermen when the requirement for fishing Certificates of Competency was introduced.

None held Marine Emergency Duties certificates.

1.7 *Life-saving Appliances*

The "E.L.M." was equipped with four DOT-approved lifejackets and an approved lifebuoy. The vessel did not carry an inflatable liferaft nor was this required by regulation. The female crew member, who lost her life, wore a lifejacket which she was assisted in properly donning at approximately 0400 when the seas became rough. Only one of the other two crew members wore a personal flotation device (jacket). All were reportedly good swimmers.

1.8 *Vessel Certification*

Being less than 15 gross registered tons (GRT), the "E.L.M." was not required to be inspected and did not have a Safety Inspection Certificate. Although privately insured, the vessel had not been recently surveyed but was reported to be in sound condition.

1.9 *Stability*

Because the "E.L.M." is a small fishing vessel of less than 15 GRT, there is no regulatory requirement for the submission of stability data.

1.9.1 Trim and Freeboard

The "E.L.M." was not fitted with draught marks; consequently, the precise forward and after draughts are not known. However, marine growth and scum marks, observed on the hull shortly after the sinking and while the hull was exposed at low water, indicated the most likely trim when she was unloaded and lying idle in port between fishing trips.

The trim was such that the bottom of the transom was immersed approximately 0.18 m, the stem forefoot was barely clear of the water and the corresponding effective freeboard was approximately 0.61 m amidships. After due allowance for the designed rake of keel, it is likely that, when unloaded, the converted vessel was normally trimmed some 0.38 m by the stern.

The weight and trimming effect of the 1,500 kg of fish, reportedly stowed on the well deck, on the landing platform at the stern and in the net, would cause the after trim to increase by approximately 0.25 m and the effective freeboard at midships to decrease by approximately 0.05 m. Consequently, before the shipping and retention of any sea water, the loaded vessel was trimmed some 0.63 m by the stern. In this condition, the effective midship freeboard would be such that the gunwale would become immersed when rolled or heeled to a minimum angle of approximately 16° in calm water.

1.9.2 Transverse Stability

The early removal of the fishing gear and main engine for preservation purposes before the final salvage of the beached hull, and the subsequent decision not to repair or return the damaged vessel to service precluded the post-casualty preparation of hull form and weight distribution data required for the calculation of precise stability characteristics.

Inspection of the beached "E.L.M." indicated that the weight and location of the additional fishing gear and reported fish catch would have raised the centre of gravity with a consequent reduction in the vessel's transverse stability.

The actual quantity of sea water shipped and retained on board is not known but, as the water accumulated, the free-surface effect would also have lowered the vessel's transverse stability and reduced the vessel's ability to right herself.

1.10 Weather and Current

1.10.1 *Weather Forecasts*

Reportedly, the operator had listened to the marine weather forecasts made by Environment Canada by very high frequency (VHF) R/T and expected continuing good weather conditions.

Transcripts of forecasts made by Environment Canada and heard by other fishing vessels during the period 0530 to 1700, 04 July, indicated that fine weather could be expected for most of the day but winds would become northerly at 15 to 25 knots during the night; similar forecasts continued throughout the night.

1.10.2 *Observed Weather Conditions*

The wind and sea conditions as observed by other fishermen were:

Winds had been light variable during 04 July but had become northerly to north-easterly during the early morning of 05 July, increasing to 25 knots by 0400 and to 30 knots by 0520. The seas had increased to 1.0 to 1.3 m in height by 0500 on 05 July.

1.10.3 *Tidal Conditions - Minas Basin*

The tidal ranges in the northern part of the Bay of Fundy (Minas Basin) are among the highest in the world. In the area of the sinking, the range for the falling tide on which the "E.L.M." sank was estimated to be about 11.4 m (37.3 feet), with high water occurring at about 0210 and low water at about 0815.

1.10.4 *Tidal Stream*

The current caused by the ebb tide was estimated to be of one to two knots in the region and running in a direction opposed to the wind.

1.10.5 *Combined Effect of Wind and Current*

It is well known among Minas Basin fishermen that, during the summer, the wind often blows from the north during the latter part of daylight hours and increases in velocity during the night. It is also well known that, if the northerly wind should coincide with an ebb tide, very rough waters can be expected over the tidal mud flats where flounder fishing takes place.

1.11 Conversions of Similar Vessels

Inspection of other similar "Cape Islander" vessels at nearby harbours revealed that eight vessels had been equipped for operation as small stern trawlers in the flounder fishing industry. The majority

were somewhat larger vessels than the "E.L.M.". All were fitted with only one trawl winch and none were equipped with the powered net reel installed aft on the "E.L.M.". The unloaded freeboard and trim of these vessels were not significantly affected by their conversion to stern trawling. Because their original well decks, on which the additional but lighter gear was installed, had not been raised, their reserve buoyancy and transverse stability characteristics were less adversely affected than was the case with the "E.L.M.".

2.0 *Analysis*

2.1 *Operational Factors*

The "E.L.M." had been routinely operated over the previous six years by the father and one other crew member, reportedly without difficulty and in similar conditions of stability and seaworthiness. The fishing routine had included carefully assessing and anticipating sea conditions, taking into account the prevailing and forecast weather and the local tidal peculiarities. The son's wife's experience was limited and, although the son had experience, this operation was different from his usual occupation in terms of geographical location, type of fishing, and vessel size.

2.2 *Stability Considerations*

Being of open construction, the vessel had no watertight decks or compartments which would have provided additional intact reserve buoyancy. The reserve buoyancy depended solely upon the freeboard provided by the intact hull.

The weight, surging and free-surface effect of the water shipped and retained on board before the sinking further reduced the vessel's effective freeboard and reserve buoyancy and lowered the transverse stability until it was insufficient to withstand the dynamic heeling forces imposed by the rough sea conditions. The reported sequence of events is consistent with a progressive flooding until the vessel was unable to recover from a heavy roll to starboard which immersed the gunwale. The resulting downflooding continued until all reserve buoyancy was lost and the vessel sank.

2.3 *Abandonment Aspects*

Under the prevailing conditions, and knowing that the vessel would probably sink, the crew determined that the vessel could possibly be beached. This was considered the best alternative since there was neither a lifeboat nor liferaft on board. An inflatable liferaft allows the crew to consider the option of abandoning the vessel in such circumstances.

3.0 Conclusions

3.1 Findings

1. The weight and location of the additional fishing gear reduced the vessel's effective freeboard and lowered the transverse stability.

2. The additional weight of the fish catch aft further reduced the effective freeboard and made the vessel more vulnerable to shipping sea water.

3. Deteriorating weather conditions and local tidal peculiarities resulted in rough sea conditions.

4. The "E.L.M." began to ship water in the rough sea conditions that developed.

5. The weight, surging and free-surface effect of the shipped water lowered the transverse stability until it was insufficient to withstand the dynamic heeling forces imposed by the prevailing sea conditions.

6. The accumulation of shipped water continued until, on a heavy roll to starboard, all reserve buoyancy was lost and the vessel sank.

7. The vessel was not carrying an inflatable liferaft.

3.2 Causes

The "E.L.M." sank because structural changes carried out when the vessel was converted to stern trawling made her vulnerable to shipping seas and, in the prevailing rough weather, progressive flooding continued until all reserve buoyancy was lost.

4.0 *Safety Action*

4.1 *Action Taken*

4.1.1 *Vessel Modifications*

Small fishing vessels under 15 gross registered tons (GRT), such as the "E.L.M.", are not inspected by the Canadian Coast Guard. Many small fishing vessel operators are not aware that modifications to the structure of their vessel and the addition of heavy fishing gear on deck can adversely affect the vessel's stability, reduce the freeboard and compromise crew safety in adverse weather conditions.

In its report on the investigation into the sinking of the 58-ton fishing vessel "LE BOUT DE LIGNE" (TSB report No. M90L3033) in the Gulf of St. Lawrence, the Board recommended, inter alia, that:

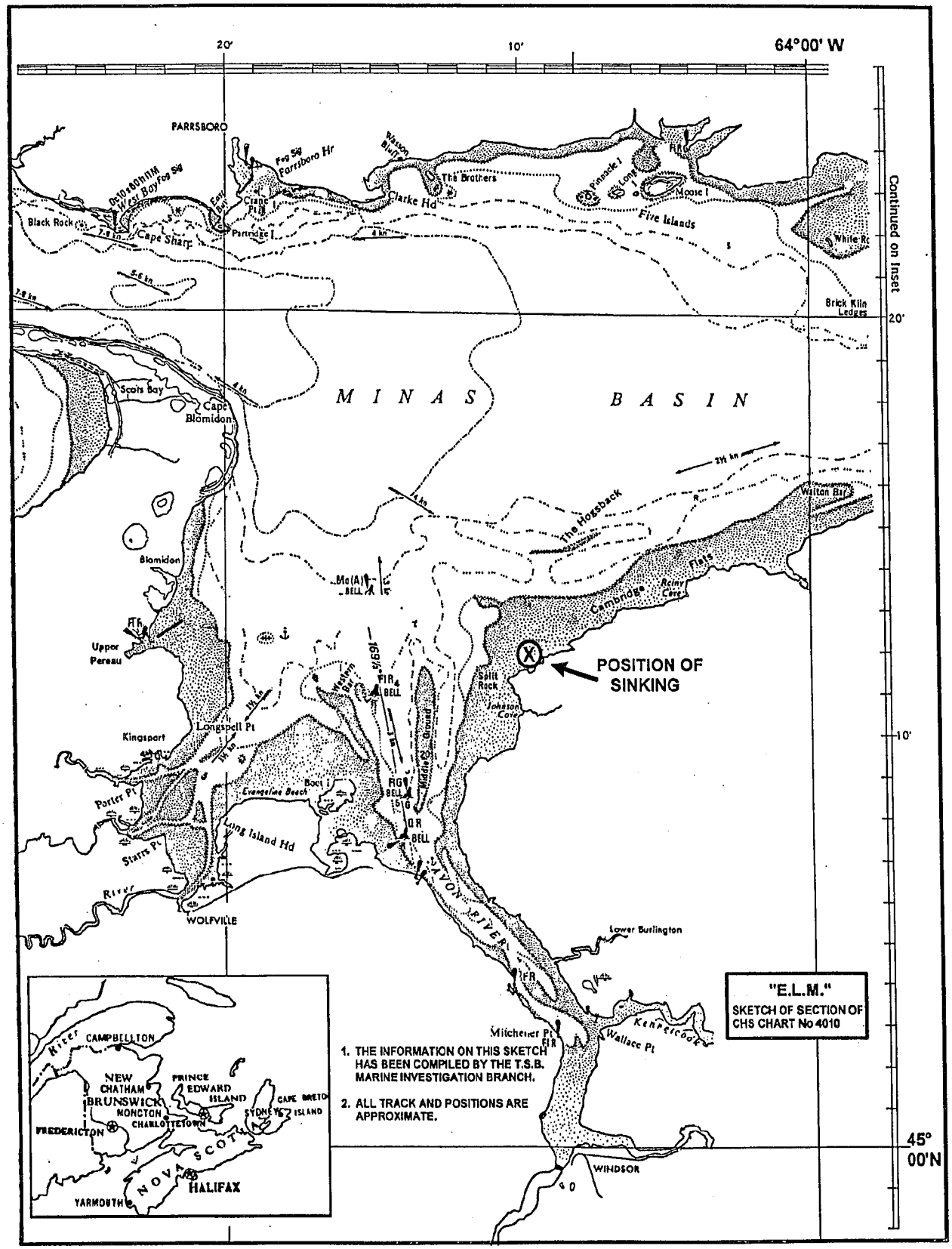
> The Department of Transport emphasize, through a safety awareness programme for owners, operators and officers of fishing vessels, the adverse effects of structural modifications and additional items on vessel stability; and
>
> (M94-31, issued December 1994)

> The Department of Transport explore means to ensure that structural modifications and addition of weight items are recorded and accounted for in re-assessing the stability of small fishing vessels.
>
> (M94-32, issued December 1994)

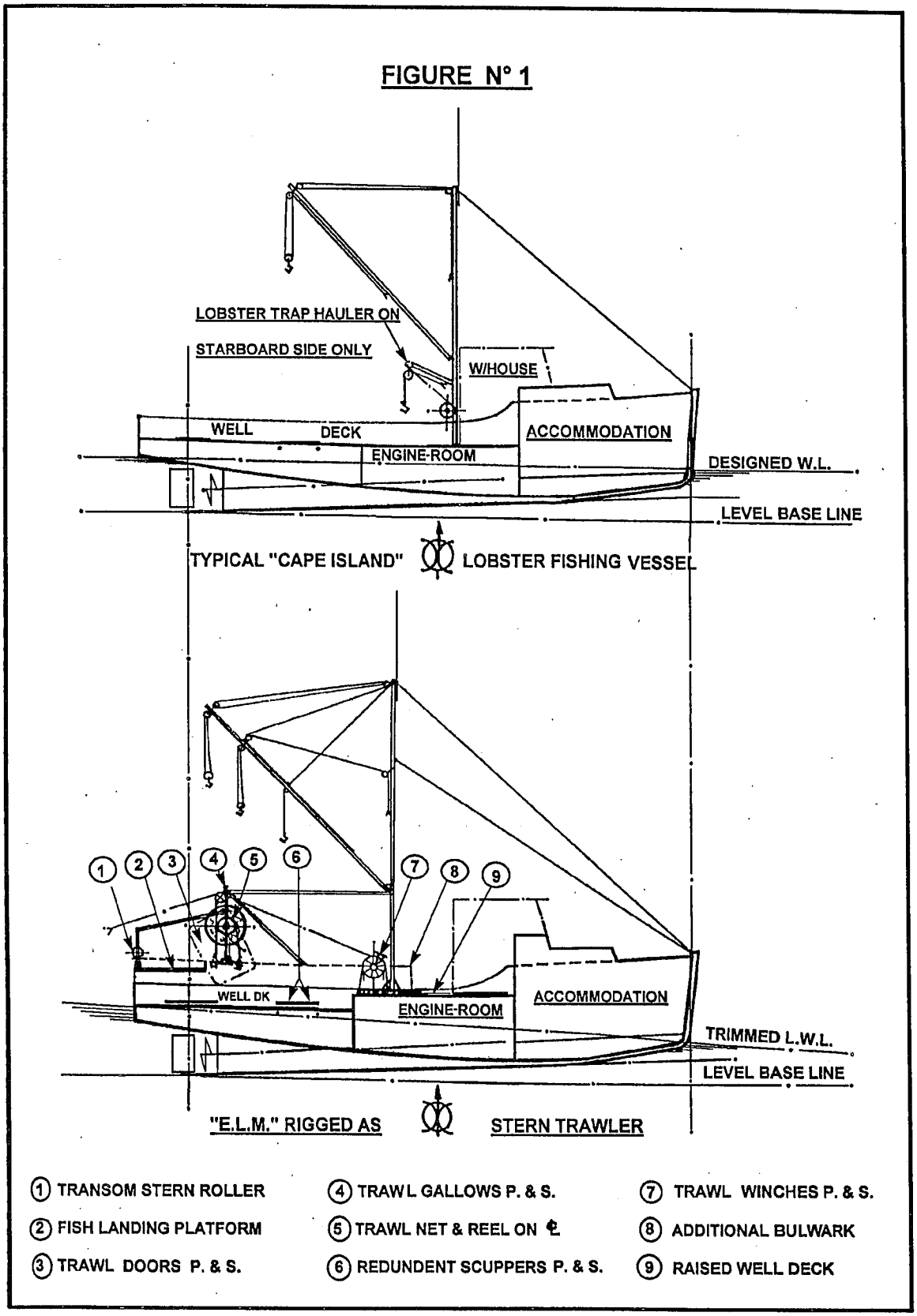
In response to these recommendations, the Canadian Coast Guard, in cooperation with the fishing industry, will emphasize the adverse effects that structural modifications may have on vessel stability. This will be done through Ship Safety Bulletins, face-to-face meetings with owners and operators of fishing vessels, and by amending the *Small Fishing Vessel Safety Manual*, TP 10038.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, John W. Stants, and members Zita Brunet and Hugh MacNeil, authorized the release of this report on 16 May 1995.

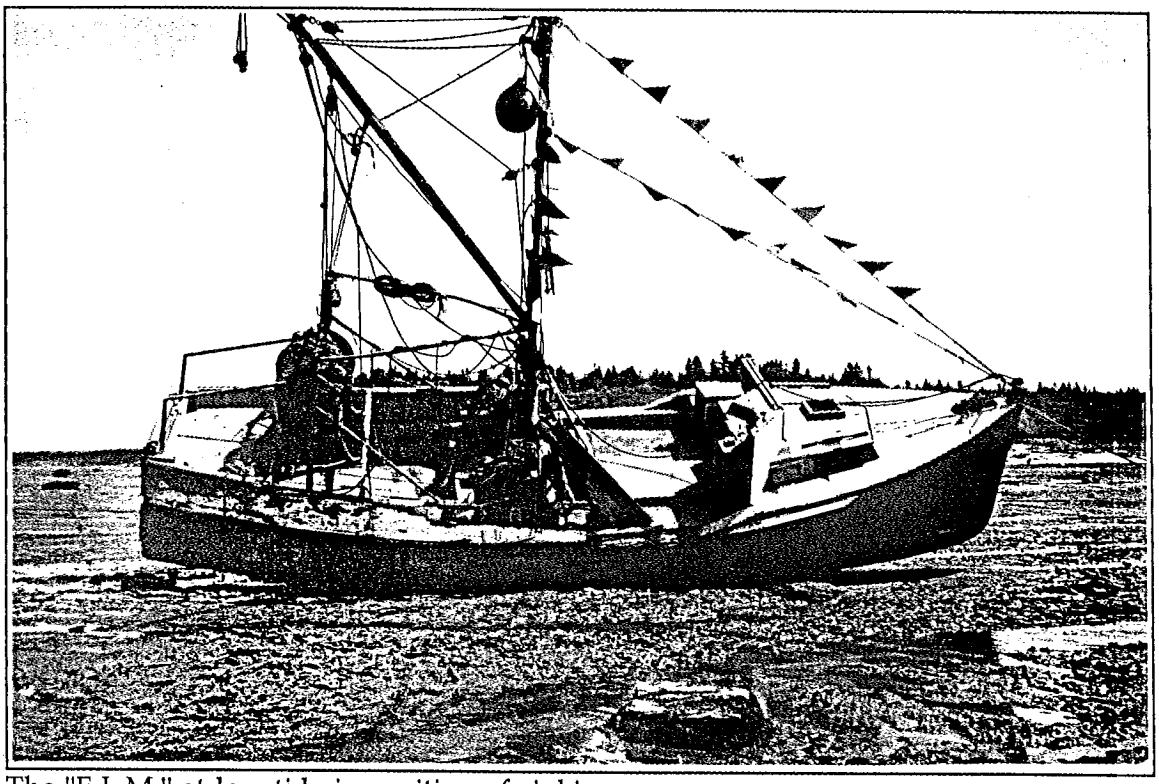
Appendix A - Chartlet of the Occurrence Area



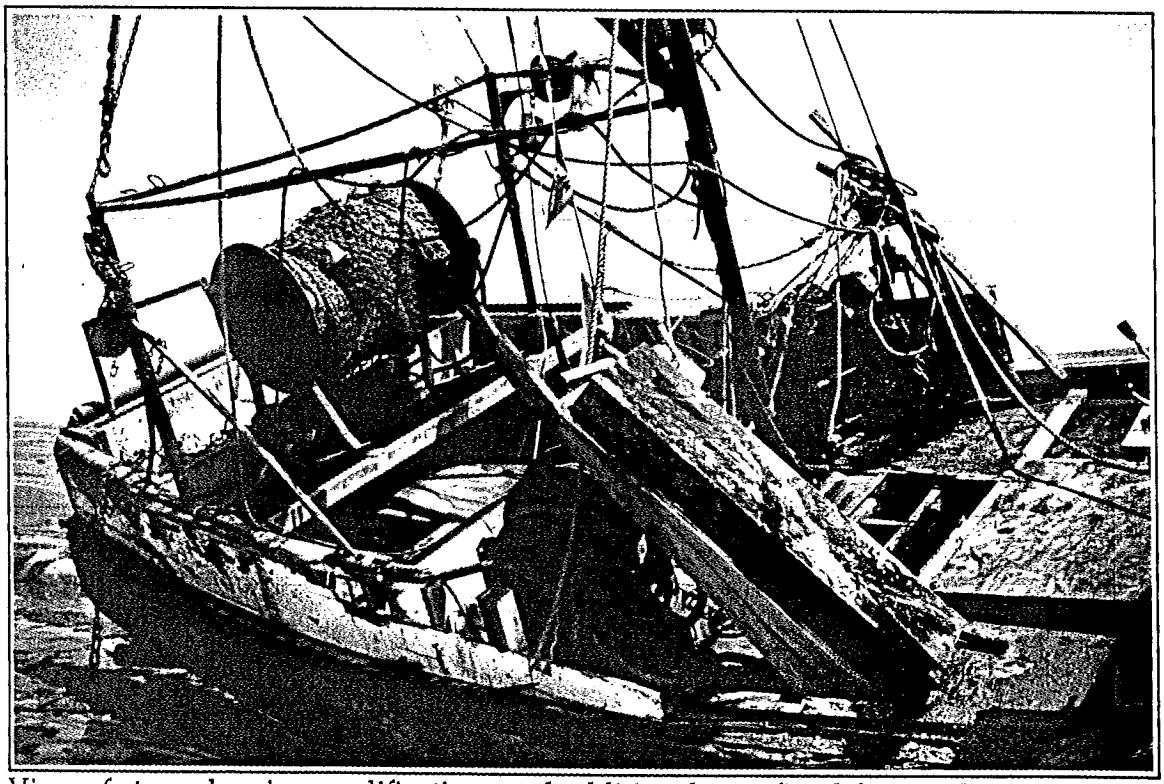
Appendix B - Conversion Diagram



Appendix C - Photographs



The "E.L.M." at low tide in position of sinking.



View of stern showing modifications and additional gear fitted for trawling.

Appendix D - Glossary

ADT	Atlantic daylight time
beach(ing)	Intentionally putting a vessel (partly) aground to prevent the vessel sinking in deep water.
BHP	brake horsepower
bulwarks	Vertical plating/planking along each side of vessel above weather deck.
Cape Islander	Small wooden fishing vessel of open construction indigenous to Nova Scotia.
free-surface effect	Loss of stability caused by movement of liquid in partially filled compartments when the vessel heels.
gallows	Steel framework from which fishing gear is suspended.
GRT	gross registered ton(s)
gunwale	upper edge of a vessel's side
IMO	International Maritime Organization
kg	kilogram(s)
m	metre(s)
DOT	Department of Transport
(vessel of) open construction	Undecked vessel; vessel decked over less than 50 per cent of her length.
RCC	Rescue Co-ordination Centre
reserve buoyancy	Enclosed hull or superstructure volumes which, when immersed, provide buoyancy which is included in intact stability.
R/T	radiotelephone
SAR	Search and Rescue
SI	International System (of units)
(to) swamp	Shipping sea water over sides of open vessel such that reserve buoyancy is lost and vessel sinks.
transverse stability	Measure of vessel's ability to resist heeling influences.
trawl doors	Heavy boards attached to each side of mouth of trawl net to keep net open.
TSB	Transportation Safety Board of Canada
VHF	very high frequency
well deck	Decking in working area below gunwale level.
°	degree(s)