National Transportation Safety Board

Marine Accident Brief

Capsizing and Sinking of Fishing Vessel *Hawaii Five-1*

Accident no.	DCA16FM007
Vessel name	*Hawaii Five-1*
Accident type	Capsizing and subsequent sinking
Location	Gulf of Mexico, 161 miles* northeast of Cozumel, Mexico 23°20.5'N, 87°16.8'W
Date	November 25, 2015
Time	1158 central standard time (coordinated universal time – 6 hours)
Injuries	None reported
Damage	Loss of vessel, estimated at greater than $500,000
Environmental damage	Potential release of about 14,000 gallons of diesel fuel and an unknown quantity of lube oil on board; some floating debris noted in vicinity of sinking location
Weather	Seas 7–9 feet with whitecaps, swells from the west-southwest, winds 25 knots from the east, visibility 4–7 miles, air temperature 76° F, water temperature 81° F
Waterway information	South central Gulf of Mexico

On November 25, 2015, at 1158, the uninspected fishing vessel *Hawaii Five-1*, en route to Honolulu, Hawaii, from Bayou La Batre, Alabama, capsized and subsequently sank in the Gulf of Mexico just north of the Straits of Yucatan. The two crewmembers, a captain and a deckhand, managed to board a liferaft and were rescued by the Coast Guard later that night. The crew reported minor injuries associated with the accident.

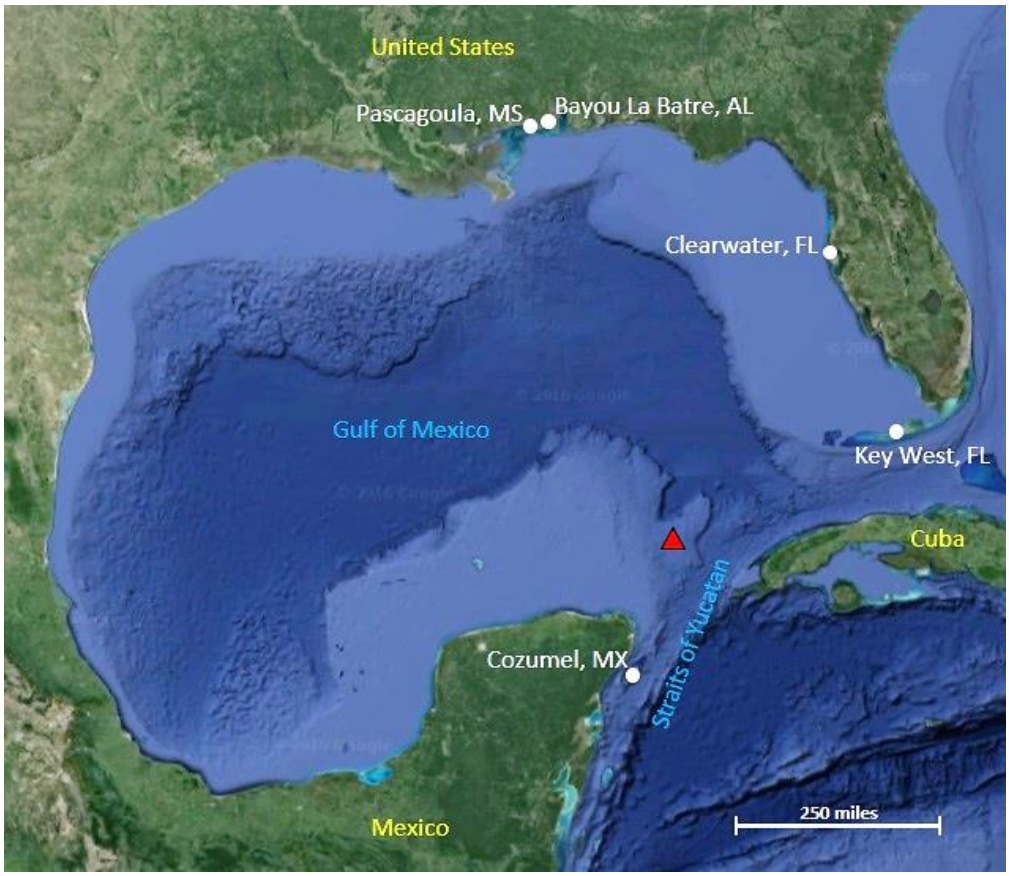
Side profile of *Hawaii Five-1* taken after the conversion at the shipyard located in Pascagoula, Mississippi. (Photo by C. E. Collier & Associates, Incorporated)

* Unless otherwise noted, all miles in this report are nautical miles (1.15 statute miles).

Note: This report was reissued on April 3, 2017, with corrections to page 7.

Accident Events

The uninspected fishing vessel *Hawaii Five-1* was originally constructed in 1973 at Davis Shipbuilding in Freeport, Texas, as a 71-foot-long, 114-gross-ton, welded-steel beam trawler outfitted for shrimp fishing**.** The vessel was originally named the *Ethel O*, then underwent a series of name changes (*Little Mike*, *Capt Jimbo*, and *Miss Kristi M*) until the current owners and their operating company, Sea Devil, LLC, renamed the vessel *Hawaii Five-1* in July 2015.



Satellite image of the Gulf of Mexico with the approximate location of the capsizing and subsequent sinking marked by a red triangle. (Background by Google Earth)

In March 2015, the *Hawaii Five-1* began an extensive conversion at South Marine Systems shipyard in Pascagoula, Mississippi, to prepare it for service in the Hawaii-based longline fishery. The conversion work was managed by one of the vessel owners and included removing the boom trawl systems and replacing an estimated 60–70 percent of the hull plating, as well as a significant amount of deck plating, internal framing, and bulkhead plating. Additionally, a new deckhouse, stern house, and bulbous bow were constructed and installed. According to photographs of the conversion, the modified deckhouse was asymmetrically placed on the deck. The aft port side of the deckhouse was flush with the port bulwarks, whereas the aft starboard side of the deckhouse was open between the bulwarks to create a walkway. The vessel's mechanical and electrical systems (including electrical wiring, cables, propulsion, bilge pump and manifold, and steering) were repaired, renovated, or upgraded. These modifications to the vessel were made without plans and without oversight or input from a marine engineer or naval architect. There was no evaluation performed to determine the vessel's overall full range of stability. On October 26, 2015, a marine surveyor based in Alabama conducted a condition and valuation survey, which concluded that the vessel's estimated value was more than $1 million.

Image of *Hawaii Five-1* before the conversion, when the vessel was known as *Miss Kristi M*. (Photo by Clarence Chavers, 2010)

In early November, the conversion work was completed and the vessel departed South Marine Systems shipyard for sea trials, which were limited in scope and performed in calm waters on the Pascagoula River and Pascagoula Sound. The captain and the owner who had overseen the conversion had no concerns with the vessel's stability or seakeeping resulting from the sea trials. However, only the vessel's initial stability—its resistance to small changes in the forces acting on it—was observed, and this only "by feel" with the vessel heeling very little.

After the sea trails, the vessel fueled up and then moved to LaForce shipyard in Bayou La Batre for final preparation and provisioning. At LaForce shipyard, the vessel was provisioned with lube oil, food, water, and other supplies for the transit to Honolulu. It was not outfitted for fishing, as the owners intended to equip the vessel with fishing gear once it arrived in Hawaii. The exact vessel tank capacities are unknown, but it was reported to investigators that the vessel had four fuel tanks integrated with the hull with a combined total capacity of 15,000 gallons, one hydraulic oil tank with a capacity of 450 gallons, three potable water tanks which were also integrated with the hull with a combined total capacity of 6,000 gallons, and a potable water tank for an ice maker with a capacity of 400 gallons. The captain estimated that he departed with about 15,000 gallons of fuel.

When interviewed, the vessel owner who had overseen the conversion said that he had stored and secured steel plates, a tool box with handheld power tools, a nose cone, and a portable welding unit onto the overhead deck of the vessel accommodation space. The owner estimated that the diesel-powered welding unit weighed between 800 and 1,100 lbs. The steel plates were 8 feet wide, 10 feet long, and 0.25 inch thick, and the owner estimated that each plate weighed roughly 1,215 pounds. The owner told investigators that there were only two steel plates on the

overhead, but the vessel captain stated that there were five to six plates. The exact number of steel plates and the total added weight of all items stored on the overhead could not be determined with accuracy.

On Sunday, November 22, about 1430, the *Hawaii Five-1* departed Bayou La Batre en route to Honolulu with the captain and deckhand on board. The captain's intended route was to navigate the vessel southwesterly in the Gulf of Mexico, through the Straits of Yucatan, and then through the Panama Canal to the Pacific Ocean. According to the captain, he and the deckhand changed watch in the wheelhouse as necessary to get rest or to take a break, and the transit was uneventful until Tuesday, November 24. At that point, the vessel was beyond the 500-fathom curve and began to encounter rougher seas.

The captain told investigators that the owner had assured him that everything on deck had been secured before the vessel got under way; however, the vessel's movement in the rough sea state began to cause appliances and other unsecured items in the galley and accommodation space to shift position. The captain and the deckhand made several attempts to secure these items with line, bungee cords, and other hardware on board, but their efforts were unsuccessful.

The captain became concerned about the *Hawaii Five-1*'s sea handling characteristics, specifically the vessel's tendency to slowly recover to an upright position from a roll to either port or starboard. He considered seeking refuge to investigate the problem but elected to proceed onward toward Panama.

On the morning of Wednesday, November 25, as the *Hawaii Five-1* continued on a southwesterly course, the vessel began to experience even heavier seas. The captain attributed this to winds, estimated at 15–20 knots from the northwest, and the powerful Yucatan current, which caused the vessel's speed over ground to drop from about 8.3 knots to 4.8 knots. The captain stated that he started to feel apprehensive about the vessel's lack of responsiveness to rolling caused by the winds and waves. As a result of the high seas, the steel plates that had been secured on the overhead began sliding around and the *Hawaii Five-1* heeled over for longer durations than the captain had previously noted. After contacting both the owner in Pascagoula and another owner in Honolulu using the vessel's satellite telephone system, the captain decided to return to Bayou La Batre.

The captain told investigators that, after changing course to a generally northwest heading, the seas were "sloppy," with estimated wave heights of 8 feet from the west-northwest. The Yucatan current was now pushing the vessel from the stern, causing the vessel's speed to increase to between 9.3 and 10.1 knots. The captain said that he reduced the engine rpms to slow the forward speed to between 8.3 and 8.5 knots. Shortly thereafter, about 1158, the captain called the Coast Guard using the vessel's satellite telephone; the call was routed to the Eighth Coast Guard District's Command Center in New Orleans, Louisiana. While the captain was on the phone, the vessel heeled significantly to port, rolled over to the point where the main deck was submerged, and then capsized. The captain told investigators that at the time of the call, he had the portside watertight door to the wheelhouse open so that he could see better. The starboard-side watertight door was closed.

The captain and the deckhand managed to escape from the sinking *Hawaii Five-1*. Both of the vessel's 10-person inflatable liferafts deployed automatically as the vessel sank, but the captain stated that one of the rafts was destroyed by contact with the hull before the vessel submerged completely. He and the deckhand swam about 200 yards and entered the remaining liferaft. The vessel's emergency position indicating radio beacon (EPIRB), which was mounted

on the overhead of the wheelhouse and featured a hydrostatic release, also deployed when the vessel sank. It began transmitting a 406-MHz emergency distress signal, which was received by the Coast Guard.

The Coast Guard launched an HC-130H fixed-wing aircraft and an MH-60T helicopter from the Clearwater, Florida, air station. The Key West, Florida-based Coast Guard cutter *Charles David Jr* got under way as well and proceeded toward the accident location. Two commercial vessels operating in the area, the *UACC Falcon* and the *Adventure*, diverted from their respective voyage plans and began to navigate toward the last known position of the *Hawaii Five-1*.

About 1806, the Coast Guard helicopter arrived on scene, deployed a rescue swimmer, and began hoist operations to retrieve the captain and the deckhand from the liferaft. The helicopter transported them to Key West International Airport, where they arrived about 2140. Both men were met by emergency medical services for subsequent transport to the Lower Keys Medical Center. Each was treated for symptoms of mild hypothermia. Alcohol and drug testing was not performed on either the captain or the deckhand.

The exact position where the vessel came to rest on the seafloor is unknown. With the vessel lost, the status of the hull and the navigational, mechanical, propulsion, steering, and other vital systems on board the *Hawaii Five-1* could not be determined. The captain stated, however, that all systems were operational before the sinking. He also said that, before the capsizing, there was no water in the engine room, no leaks were observed, and the crew had not needed to run the bilge pumps.

Stability

Stability may be defined as the tendency of a vessel to return to its original upright position after being heeled over by any combination of external forces such as wind, waves, or fishing operations. A vessel's hull shape and loading may act to right the vessel. While under way, a vessel's stability is always changing due to internal forces that may develop from shifting loads, the movement of ballast water, and/or the use of consumable fluids such as fuel or potable water. A vessel is considered to be unstable when it has an inadequate ability to counter any combination of these external and internal forces and cannot return to its upright position.

The two predominant forces that act on a vessel and provide stability are gravity, the force that pushes the vessel down into the water, and buoyancy, the force that pushes the vessel up in the water. Both can be mathematically calculated and combined into single points, respectively called the center of gravity and the center of buoyancy. For vessels that have positive stability, the center of gravity is located directly above the center of buoyancy when in calm waters without wind or other external forces acting on the vessel. Depending on sea conditions, winds, and other factors, both the center of gravity and the center of buoyancy can temporarily shift in an outboard direction. If the vessel's center of buoyancy shifts farther outboard than the center of gravity, the force of buoyancy will push the vessel back to its upright position. However, if the center of gravity shifts farther outboard than the center of buoyancy, the vessel will continue to roll past its limit of positive stability and subsequently capsize.

A vessel's overall stability range, which is critical in heavy seas, is defined as the number of degrees between its upright position and the angle of heel at which the vessel will capsize. This range cannot be accurately assessed through observation alone and must be calculated. The *Hawaii Five-1* had no stability calculation performed and no inclining experiment that would have determined the vessel's center of gravity and displacement. Per existing regulations,

commercial fishing vessels less than 79 feet in length, such as the *Hawaii Five-1*, were not required to have a stability test or calculations performed.

When a vessel stows cargo or gear on the uppermost deck, the added weight makes the vessel less stable because the high load raises the center of gravity. When vessels with originally adequate stability have the height of their center of gravity substantially increased by stowing proportionally large weights (compared to their displacement) of cargo or gear on high decks, they will begin to have less resistance when rolling to port or starboard. In this condition, when the vessel does experience a roll, it will have a larger angle of heel for a longer period of time and can capsize if the center of gravity shifts farther outboard than the center of buoyancy. This likely was the case for the *Hawaii Five-1*. The storage of heavy equipment and steel plates above the accommodation spaces certainly did nothing to improve the stability of the vessel. The asymmetry of the deckhouse also likely impacted stability, as this type of design does not allow for proper drainage, and therefore the vessel would not be able to drain water effectively off the deck.

Based on the two survivors' accounts, the *Hawaii Five-1* began exhibiting significant signs of instability well before the actual capsizing. The captain, although concerned about the situation, took no appreciable action to address the instability or lessen the risk of capsizing. Actions such as reducing speed, turning directly into the seas to decrease the vessel's motion, or attempting to re-secure or jettison the cargo that had been placed on the upper deck may have individually or collectively improved the vessel's stability. Additionally, despite the captain's stated concern about the vessel's poor responsiveness when rolling, he did not close the watertight door on the port side of the wheelhouse, which would have served to stop boarding seas and may have slowed the final sinking of the vessel.

The National Transportation Safety Board (NTSB) has advocated that senior crewmembers on fishing vessels should have a general awareness of the principles of stability and that each crewmember on board should be properly prepared and trained to take measures to reduce the adverse effects of all potential emergency situations. Additionally, owners and operators of fishing vessels should consult with qualified professionals to determine a vessel's overall full range of stability and its suitability for the intended service. In the case of the owners and the captain of the *Hawaii Five-1*, the concepts of prudent seamanship, stability, and watertight integrity were either not fully understood or they were ignored.

Probable Cause

The National Transportation Safety Board determines that the probable cause of the capsizing and sinking of fishing vessel *Hawaii Five-1* was inadequate intact stability due to the owners' failure to determine and mitigate the impacts that the conversion to longline fisheries services had on the vessel's overall stability. Contributing to the loss of the vessel was the master's insufficient understanding of stability principles, as demonstrated by his lack of action to improve the vessel's stability during adverse sea conditions, and his failure to maintain watertight integrity.

Vessel Particulars

Vessel	*Hawaii Five-1*
Owner/operator	Sea Devil, LLC
Port of registry	Honolulu, Hawaii
Flag	United States
Type	Uninspected fishing vessel
Year built	1973, retrofitted in 2015 for longline fisheries
Official number (US)	553103
IMO number	7520396
Construction	Welded steel
Length	71 ft 0 in (21.6 m)
Depth	12 ft 0 in (3.7 m)
Beam/width	22 ft 0 in (6.7 m)
Gross and/or ITC tonnage	114 gross tons; 77 net tons
Engine power; manufacturer	540 hp (403 kW); Caterpillar Model 3412
Persons on board	2

For more details about this accident, visit www.ntsb.gov and search for NTSB accident ID DCA16LM007.

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NTSB investigators worked closely with our counterparts from Coast Guard Sector Mobile throughout this investigation.