

Flooding and Sinking of Fishing Vessel *Grace Marie*

On July 8, 2022, about 2200 local time, the fishing vessel *Grace Marie* was about 80 miles east of Gloucester, Massachusetts, transiting to fishing grounds, when the engine room began flooding.¹ The crew of seven was unable to pump out the water with the vessel's bilge pumping system, and they abandoned the vessel into an inflatable liferaft. A nearby Good Samaritan vessel rescued the crew, and no injuries were reported. An oil sheen was observed the next day in the area where the vessel was last seen. The *Grace Marie*, valued at \$650,000, was a total loss.



Figure 1. *Grace Marie* underway before the sinking. (Source: Paul Spillane)

¹ (a) In this report, all times are eastern daylight time, and all miles are nautical miles (1.15 statute miles). (b) Visit [nts.gov](https://www.nts.gov) to find additional information in the [public docket](#) for this NTSB investigation (case no. DCA22FM027). Use the [CAROL Query](#) to search investigations.

Casualty type	Flooding/Hull Failure
Location	Atlantic Ocean, 80 miles east of Gloucester, Massachusetts 42°41.31' N, 68°46.37' W
Date	July 8, 2022
Time	2200 eastern daylight time (coordinated universal time -4 hrs)
Persons on board	7
Injuries	None
Property damage	\$650,000 est.
Environmental damage	Oil sheen, 360 ft by 150 ft
Weather	Visibility 8.5 nm, winds south-southwest 8-10 kts, seas 2-3 ft, swells south-southwest 4-8 ft, air temperature 66°F, water temperature 64°F, sunset 2024, evening twilight 2058, sunrise 0518
Waterway information	Ocean, depth 500 ft at sinking location



Figure 2. Area where the *Grace Marie* flooded and sank, as indicated by a red X. (Background source: Google Maps)

1 Factual Information

1.1 Background

The *Grace Marie*, a steel-hulled stern trawler previously named the *Paul & Dominic*, was built in 1978 by Rhode Island Marine Services in Snug Harbor, Rhode Island. The current owner, AGV Company, purchased the vessel in 1997 and renamed it the *Grace Marie*. Homeported in Gloucester, Massachusetts, the *Grace Marie* was an uninspected commercial fishing vessel used exclusively for groundfishing. It was powered by a single 565-hp Caterpillar engine. The vessel's main deck had a working deck aft, rigged with dual net drums set above net ramps, and a deckhouse consisting of crew quarters, a galley, and storage areas forward. The wheelhouse was located above the deckhouse. Below-deck areas from forward to aft were divided into a forepeak tank, engine storeroom, engine room, fish hold, and lazarette. There was a roughly 18-inch crawl space between the bottom of the fish hold and the engine room bilge. This crawl space provided a "shaft alley" for the vessel's propeller shaft, which extended from the main engine aft about 8 feet under the fish hold and out of the vessel's hull through the stern tube and shaft stuffing box.

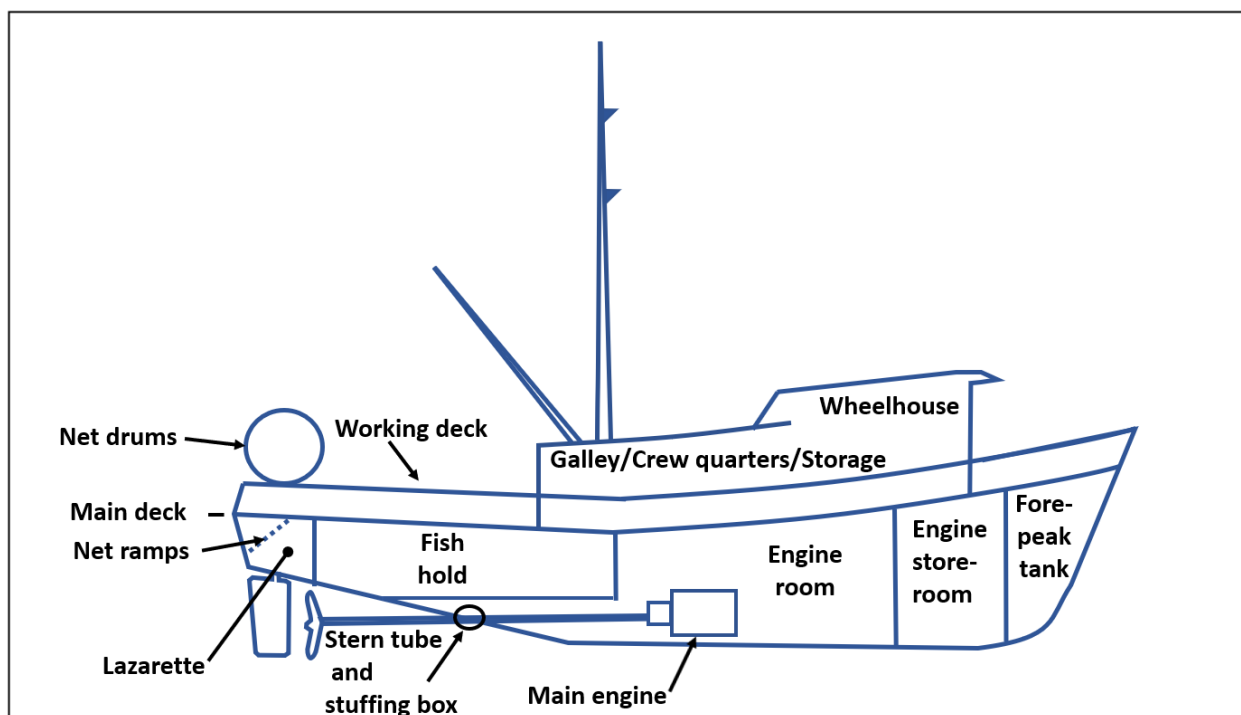


Figure 3. Simple profile of the *Grace Marie*.

The vessel's bilge system consisted of three electrically driven pumps of varying capacities (two 2-inch pumps and one 3-inch pump), which were in the engine room and powered from the vessel's alternating current electrical system. Some were exclusively for pumping bilge water, while others could also be

configured for deck wash down and cleaning of fish. Depending on the system configuration (valve and pump lineup), suction could be taken from the bilges of the lazarette, fish hold, or engine room, the contents of which could then be discharged overboard. Bilge float alarms were also installed on board the *Grace Marie* in the lazarette, fish hold, and engine room. When activated by a high liquid level in the bilge, they were designed to alarm (light and sound) in the wheelhouse and locally. There was a high alarm and a secondary “high-high” alarm associated with each bilge float. The high-high alarm activated if the high alarm remained active and the liquid level continued to rise. The three pumps could be started and stopped manually from the wheelhouse. Additionally, an independent 1-inch bilge pump, which was solely for the fish hold, activated and discharged overboard automatically.

1.2 Event Sequence

On July 6, 2022, at 1600, the *Grace Marie* departed Gloucester and proceeded to fishing grounds located about 80 miles east. The crew of the *Grace Marie* consisted of a captain and six deckhands. The captain, who had more than 41 years of fishing experience, had worked on the *Grace Marie* for 25 years. The deckhands were also experienced fishermen, all having previously sailed on the *Grace Marie*.

The crew fished for the next 2 days, from sunrise to sunset, deploying the net off the stern several times, dragging the net along the sea floor, and retrieving it using winches. Once hauled, the catch was unloaded from the net onto the stern while the crew sorted and lowered the fish into the fish hold through the hatches and packed it in layers of ice. During daylight hours while fishing, the captain navigated the vessel from the wheelhouse while the crew worked on deck. At night, the six deckhands rotated through 1-hour navigation watches in the wheelhouse as the vessel traveled to new fishing grounds or drifted to conserve fuel. The captain said that the fishing was good on the trip, and in 2 days of fishing, the crew caught and loaded 70,000 pounds of redfish into the vessel’s fish hold, nearly reaching the vessel’s 80,000-pound capacity.

At 2035 on July 8, the crew had finished fishing for the day, and the captain turned the navigation watch over to one of the deckhands to begin a 10-mile transit to another location. The captain rested in his bunk while the remainder of the crew rested either in their bunks or the galley. About an hour later, as the vessel was approaching the new fishing location, the deckhand on watch woke the captain to take control of the vessel. Several minutes later, after the vessel had arrived at the new location, one of the deckhands (deckhand 1) entered the engine room and began his normal duty of lining up the fuel system and transferring fuel from one of the vessel’s storage tanks to a service tank that supplied the main engine and generators.

At 2150, an engine room bilge high-level sensor alarmed in the wheelhouse. The crew stated that an engine room bilge high-level alarm was normal while the vessel was underway and fishing. (Many of the vessel's accommodation sinks and deck drains fed into the engine room bilge. Any overflow from the fish hold and normal seawater leakage from the stuffing box would also accumulate in the engine room bilge.) The crewmembers told investigators that they would typically receive an alarm once per day; the alarm would normally clear after several minutes of pumping.

When the captain received the bilge alarm in the wheelhouse, he started one of the vessel's bilge pumps remotely. Deckhand 1, who was in the galley at the time of the bilge alarm, had just been in the forward end of the engine room transferring fuel. Following the casualty, he told investigators that he did not notice anything out of the ordinary while in the engine room, and he did not inspect the bilges at that time.

Ten minutes later, at 2200, the engine room high-high bilge alarm sounded in the wheelhouse. The captain recognized that this was not normal and immediately went to the engine room to investigate with deckhand 2. (By this time, deckhand 1, who had been previously transferring fuel, had assumed the navigation watch in the wheelhouse.) Both the captain and deckhand 2 observed water steadily rising in the engine room bilge, but neither could identify the source. The captain manually started two additional bilge pumps to increase the rate of dewatering, and he also closed the vessel's two seacocks to ensure that the water was not entering via a breach in the vessel's saltwater cooling or priming systems.² The water level continued to rise.

During this period, the vessel's propulsion and steering systems were operating normally. The engine room was the only space with an activated bilge alarm.

Once the water level in the bilge reached the propeller shaft, the captain instructed deckhand 2 to stop the main engine. Observing that the bilge pumps were not keeping up with the rising water level, the captain ordered the crew to prepare to abandon the vessel. Crewmembers woke those who were asleep, and all donned immersion suits. The captain and deckhand 2 retrieved the vessel's eight-person inflatable liferaft from its storage location on the bow. They launched and inflated the liferaft, and then tied it to the leeward side of the vessel, aft.

At 2210, the captain ordered deckhand 1 to broadcast a mayday call on VHF channel 16. The crew of the nearby fishing vessel *Dawn T*, which was about 2.5 miles

² A seacock is a fitting through the hull of a vessel, or close to it, with a valve that allows seawater to enter a piping system, such as for cooling an engine or for a saltwater faucet, or out of the vessel, such as for a cooling system overboard or sink drain.

away and within view, heard the mayday call, contacted the *Grace Marie* on the radio to confirm their emergency, and began making way toward the flooding vessel.

At 2221, upon the captain's order, all crewmembers from the *Grace Marie* abandoned the vessel directly into the liferaft. Within minutes, the *Dawn T* was on scene. Once the liferaft had drifted away from the abandoned *Grace Marie*, the *Dawn T* came alongside the raft. By 2234, all *Grace Marie* crewmembers were on board the *Dawn T*.

The captain of the *Grace Marie* attempted to communicate with the US Coast Guard from the *Dawn T*. The Coast Guard had heard the *Grace Marie*'s distress call, and after receiving the captain's follow-up communications via relay from a nearby vessel, the Coast Guard confirmed the *Grace Marie*'s situation and that its crewmembers were safe.

The *Dawn T* remained on station in view of the *Grace Marie*, which over time began to exhibit a starboard list. At 0048 on July 9, the crewmembers lost visual contact when the *Grace Marie*'s deck lights went out. The *Dawn T* then got underway for Gloucester.

At 0241, in a position close to where the crew abandoned the vessel, the *Grace Marie*'s float free, water-activated emergency position indicating radio beacon (EPIRB), which had been left on the vessel, activated. The Coast Guard received the EPIRB signal, and, at 0936, conducted an overflight of the last known position of the *Grace Marie* and the EPIRB coordinates, where they observed a 360-foot-by-150-foot oil sheen.

At 1220, the *Dawn T* arrived into port, and the *Grace Marie* crew disembarked. They reported no injuries. The *Grace Marie* was presumed to have sunk and was not salvaged. An underwater survey of the wreckage was not conducted. The *Grace Marie* was assessed as a total loss, valued at \$650,000.

1.3 Additional Information

1.3.1 Vessel Maintenance

The manager of a shipyard in Gloucester that had recently conducted repairs on the *Grace Marie* told investigators the vessel was in "better than fair condition" and that the vessel was "worked hard," but the owner spent money to keep it maintained. The vessel had been drydocked 4 months before the casualty to replace the propeller, but no hull maintenance was conducted. The vessel's most recent hull maintenance was in February 2021, when shipyard personnel hauled the vessel out of the water, scrubbed and painted the bottom, and replaced the sacrificial zincs.

In 2015, the *Grace Marie* was hauled out of the water and had its shaft replaced. The stern tube stuffing box packing was also renewed. The crew told investigators that it was normal for the stern tube stuffing box to leak some water through its packing gland, and it was regularly inspected. About 5 weeks before the casualty, the crew had added a piece of packing to the stuffing box, which they said was routine maintenance. As designed, the stuffing box would leak slightly to facilitate shaft lubrication and cooling of the seal, but the crew said there was no excessive leakage from the stern tube stuffing box leading up to the flooding.

The Coast Guard last conducted a dockside safety examination of the *Grace Marie* in August 2020. Under the Coast Guard Authorization Act of 2010, commercial fishing vessel safety examinations are required once every 5 years for fishing vessels that operate 3 nautical miles beyond the baseline. These safety examinations help ensure that all the required safety equipment and systems on board are in serviceable condition; examinations do not include the hull, electrical systems, or machinery as required for Coast Guard-inspected vessels. The Coast Guard tested all bilge alarms and found them to be in satisfactory working condition and noted no other deficiencies. As a result, the Coast Guard issued the *Grace Marie* a commercial fishing vessel safety decal.

In 2018, a marine surveyor conducted a condition and valuation survey, which included a bottom survey of the vessel. The marine surveyor's inspection report indicated that the vessel's hull was constructed of a 1/4-inch welded steel plate with 3/8-inch steel doubler plates installed along each side of the keel.³ The vessel owner said that he had the doubler plates welded onto the vessel 8-10 years before the casualty because the material condition of the hull in that area was "a little spotty." When describing the location of the installed doubler plating on the *Grace Marie*, the captain said that "under the engine room, it was all [doubler] plate." The marine surveyor indicated in the 2018 bottom survey report that the "hull was found to be in overall good condition for a vessel of its age with no damages, no blisters or electrolysis observed."

Uninspected commercial fishing vessels such as the *Grace Marie* are permitted to use doubler plating for both temporary and permanent repairs. The Coast Guard has longstanding general guidance to the marine industry and Coast Guard inspectors regarding steel repairs for vessels. Regarding the use of doubler plating:

Doublers may properly be used to provide local reinforcement at hatch corners, overboard discharges, seachests, mast or kingpost foundations, etc... Additionally, where doublers have been used, they tend to proliferate as randomly placed patches which often serve only to cover

³ A *doubler plate* is a small piece of plate that is attached to a larger area, to provide strengthening in that location.

up the deficiencies which would otherwise indicate the true condition of the hull.⁴

The Coast Guard further stated in guidance to the towing vessel industry on the use of doubler plates:

A doubler plate repair can lead to increased stress concentrated in the area of the repair. In such instances, rather than relieve the stress, the repair can exacerbate the original problem and create a situation of greater risk to the vessel (such as continued crack propagation). Additionally, a patchwork of doubler plates inhibits the ability to assess the true condition of the hull and may compromise the original strength of the steel.⁵

In general, for welded constructed vessels, the Coast Guard recommends cutting back (cropping out) any existing wasted steel plate on the hull to good material and inserting new plating in its place (instead of covering the wasted plate with a doubler plate).

2 Analysis

While the captain was navigating the *Grace Marie* from the wheelhouse, the engine room bilge high and high-high level alarms sounded. After investigating in the engine room, the captain and deckhand 2 noticed the seawater level rising quickly and uncontrollably in the engine room bilge. To determine the source of the flooding and slow or stop the inrush of water, the captain secured the seacocks and started all available bilge pumps. Unable to stem the rising water level in the bilge, he ordered his crew to don immersion suits and broadcast a mayday call while he and another crewmember readied the liferaft. After they completed preparations, the captain ordered all crewmembers to abandon the vessel. The captain's early, quick, and effective decision-making led to the successful abandonment of the vessel by all crewmembers—without having to enter the water or sustaining injuries—and their prompt rescue by the Good Samaritan vessel *Dawn T*.

The precise cause of the flooding aboard the *Grace Marie* that ultimately led to its sinking could not be determined. The vessel was not salvaged, nor was an underwater survey of the wreck conducted. However, high and high-high bilge level alarms indicated the flooding began in the engine room, as bilge alarms in the

⁴ Coast Guard, "Navigation and Vessel Inspection Circular No. 7-68," (October 28, 1968), [NVIC 7-68, 28Oct1968 \(uscg.mil\)](#)

⁵ Coast Guard, CG-CVC Policy Letter 21-03, "Guidance Concerning the use of Doubler Plates for Repairs Involving Towing Vessels Subject to 46 CFR Subchapter M," (May 19, 2021), [Directive \(uscg.mil\)](#)

lazarette and fish hold did not activate while the crewmembers were on board the vessel. Therefore, it is unlikely those spaces were the source of the initial flooding. Also, it is unlikely that a problem with the vessel's running gear, such as a shaft failure, contributed to the initial flooding because the vessel was still able to navigate with propulsion and steering during the early stages of flooding. Deckhand 1, who was transferring fuel in the forward part of the engine room shortly before the engine room bilge alarm sounded, did not notice anything out of the ordinary. Both the captain and deckhand 2, while investigating the source of water in the engine room bilge, witnessed the water level in the bilge "rising fast," but could not pinpoint where the water was coming from.

Potential sources of flooding included: (1) a failed stern tube due to material fatigue and (2) a packing failure in the stuffing box. Water flooding into the vessel from either of these two locations would not have been visible to the captain and deckhand 2 while they were investigating the source of the rising water. In addition, depending on the level of failure, flooding from either location could cause the water level in the bilge to rise rapidly. However, these two flooding sources are unlikely because crewmembers regularly inspected the stern tube and stuffing box and did not observe anything concerning.

A more likely source of flooding is a hull failure under the engine room. The hull plating under the engine room could not be inspected visually unless the vessel was drydocked. Internally, the bilge under the main engine and other equipment would not have been easily visible to the captain and deckhand 2 while they investigated the source of the flooding, and due to floodwater, the bilge may not have been visible at all.

The external area of the hull along the keel and under the engine room was covered with steel doubler plating that had been installed 8-10 years before the vessel sank to cover and reinforce areas of deteriorated steel. It is common for uninspected commercial fishing vessels such as the *Grace Marie* to use doubler plating as a means of repairing and reinforcing damaged or wasted underwater hull sections. However, doubler plate repair can lead to increased stress concentrated in the area of the repair, doubler plates are not suitable as a permanent repair for sections of the hull, and the use of doubler plating inhibits the ability to assess the true condition of the hull.

3 Conclusions

3.1 Probable Cause

The National Transportation Safety Board determines that the probable cause of the flooding and sinking of fishing vessel *Grace Marie* was uncontrolled flooding of the engine room from an undetermined source, likely a failure of the doubler-plated hull below the engine room.

3.2 Lessons Learned

Using Doubler Plates for Hull Repairs

Although doubler plating can be used as a temporary repair solution, it is not generally suitable as a permanent repair for a vessel's hull. Vessel owners should crop out wasted steel on the hull and replace it by inserting new plating instead of covering it up with doubler plating.

Vessel	<i>Grace Marie</i>
Type	Fishing (Fishing vessel)
Owner/Operator	AGV Company Ltd. (Commercial)
Flag	United States
Port of registry	Gloucester, Massachusetts
Year built	1978
Official number (US)	591608
IMO number	7908366
Classification society	N/A
Length (overall)	65.3 ft (19.9 m)
Breadth (max.)	21.0 ft (6.4 m)
Draft (casualty)	8.2 ft (2.5 m)
Tonnage	117 GRT
Engine power; manufacturer	1 x 565 hp (421 kW); Caterpillar D 379 diesel engine

NTSB investigators worked closely with our counterparts from **Coast Guard Sector Boston and Coast Guard Station Gloucester** throughout this investigation.

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For more detailed background information on this report, visit the NTSB investigations website and search for NTSB accident ID DCA22FM027. Recent publications are available in their entirety on the NTSB website. Other information about available publications also may be obtained from the website or by contacting—

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