

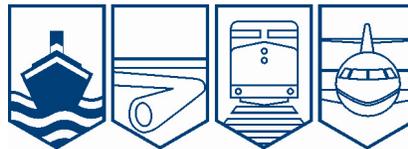
Transportation Safety Board  
of Canada



Bureau de la sécurité des transports  
du Canada

## MARINE INVESTIGATION REPORT

M06W0039



### SINKING AND LOSS OF LIFE

SMALL FISHING VESSEL *B.C. SAFARI*  
NEAR QUALICUM BEACH, BRITISH COLUMBIA  
08 MARCH 2006

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 Investigation Report

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### *Summary*

At about 1713 on the evening of 08 March 2006, the fishing vessel *B.C. Safari* was making way in the Strait of Georgia between Deep Bay and French Creek, British Columbia, when it capsized and sank. The master, who was the lone operator, is missing and presumed drowned.

Ce rapport est également disponible en français.

## *Other Factual Information*

### *Particulars of the Vessel*

Name of Vessel	<i>B.C. Safari</i>
Official No./Fishing Licence No.	344771/91308
Port of Registry	Prince Rupert, B.C.
Flag	Canada
Type	Licensed fishing vessel operating as a fish packer
Gross Tonnage	62.75
Length <sup>1</sup>	17.71 m
Draft	Forward: 0.8 m Aft: 2 m
Built	1972
Material	Wood
Propulsion	One 242 kW (325 BHP) diesel engine driving a single fixed-pitch propeller
Cargo	Herring
Crew	4
Registered Owner(s)	Private owner

### *Vessel Description*

The *B.C. Safari* was a small, wooden fishing vessel of closed construction. Below the main deck were crew quarters in the forward section of the vessel followed by the engine room with built-in fuel tanks port and starboard. Located just aft of the engine room were two insulated fish holds, number 1 (port), and number 2 (starboard), followed by the number 3 hold which ran athwartships. This was followed by a void space and a lazarette where the steering gear and two fresh water tanks were located. Drainage piping led forward from the lazarette under the fish holds to the engine room bilges.

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<sup>1</sup> Units of measurement in this report conform to International Maritime Organization standards or, where there is no such standard, are expressed in the International System of Units.

On the main deck forward was a superstructure with an enclosed wheelhouse and steering station. One set of stairs led from the rear of the wheelhouse up to the boat deck and another led down to a starboard side companionway on the main deck. From here, a fixed ladder provided access to the engine room below, and a hinged door provided access to the starboard exterior deck.

Abaft the superstructure was the main working deck with three raised hatch coamings and a net drum on the centreline. An aluminum tilt ramp extending approximately 2 m beyond the stern was attached to the fir timbers. The *B.C. Safari* was originally built for salmon seining, but at the time of the accident it was being used as a fish packer to transport herring from the fishing grounds to another vessel that would then be used to transport the fish product to a processing plant on shore.



**Photo 1.** The *B.C. Safari*

### *History of the Voyage*

From March 2005 until February 2006, the *B.C. Safari* was laid up at a shipyard on the Fraser River in Richmond, British Columbia. During that time, the propeller shaft packing gland was loosened and re-tightened during a scheduled Transport Canada (TC) safety inspection of the vessel's propeller shaft. Also during those 11 months, some waterline hull planks were renewed and some plank seams below the waterline were resealed.

The vessel left the shipyard on February 26 and, within hours, excessive water was discovered entering the hull through the tail shaft packing gland, which was located beneath the number 3 fish hold and only accessible from there. The gland was again re-tightened just before 14 tons of

ice was loaded into the three holds, 2.5 tons of which went into hold number 3, with the remainder distributed equally between hold numbers 1 and 2. At this time, the vessel had approximately 0.75 m of freeboard.<sup>2</sup>

The following day, February 27, the vessel proceeded to the fishing grounds. No steps were taken to verify its operational readiness following the repairs and adjustments that were made during the previous 11 months.

The vessel, with a crew of three including the master, left the Fraser River to cross the Strait of Georgia but returned within hours after encountering gale-force southeast winds and steep waves. During this short voyage, the lazarette's high-water bilge alarm sounded and the engine room bilges were found to be nearly full of seawater.

On February 28, the vessel crossed the Strait of Georgia without incident, arriving at French Creek, B.C., at about 1700.<sup>3</sup> During the crossing, the lazarette's high-water bilge alarm sounded several times and water was pumped overboard from the engine room bilges where it had accumulated after flowing forward from the lazarette and/or the packing gland under the number 3 fish hold. At some time during the voyage, the float switch for the lazarette's high-water bilge alarm was raised so that it would activate less frequently. The engine room bilges needed to be pumped out at regular four or five hour intervals from the time the vessel left the Fraser River on February 27 until the day of the capsizing, March 8. Otherwise, bilge water would rise above the engine room deck plating.

On March 4, the vessel moved 16 miles west of French Creek to Deep Bay, where a fourth crew member joined the vessel. On March 5, the anticipated gillnet herring fishery began. The fishing operation involved the use of an aluminum punt as a platform from which to launch herring nets. When fish were hauled aboard the punt, they were transferred to the *B.C. Safari* and stowed in the holds. Fishing continued in this manner for three days until March 8 when the master became concerned that the quality of the fish on board might suffer due to their age and the fact that the fish hold ice used to preserve the fish had mostly melted.

He decided to take advantage of improving weather conditions between storms to transport the vessel's 22 tons of herring to a fish packer anchored near French Creek. He told the three crew members to continue fishing from the punt while he operated the vessel by himself during an anticipated three-hour voyage to deliver the herring. The three holds were hastily pressed up with seawater,<sup>4</sup> and the hatch covers were fitted but not secured. In this condition, the main deck was awash with seawater shipped through the freeing ports and when moving ahead the depth of water on the deck increased.

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<sup>2</sup> Freeboard is the distance between the waterline and the lowest continuous watertight deck. It is an important factor in assessing a vessel's transverse stability.

<sup>3</sup> All times are Pacific standard time (Coordinated Universal Time minus eight hours).

<sup>4</sup> Partially-filled holds allow their liquid contents to move about, resulting in a condition known as "free surface" which has a strong negative impact on a vessel's positive stability characteristics and is considered very dangerous. Completely filling the holds ("pressing them up") or completely emptying them eliminates free surface.

The vessel departed Deep Bay at about 1455. The engine room bilges had been pumped out approximately two hours previously. The boom was left raised at an angle of approximately 45° and slewed slightly to port.

At approximately 1700, the master made a cellular telephone call to the vessel's owner ashore asking how to operate the engine room's hydraulic bilge pumping system. At 1713, the master made a distress call on very high frequency (VHF) channel 16 during which he reported his vessel's position relative to French Creek. He told a Marine Communications and Traffic Services (MCTS) officer in Comox, B.C. that the vessel was rapidly taking on water and that he planned to abandon ship immediately. Attempts by MCTS to communicate further with the *B.C. Safari* were unsuccessful.

In the last minutes of being upright, the *B.C. Safari* altered course abruptly to port then turned to starboard until the vessel was on a westerly heading to windward. Moments later it capsized to port and quickly sank.

### *Vessel Certification*

The *B.C. Safari* was subject to a regular four-year inspection by TC Marine Safety. The vessel had completed an inspection in December 2005 and had been issued a safety inspection certificate (SIC 29) allowing it to conduct commercial fishing-related operations on the Pacific coast up to 20 miles off shore and as far south as Portland, Oregon. The SIC was valid until 18 December 2009.

### *Personnel Certification and Experience*

The master had been issued a Fishing Master IV certificate by TC in December 2000 that was valid until December 2005. He had over 25 years of experience as a fisherman and boat handler, and had been the master on the *B.C. Safari* for 10 annual herring seasons.

The engineer had five years of experience on various fishing vessels and had been the engineer on the *B.C. Safari* during the 2005 herring season. He did not hold any TC certification, nor was this required.

Each of the two deckhands had over 20 years of fishing experience. Neither held TC certification, nor was this required.

The master and one deckhand had received MED (marine emergency duties) training. The engineer and other deckhand had not, nor were they required to do so.

### *Vessel Loading Characteristics*

The *B.C. Safari* had 22 tons of herring on board at the time of the occurrence, 10 tons in each of hold numbers 1 and 2, and the remaining 2 tons in hold number 3. Some ice also remained in each hold, all three of which were topped up with seawater immediately before the vessel departed for French Creek on March 8.

## *Bilge Pumping System*

An electric and a hydraulic bilge pump were located in the engine room, along with an additional electric pump in the propeller shaft log. An electric bilge pump was installed in the lazarette, but was not in operational condition either before or after the extended layup. Port and starboard drain pipes were fitted in the lazarette that allowed seawater to drain forward beneath the three fish holds to the engine room bilge where it could be pumped overboard.

## *Vessel's Stern Construction*

The vessel's stern was composed of horizontal rows of individual fir timbers that, when fitted atop each other, formed what is known as a "timbered stern." Seams that have remained above the waterline for an extended period of time and are then submerged due to a lowering of a vessel's freeboard are wide enough to allow water to pass through them and into the hull's interior. Over a period of hours or days of being submerged, the timbers swell so that sealing compounds (which are inserted in the seams at an earlier date) come together to form a watertight seal. The shrinking and swelling characteristic of timbered sterns is common knowledge among owners and operators of wooden vessels. Extra pumping is usually required and pumps are made ready to discharge the expected increase flowing through the seams.

## *Shipyard Repairs and Inspection during Layup*

The vessel was used as a fish packer for one month in 2005. During the remainder of that year, shipyard workers replaced several starboard-quarter hull planks at the waterline and re-caulked seams of planks below the waterline and around the stern post. The tail shaft, rudder, and sea connections were removed and later replaced as part of a scheduled TC inspection procedure.

## *Weather*

Environment Canada reports indicate that at 1605 on March 8 the wind speed in the Strait of Georgia was 2 knots from the south. By 1700—about the time the master called the owner for instructions on how to operate the engine room's hydraulic bilge pumping system—winds had increased to 21 knots from the west. Wave heights were 1-2 m.

## *Search and Rescue Efforts*

Approximately one minute after the master's distress call, MCTS Comox informed Joint Rescue Coordination Centre Victoria, which tasked the Canadian Coast Guard (CCG) auxiliary vessel *French Creek 1* to proceed to the *B.C. Safari's* last known position and search for survivors. Also tasked were two fishing vessels, one of which was the first to arrive on scene at 1727, 14 minutes after the distress call was made. A search and rescue Cormorant helicopter stationed in Comox joined the search as did the CCG cutter *Cape Cockburn* and the CCG hovercraft *Siyay*. The search continued until approximately 0120 on the morning of March 9. Neither the master nor the vessel was found.

On 11 April 2006, the Royal Canadian Mounted Police and the Department of Fisheries and Oceans deployed a remotely-operated vehicle that was able to locate the sunken vessel but not the master. The vessel remains sunk near its last reported position.

## *Analysis*

### *Verification of Operational Readiness*

It is good practice for crews to establish a vessel's operational readiness following a long layup. Although not mandatory, and dependant upon the extent of any modifications, this practice allows operators to evaluate performance and stability characteristics and to assess any recent repairs. In this instance, despite the 11-month layup, the lazarette bilge pump was neither repaired nor replaced. It therefore remained non-functional despite the expectation that seawater would likely be entering that compartment when the vessel returned to service.

No attempt was made to verify:

- that the tail shaft packing gland was sufficiently tightened;
- that the seams of the newly-replaced hull planks were watertight; or
- that the bilge-pumping system was adequate to handle the expected quantity of water ingress into the lazarette through the seams of the timbered stern.

Even after the packing gland was discovered to be leaking in the hours immediately following the vessel's departure from the shipyard, no evaluation was carried out. Instead, the gland was re-tightened and 2.5 tons of ice was immediately added to the number 3 hold, thus prohibiting further access and making it impossible to monitor the effectiveness of the re-tightening procedure under normal operating conditions.

### *Watertightness of a Timbered Stern*

In this occurrence, the *B.C. Safari* left the shipyard after an 11-month layup, loaded a total of 14 tons of ice into the three fish holds, and proceeded to the fishing grounds the following day while still possessing significant freeboard. It was not until March 8, when the vessel also had 22 tons of herring and its fish holds had been pressed up with seawater, that the stern became fully submerged.

When that occurred, the volume of water likely entering the lazarette through the unsealed seams would have exceeded the capacity of the drains to move all of it forward to the engine room, particularly with the lazarette bilge pump not working. Consequently, free-surface effects would have developed in the lazarette and engine room. Seawater partially retained on the main deck would have resulted in additional free surface. Together, the existence of below-deck and on-deck free surface would have significantly reduced the vessel's positive stability characteristics and its ability to remain upright.

### *Decision to Sail Alone*

By sailing alone, the master took it upon himself to perform multiple roles. His navigational duties, for instance, required him to remain in the wheelhouse, but left him unable to monitor and confirm the condition of the below-deck compartments.

In addition, he was not familiar with how to operate the engine room's hydraulic bilge-pumping system. Although this was not an issue when there was an engineer on board, it became crucial when the vessel was taking on water and there was no effective way to dispel it.

Once the master became aware that the water was rising in the engine room and lazarette – an awareness likely delayed by the earlier ad hoc adjustment of the float switch for the lazarette's high-water bilge alarm – he telephoned the vessel's owner requesting pumping instructions. However, by the time they had finished speaking, the *B.C. Safari's* positive stability characteristics had been so reduced that there was imminent danger of it capsizing. The master had no time to take any safety action other than to make a distress call. During the call, he reported that he intended to abandon the vessel immediately.

### *Failure to Properly Secure Deck Equipment Prior to Departure*

On March 8, relatively calm seas and concerns as to the effect of the dwindling ice supply in the holds made the master eager to begin the voyage to French Creek. In the haste to depart, the hatch covers were not secured. It is likely they became dislodged when the vessel turned sharply to port and then to starboard just prior to capsizing. This would have caused water to flow out of the fish holds, producing increased free-surface effects and negatively affecting vessel stability.

In addition, the boom was left raised above the working deck at an estimated angle of 45° and slewed slightly to port. Had the boom been lowered and secured to the centreline of the net drum before leaving Deep Bay, the vessel's centre of gravity would have been lowered, offering improved stability. Instead, the raised boom negatively affected stability at a time when it would have been prudent to keep the centre of gravity as low as possible.

Both of these actions – failing to secure hatch covers and leaving the boom unsecured – negatively impact the stability of a vessel.

### *Knowledge of Stability*

The stability characteristics of fishing vessels are apt to change often and substantially due to the frequency with which nets, traps, or lines are deployed from the vessel into the sea and then hauled back aboard along with various quantities of fish product.

On a longer term basis, stability characteristics may change as fishing gear and equipment are added, removed, or relocated in an attempt to maximize catch levels while conforming to government fishing and safety regulations.

It is therefore in the best interest of fishing vessel owners and operators to acquire training to understand which factors affect their own vessels' stability and to then take whatever actions are necessary for their vessels to remain safely upright in all conditions likely to be encountered.

It has been shown in past occurrences that adequate knowledge of vessel stability and stability related information is critical to the safe operation of fishing vessels. In its investigation into the capsizing of the small fishing vessel *Cap Rouge II* (TSB report M02W0147), the Board found that

limited knowledge of basic principles of trim and stability on the part of those onboard contributed to that occurrence. Similarly, in its investigation into the capsizing of the small fishing vessel *Ryan's Commander* (TSB report M04N0086), the Board found that not having an adequate knowledge of vessel stability information, on the part of owner and master, had serious adverse consequences when making decisions pertaining to safe operating conditions.

## *Findings as to Causes and Contributing Factors*

1. The combined effect of the raised boom and the uncontrolled accumulation of water both on and under deck contributed to a significant loss of positive stability, causing the vessel to quickly capsize and sink.
2. The seams of the timbered stern allowed uncontrolled quantities of seawater to flow into the lazarette and engine room bilges, significantly reducing the vessel's positive stability.
3. The absence of additional crew members compromised the master's ability to take appropriate, timely, and effective action against the water ingress in the under deck compartments and to abandon ship safely.
4. The vessel sailed with one pump known to be non-functional.
5. Adjusting the position of the float switch for the bilge alarm delayed response time, allowing more water to accumulate in the vessel and thus putting the vessel and crew at greater risk.

## *Findings as to Risk*

1. Operators who are unfamiliar with the principles of transverse stability or who cannot apply them to actual on-board conditions place the safety of a fishing vessel and those aboard at risk.
2. The vessel's operational readiness was not fully determined following the extended layup.
3. The master's inability to operate a key piece of on-board equipment – the bilge pump – created a risk to him and the vessel.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 21 August 2008.*

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# Appendix A – Sketch of Occurrence Area

