Statens haverikommission

RON JEREMY– the sinking of the vessel off the coast of Piteå

The Swedish Accident Investigation Authority has investigated a marine accident that occurred off Piteå, in Norrbotten County, on 1 June 2025

29 May 2026

Final report
SHK 2026:09e

About the Swedish Accident Investigation Authority

The Swedish Accident Investigation Authority (SHK) investigates accidents and incidents from a safety perspective regardless of whether they occurred on land, at sea or in the air. The authority's accident investigations are intended to disseminate knowledge and provide a basis for actions by authorities, companies, organizations, and individuals that improve safety and reduce the risk of accidents. The activities should also contribute to people feeling secure and having trust in society's institutions and the confidence in transportation systems. The mission also includes assessing the efforts made by the rescue services in connection with an accident. However, the investigations should not assign blame or liability, whether criminally, civilly, or administratively.

The investigations by SHK aim to answer three questions:

- What happened?
- Why did it happen?
- How can a similar accident/incident be avoided in the future?

The report is also available on the Swedish Accident Investigation Authority's website: www.shk.se.

ISSN 1400–5735

File number: S-127/25

Content

Summary

On 1 June 2025, the Swedish Accident Investigation Authority (SHK) was notified of a serious maritime accident involving the tugboat RON JEREMY (SMBU), which sank south of Rödkallen off the coast of Piteå. The vessel, built in 1930, was towing a barge loaded with timber from Hindersön to Piteå. The crew consisted of four persons.

The waters around Hindersön were shallow and poorly charted. Six hours after departure, the crew discovered that the vessel had developed a starboard list and water was accumulating on the starboard side of the aft deck. Despite various attempts to correct the list, the situation worsened. The crew did not realise that the vessel was taking in water, which led to a delayed evacuation.

When the order to abandon ship was finally given, the crew did not have time to carry out a safe evacuation. The vessel capsized and sank stern-first, pulling all four crew members underwater. Three survived by reaching the barge and were rescued; one crew member was later found deceased inside the upper part of the engine room.

The vessel had recently been refurbished and certified, but some deficiencies remained. The crew had not practised evacuation since boarding. The accident resulted in the total loss of the vessel, minor diesel pollution, and one fatality.

Causes of the accident

The direct cause of the sinking was that a large amount of water entered one of the vessel's watertight compartments, most likely as a result of a minor hull damage. As the bilge alarm in the compartment was out of order, the crew did not notice the water ingress.

Contributing factors to the accident:

- No systematic troubleshooting was carried out to determine what might have caused the list.
- The crew had limited knowledge of the vessel's technical systems and stability characteristics.
- The high workload and stress during the incident affected the crew's situational awareness.

Taken together, this meant that the crew did not realise that the vessel was taking in water and was in the process of sinking. As a result, evacuation was initiated at a late stage and the crew did not have time to prepare for a safe evacuation.

Safety recommendations

SHK submits the following recommendations:

The shipping company T. Ekstrand Sjötjänst AB is recommended to:

- take measures to strengthen the crew's knowledge of the vessel's equipment and systems, as well as their ability to act in emergency situations (see section 3.3). (SHK 2026:09)

The investigation

SHK was notified on 1 June 2025 that a very serious maritime accident involving the tugboat RON JEREMY, call signs SMBU, had occurred south of Rödkallen off the coast of Piteå on the same day at around five a.m.

The accident has been investigated by SHK, represented by Kristina Börjevik Kovaniemi, Chair, Per Jakobsson, Lead Investigator, Björn Ramstedt, Operational Investigator, and Sofia Martinsson, Rescue Services Investigator.

The company SALTECH Consultants AB has assisted SHK with a stability analysis.

Patrik Jönsson has participated as coordinator for the Swedish Transport Agency.

Investigation material

Interviews have been conducted with the crew, the shipowner, former employees, and family members of the deceased.

The Police and the Swedish Coast Guard carried out several diving investigations on the wreck. These investigations were undertaken both to search for the missing person and to prevent the release of diesel from the vessel. The vessel could not be examined in full, as the wreck was partially embedded in the seabed sediments. The Police also assisted SHK with additional technical examinations. SHK personnel was present during these diving operations, at which the port-side life raft was also recovered. The vessel itself has not been salvaged.

SHK has reviewed documentation, photographs, drawings, inspection reports, information from the auction house Klaravik, as well as various witness statements from the shipping company, crew, the Swedish Transport Agency, shipyard, and previous owners.

Fact finding meetings were held in Riga on 12 December and in Stockholm on 16 December 2025. At these meetings, SHK presented the factual material available at that time.

Final report SHK 2026:09e

Ship particulars	
Flag/register	Sweden
Identification IMO identification/ call sign	-/ SMBU
Type of ship	Tug boat
New building shipyard/year	Norway, Trosviks Verksted A/S, 1930
Gross tonnage[1]	97
Length, over all	25,8 metres
Beam	6,4 metres
Draft, max	Around 2,8 metres
Main engine, output	Volvo Penta TAMD 165A, 404 kW Volvo Penta TMD 100, 210 kW
Propulsion arrangement	Straight propeller shaft, fixed propeller
Rudder arrangement	Simplex rudder with heel shoe
Service speed	10 knots
Ownership and operation	T. Ekstrand Sjötjänst AB

Voyage particulars	
Ports of call	Gåsören, Hindersön, Luleå archipelago
Type of voyage	Munksund, Piteå
Cargo information/passengers	The vessel was towing the barge OSKAR carrying timber
Manning	Four crew members

Marine casualty or incident information	
Type of marine casualty or incident	Very serious marine accident
Date and time	1 June 2025, at 4:59 a.m. local time
Position and location of the marine casualty or incident	65˚13,8' N 022˚20,3' E
Weather conditions	8–9 m/s north-westerly wind, good visibility, daylight
Other factors	Significant wave height just over 0.7 metres
Consequences	
- Personal injuries	One fatality
- Environment	Minor diesel spill
- Vessels	Total loss, vessel sunk

[1] Gross tonnage – Dimensionless measure of the vessel's volume.

1. Factual information

The forestry association Norra Skog had contracted the shipping company T. Ekstrand Sjötjänst AB (the shipping company) to transport timber from Hindersön to Munksund, off Piteå. The operation was to be carried out during the summer of 2025 using the tugboat RON JEREMY (the vessel) and the barge OSKAR, see Figure 1.

Figure 1. The image shows the vessel moored alongside the barge. The photo was taken on 31 May 2025. Photo: The Swedish Coast Guard.

1.1 Sequence of events

The vessel departed from Gävle with the barge on 28 May and arrived at Gåsören on Hindersön on the evening of 30 May. The crew consisted of a master, a chief officer, and two deckhands (referred to in the report as deckhand 1 and 2). Timber was to be loaded onto the barge, which would then be towed by the vessel to Piteå.

Gåsören lacked a pier or loading area, and therefore Norra Skog had constructed a temporary pier to which timber was transported from the island.

The fairway to Hindersön was maintained by Luleå Municipality, but it did not extend to the temporary pier at Gåsören. The final stretch towards Gåsören, just under a nautical mile, passed over shallow and only partially surveyed waters. Norra Skog had engaged a local company to survey the entire fairway to the pier using a traditional echo sounder. For the section that was not part of the main fairway, the company had laid out black plastic containers along a temporary route to indicate where the vessel should steer. Two shoals in the fairway, at depths of 3.1 and 2.9 metres respectively, were also marked with black plastic containers.

The crew had been informed that there was a main fairway as well as a temporary route, marked with black plastic containers, which they were to follow.

On the morning of 31 May, loading of timber onto the barge commenced. At lunchtime, the Swedish Coast Guard arrived on site to ensure that the plastic containers would be removed once the timber transport was completed. The Coast Guard photographed the vessel and informed the crew that they had passed on the wrong side of a green buoy when entering Gåsören.

Loading was completed shortly before 22:00, and the vessel departed soon afterwards. The crew followed the temporary route and then continued along the main fairway. As the waters were very shallow, the master navigated cautiously during the initial section, maintaining a speed of approximately 2.5 knots. After about 40 minutes, the tug and barge had reached deeper water. At 22:39, the master sent a text message to the company that had surveyed the fairway, confirming that they had reached deeper water and that everything had gone well. See Figure 2 for the vessel's route from Gåsören to the site of the sinking, and Figure 3 for the passage in and out of Gåsören.

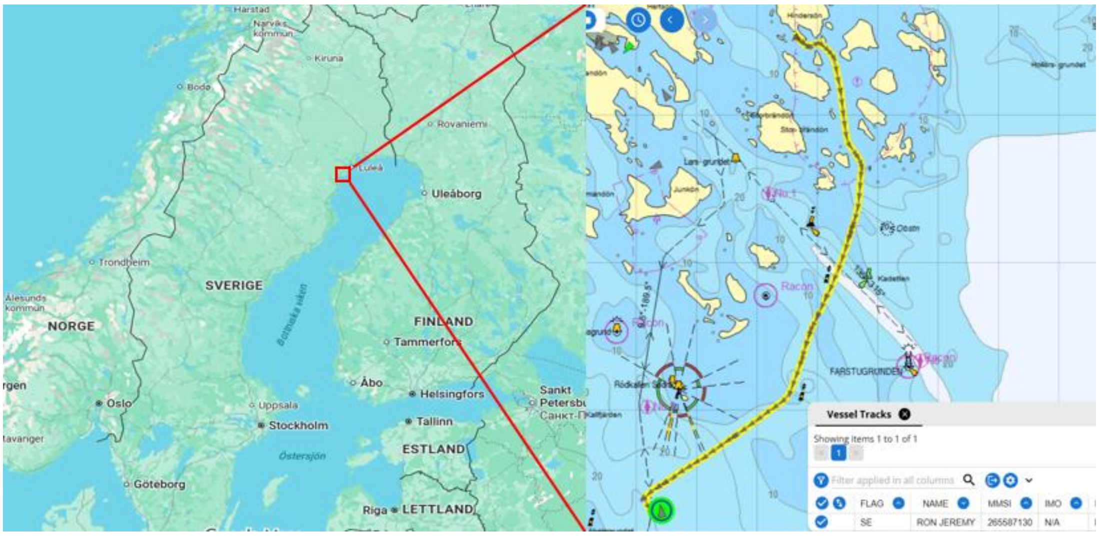

Figure 2. The image on the left shows where in Sweden the incident occurred. The image on the right shows the route in yellow from Gåsören (at the top) to the location where the vessel sank, marked by the green marker (at the bottom of the image). Image: SEG – SafeSeaNet Ecosystem GUI. Annotations added by SHK.

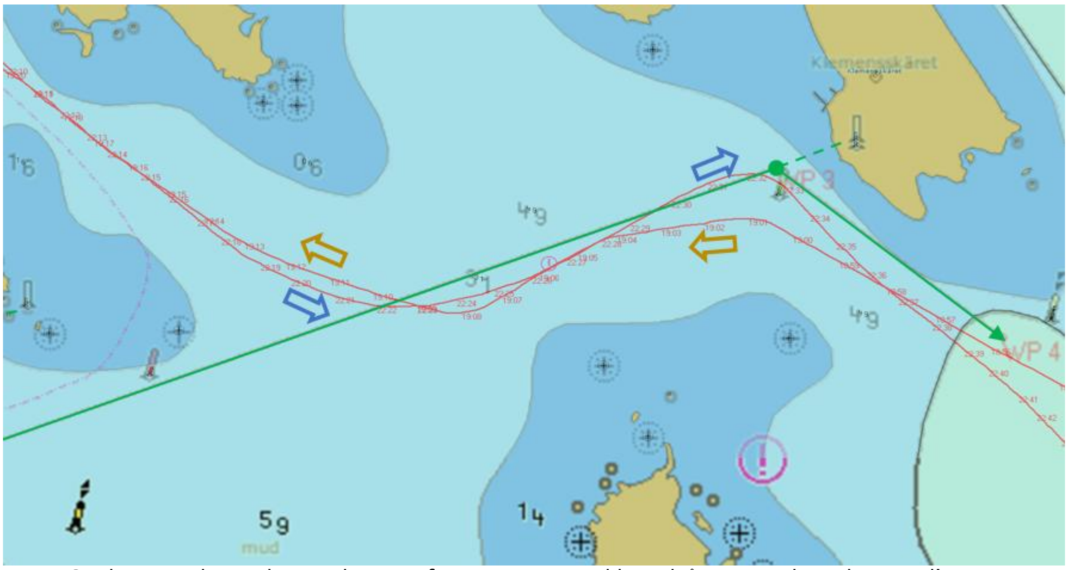

Figure 3. The green line indicates the main fairway maintained by Luleå Municipality. The vessel's route in to and out from Gåsören (to the left in the image) is shown with a red line; orange arrows indicate the inbound route and blue arrows the outbound route. Chart image © Swedish Maritime Administration no. 26-00511. Annotations added by SHK.

To improve the vessel's manoeuvrability, the barge was initially towed close to the vessel. The barge was then paid out so that it was positioned approximately 120 metres astern of the vessel. The speed was then increased to about 3.5 knots.

At 23:30, the master was relieved by the chief officer. At the same time, the deckhands relieved one another, and deckhand 1 took over the watch. As it was light outside and no lookout was required, the chief officer was alone on the bridge.

At around 02:20, the vessel had reached open water. The chief officer set a south-westerly course on the autopilot. The sea state was moving from the north-west towards the south-east, striking the starboard side of the vessel. The barge remained steadily astern of the vessel, but slightly more to the south-east due to the wind. The distance between the vessel and the barge was kept constant. The speed was maintained between 3 and 4 knots. According to the crew, the engine was running smoothly and at normal temperature.

A little before 03:00, deckhand 1 made a round of the engine room. He did not observe anything unusual and saw no signs of a list or water in the engine room. He then woke deckhand 2, who was to relieve him, and went to his cabin to rest.

Meanwhile, the chief officer noticed that the sea state had increased. He began to feel slightly seasick and therefore kept his eyes on the horizon. After a while, he noticed that more sky was visible on the port side than on the starboard side and realised that this was because the vessel had developed a list to starboard. Although he did not consider it to be serious, he wanted to consult the master.

At 04:00, the officer of the watch recorded the vessel's position in the logbook. Shortly thereafter, he woke the master and informed him that the vessel had a list. The master, whose cabin was located aft of the bridge, quickly arrived on the bridge, took over the vessel's navigation, and switched to manual steering. He estimated the list to starboard to be about 5 degrees and that the water surface was level with the main deck on the starboard side. Both the master and the chief officer observed that there was water standing on the starboard side walkway, about 40 to 50 centimetres from the rail. The water level on deck was touching the manholes to the side tanks. The chief officer also observed that one of the mooring lines was about to be washed out through the aft freeing port on the starboard side.

The master realised that something was wrong and asked the chief officer to find deckhand 2, who was on watch. As the chief officer could not find him, he went to deckhand 1, who had woken up a short time earlier when the vessel had heeled to starboard and now made his way up to the bridge.

The chief officer went out onto the aft deck to recover the mooring line so that it would not be washed overboard and risk becoming entangled in the propeller. He was able to walk along the starboard side walkway without getting wet, but again observed that water was accumulating on deck. As the chief officer went down to the aft deck, he asked the master to alter course so that the waves would come from astern and not wash more water in through the freeing ports. According to the AIS[2] track, the vessel altered course at 04:10, see Figure 4.

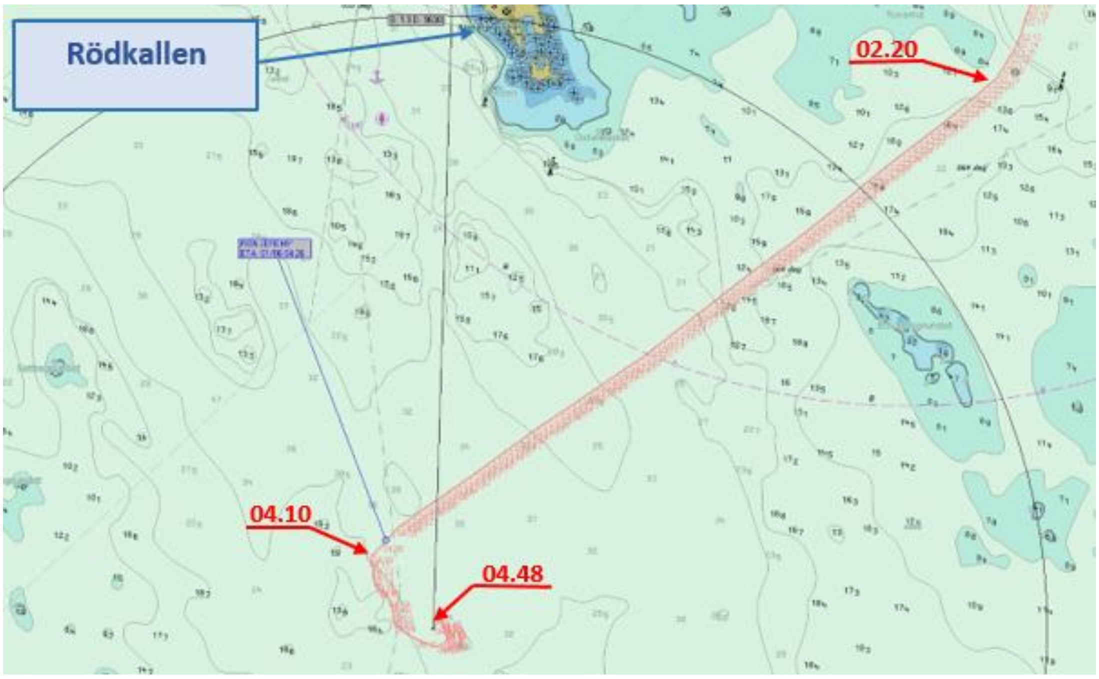

Figure 4. The AIS track after the vessel set a south-westerly course at 02:20, until the master altered course to south-east at 04:10, and the vessel's final position just under 10 kilometres south of the island of Rödkallen at 04:48. ©Swedish Maritime Administration no. 26-00511. Annotations added by SHK.

The entire crew gathered on the bridge to discuss what might have happened to the vessel. The master, suspecting that there was to mutch water in the starboard ballast tank, brought out system diagrams to understand how they should handle the situation. Several suggestions were discussed and the crew decided to attempt to pump out the starboard ballast tank. As deckhand 2 was the only person on board with knowledge of the ballast and bilge system, he was ordered down to the engine room to start the combined ballast and bilge pump. The chief officer accompanied him.

When they reached the engine room, they observed nothing unusual and saw no signs of any leakage. Deckhand 2 set the valves for pumping out the ballast tank, but when the electric pump was being started, the vessel suffered a power outage. After a while, they managed to

[2] AIS (Automatic Identification System) – A maritime safety system used to identify and track a vessel using radio signals.

restore power on the vessel, but made no further attempts to start the pump. They then returned to the bridge.

While the chief officer and deckhand 2 were trying to start the bilge pump, the master and deckhand 1 discussed what they should do if the vessel sank. Deckhand 1 mentioned that in that case, they should make their way to the barge. The question of abandoning the vessel was not discussed further. Based on his previous experience from the sinking of the company's tug PAMPUS[3] in 2024, deckhand 1 assessed that they would need to abandon the vessel when the water level reached the top of the goosenecks[4] at the starboard rail.

When the chief officer and deckhand 2 returned to the bridge, they reported that it had not been possible to start the bilge pump. Several other measures were discussed, including attempting to pump fuel from starboard to port and to empty the fresh water tanks on the starboard side. However, none of these measures could be carried out.

Finally, the crew decided to attempt to counterflood the port ballast tank. Due to problems with the main ballast system, the tank had to be filled using a portable bilge pump. This was done through a manhole on the freeboard deck. Deckhand 2 was ordered to open the manhole and fill the tank. In Figure 5 below, the open manhole is visible on the right, along with the hose from the portable bilge pump protruding from it.

Figure 5. The red marking shows the open manhole to the port ballast tank, where a blue pump hose is inserted. The yellow marking shows the gooseneck for the same tank. In the upper right corner, the barge can be seen, connected to the vessel by the towing wire running out over the port rail. Photo taken by the crew at 04:47. Image: The Shipping company. Annotations added by SHK.

[3] PAMPUS – Grounding off Hörnefors, SHK 2025:02, case number: S-37/24

[4] Ventilation pipe to a tank that extends up to the deck, bent 180 degrees to prevent water ingress.

Meanwhile, the master made several course alterations. The vessel eventually ended up on a north-westerly course. The master then made another turn to port in an attempt to use the towing wire to the barge to counteract the list.

Deckhand 1 noted that the goosenecks on the starboard side were below the waterline and informed the others that they now had to abandon the vessel. The master fetched lifejackets and immersion suits from his cabin behind the bridge and threw them out on the port side of the cabin. The chief officer and deckhand 1 had some difficulty putting on the suits but assisted each other. At this point, the crew took photographs that clearly show that the starboard rail was below the waterline, see Figure 6.

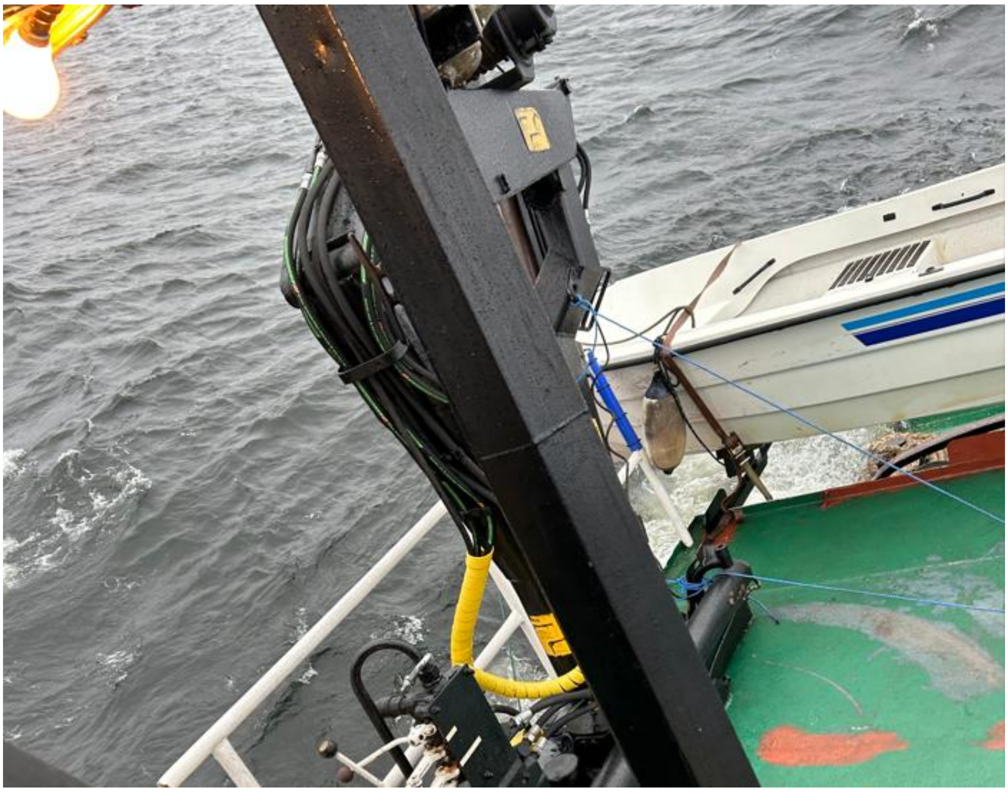

Figure 6. In the image, it can be seen that the water level has reached above the starboard rail and walkway; the photo was taken by the crew at 04:47 from aft of the funnel and the bridge.
Image: The Shipping company.

The master returned to the wheelhouse to make a distress call on VHF[5] channel 16. The Maritime and Aeronautical Rescue Coordination Centre (JRCC[6]) received the call at 04:47. While the master spoke to the JRCC operator, the chief officer shouted to deckhand 2 that he must come up to the bridge deck. The master also pressed the DSC[7] button on the VHF radio, but was unsure whether this had any effect. He heard the JRCC respond, but judged that, due to the rapidly increasing list, he was at risk of becoming trapped inside the bridge, and therefore hurried outside. The call with JRCC was disconnected at 04:48.

[5] VHF radio (Very High Frequency radio) – A communication system for maritime use with limited range.

[6] JRCC (Joint Rescue Coordination Centre) – The Swedish Maritime Administration's Maritime and Aeronautical Rescue Coordination Centre leads and coordinates maritime and aeronautical rescue operations.

[7] DSC (Digital Selective Calling) – A digital function on the VHF radio that automatically transmits identity and position to the JRCC.

The master joined the chief officer and deckhand 1 and started to put on his immersion suit. He had not previously tried it on and soon realised that it was too small. He only managed to pull it up over his lower body and one arm. He also released the life raft's lashing to help the raft float free. Meanwhile, the chief officer and deckhand 1 had managed to put on their suits.

Deckhand 2 joined the others, who had gathered aft of the bridge, behind the door to the master's cabin. Reportedly, he was offered an immersion suit, but instead put on an inflatable lifejacket, which he inflated. None of the other three had put on a lifejacket, but were using only immersion suits. They then moved aft and to port of the funnel. The crew discussed that they would make their way to the barge once they were in the water.

The Figure below shows a schematic of the crew's approximate positions as they gathered on the bridge deck before the vessel capsized onto its starboard side.

Figure 7. The image shows the approximate positions of the crew. Deckhand 2, wearing a red lifejacket, is furthest forward, followed by the chief officer and deckhand 1 in red immersion suits, and the master furthest aft in an orange immersion suit. The port-side life raft was in its cradle. Note the port engine room door, which was reportedly open.

The list increased further until the vessel lay completely on its side. When the vessel was on its side, the navigation lights remained lit for a short while before going out. After another minute, the stern sank and the bow rose above the water surface for about 30–50 seconds before the vessel disappeared completely beneath the surface. As the vessel sank, the crew ended up in the water. When the master surfaced, he saw the bow of the vessel disappear beneath the water. At 04:59, the vessel foundered[8]. The sequence of events in the final stage of the foundering is shown in Figure 8 below.

[8] The time has been determined from a video recorded by two witnesses who observed parts of the sequence from Rödkallen.

Figure 8. The sequence of images shows frames from the moment when the navigation lights go out until just before the vessel rises and sinks. The images are taken from video footage filmed by two witnesses on Rödkallen. Image: private. Time indications added by SHK.

When the chief officer surfaced, he saw deckhand 1 who had come up nearby. Together, they began searching for the other crew members and heard the master calling out to them. They continued to look for deckhand 2, but could not see him.

After a while, the master, the chief officer and deckhand 1 gathered together in the water. They spotted one of the life rafts, but judged it to be too far away and considered it easier to swim to the barge. Only the chief officer was able to climb onto the barge by his own efforts. He was also able to help deckhand 1 up onto the barge. He then attempted to help the master up, but was unsuccessful. At 05:22, the chief officer called SOS Alarm using his mobile phone, which he had kept inside his immersion suit. He informed them that they were on the barge, that one crew member was holding on to the side of the barge, and that one was missing.

After several further attempts, the chief officer managed to assist the master up, who had remained in the water the whole time but had managed to cling to the outside of the barge. At 05:41, the chief officer called SOS Alarm again and reported that three of the crew were safe on the barge.

1.2 Emergency response

When the JRCC received the distress call at 04:47, the Swedish Maritime Administration decided to initiate a search and rescue operation. Within the following minutes, maritime rescue units from Luleå and Piteå were dispatched, as well as two SAR helicopters (search and rescue helicopters) from Umeå and Finland respectively. The JRCC also received an alert from the vessel's EPIRB[9] at 05:03. In total, nine sea and air units were mobilised in the search and rescue operation, including resources from the Swedish Maritime Administration, the Swedish Sea Rescue Society (SSRS), and the Swedish Coast Guard.

At 06:05, the rescue vessel RESQUE ALBERT ISAKSSON was able to take the three survivors off the barge. At the same time, the SAR helicopter had arrived on the scene and commenced the search.

[9] EPIRB (Emergency Position Indicating Radio Beacon) – A small waterproof floating radio transmitter that is activated automatically or manually in maritime emergencies.

At 06:15, the rescue vessel RESQUE LEIF JOHANSSON reached the life raft, which had by then surfaced. The crew found that the life raft was upside down and could not be righted, as it was most likely still attached to the vessel.

At 07:15, the crew members who had been on the barge were transferred to an ambulance waiting on shore for further transport to Piteå Hospital.

At 08:25, RESQUE ALBERT ISAKSSON returned to the life raft to check if it was empty. To do this, they had to cut open the bottom of the raft. In the process, the life raft detached from the vessel and could then be recovered. No one was found in the life raft.

The rescue operation was concluded at 10:34, as the search area had been covered and survival of the missing deckhand was deemed unlikely given the water temperature.

Deckhand 2 was found deceased in the upper part of the vessel's engine room on 15 June 2025.

1.3 Damages

1.3.1 Personal injuries

The autopsy report indicates that the circumstances strongly suggest that deckhand 2 died as a result of drowning.

The master and deckhand 1 were assessed as having mild hypothermia[10], most likely because their immersion suits were either not fully donned or not entirely sealed. The chief officer, who had put on his immersion suit correctly, avoided becoming chilled.

1.3.2 Damage to the vessel

Diving surveys of the wreck show that approximately 10 metres of the stern section are embedded in the seabed sediments and that it is inclined at about 25 degrees longitudinally. The propeller of the motorboat that was stored aft of the funnel was found during the surveys just above the seabed sediment covering the stern section. As a result, it was not possible to examine the stern.

During the diving surveys, the vessel was resting on the bottom with a noticeable list to starboard, which meant that the starboard engine room door was situated deeper than the engine room door on the port side. Of the parts of the vessel not concealed by sediments, no obvious damage was visible. The doors to the engine room were closed, as were the other doors into the vessel. The bridge was intact, as were the guardrails. The towing wire ran from the pulley at the aft end of the superstructure and lay out over the port rail. It was also observed that one of the two freeing ports on the port side was open. The two aft freeing ports were hidden beneath the seabed sediments.

[10] Hypothermia means that the core body temperature is below 35°C.

1.4 Place of occurrence

The sinking occurred south of the island of Rödkallen, off the coast of Piteå. The water depth at the site where the vessel sank was approximately 40 metres. There were no other vessels in the area at the time of the sinking.

The route taken by the vessel from Gåsören is largely well charted, with the exception of the area closest to Hindersön. The depth soundings forming the basis for depth information in this area were carried out between 1894 and 1896. The distance between the measurement points ranges from 40 to 100 metres. The fact that the area around Hindersön is covered only by older depth soundings is evident from the Swedish Maritime Administration's chart viewing service, see Figure 9.

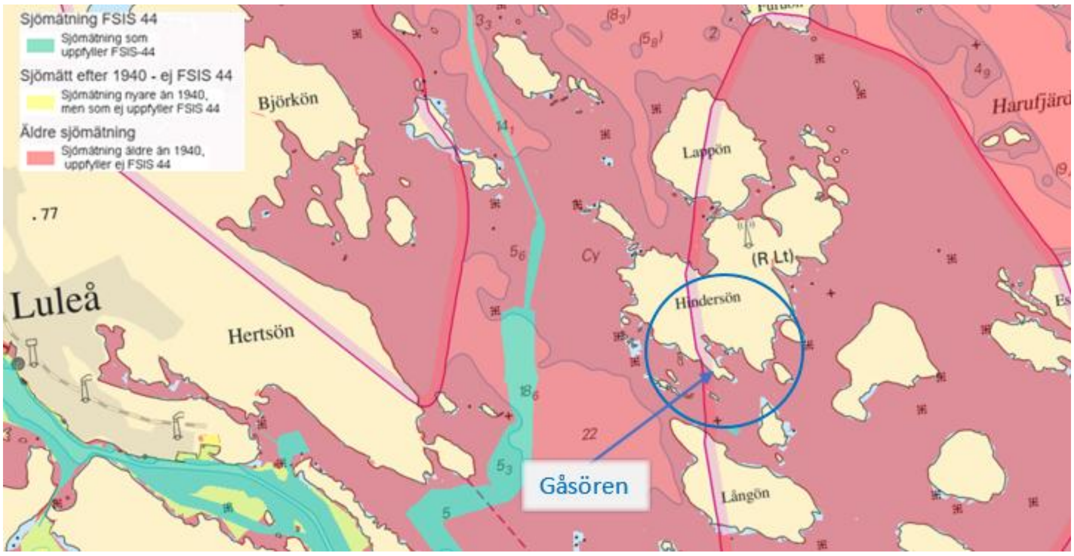

Figure 9. In the Swedish Maritime Administration's chart viewing service, the area around Hindersön and the approach to Gåsören is marked in red (see blue circle), indicating that the depth information is of low quality. © Swedish Maritime Administration no. 26-00511. Annotations added by SHK.

The Swedish Maritime Administration has stated that orthophotos[11] of the area show several visible boulders along the shoreline and in the shallow waters. Given the age of the original depth surveys and the limitations of the measurement method (lead line), the Swedish Maritime Administration has indicated that the nautical charts are unreliable. It cannot be ruled out that certain shoals or stones have not been recorded, and furthermore, the seabed conditions may have changed since the surveys were conducted.

Luleå Municipality maintains the fairway to Hindersön and carries out annual depth measurements in the fairway to detect whether the ice has moved boulders or otherwise altered the seabed conditions. They use a traditional echo sounder for these measurements and ensure that the fairway south of Hindersön has a minimum depth of 2.5 metres. The fairway is marked with leading marks and lateral marks[12].

[11] Orthorectified aerial photographs, which have been processed to be dimensionally accurate and geometrically correct.

[12] Lateral marks are green and red navigational marks indicating the course of the fairway. Leading marks is formed by two navigational marks or landmarks positioned exactly in line behind one another; the line indicates the direction of the fairway.

1.5 The vessel's construction and equipment

1.5.1 Ship history

The vessel was built in Norway at Trosviks Verksted A/S in 1930 and was originally named TINFOS. The client was Tinfos Papirfabrikk A/S, which required a vessel for timber towing. The vessel was registered in Sweden in 1988 under the same name. The shipyard constructed at least one other similar vessel (SAGAFOS) of the same size. That vessel was registered in Sweden in 1987 but sank off Gotland in 1990.

From the time the vessel was built until the accident, it underwent several modifications. Among other things, a mobile crane was installed, the fresh water tanks were rebuilt, and the engines were replaced.

Over the past 15 years, the vessel had been owned by three different shipping companies. For most of that time, it was used sparingly. Between 2019 and 2024, it was not used for shipping but lay moored at the quay and was used as a residential platform. During this period, the engine room was partially flooded due to burst water pipes, resulting in water damage to the engine room. The vessel was up for sale for several years and was purchased in the spring of 2024 by T. Ekstrand Sjötjänst AB.

1.5.2 Construction

The vessel's hull was constructed from riveted steel plates, which were largely preserved. The original plate thickness varied between 6 and 8 millimetres. Along the waterline, the hull plating was ice-reinforced by doubling. According to information from the Swedish Transport Agency, the vessel was originally designed in accordance with the then-current coastal shipping regulations of the classification society DNV.

The vessel was divided into three watertight compartments: a storeroom at the aft end, the engine room amidships, and accommodation at the forward end, see Figure 10.

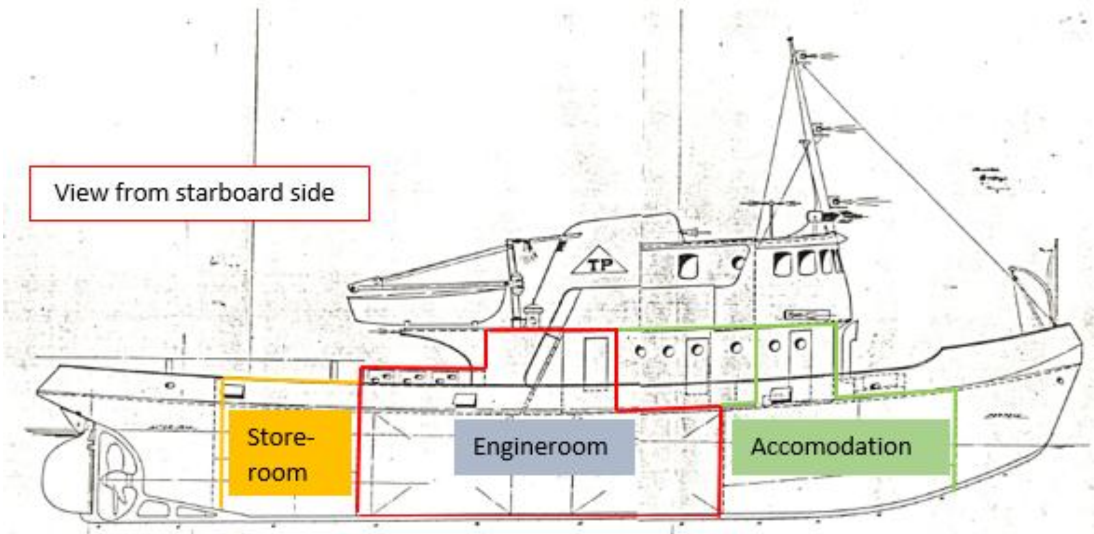

Figure 10. The image is from an old stability document from the Swedish Transport Agency and shows an overview of the vessel's layout and its three watertight compartments: storeroom, engine room, and accommodation. Aft of the storeroom and forward of the accommodation were two ballast tanks. Image: Swedish Transport Agency. Annotations added by SHK.

Access to the compartments was via openings on the main deck. The storeroom at the aft end was reached through a hatch located on a raised section of the aft deck, approximately one metre high. The hatch was designed as a sliding hatch and opened sideways to port. Since the hatch was positioned on the raised section and the towing wire ran over it, it was only possible to enter the storeroom when the vessel was not towing or was stationary, see Figure 11.

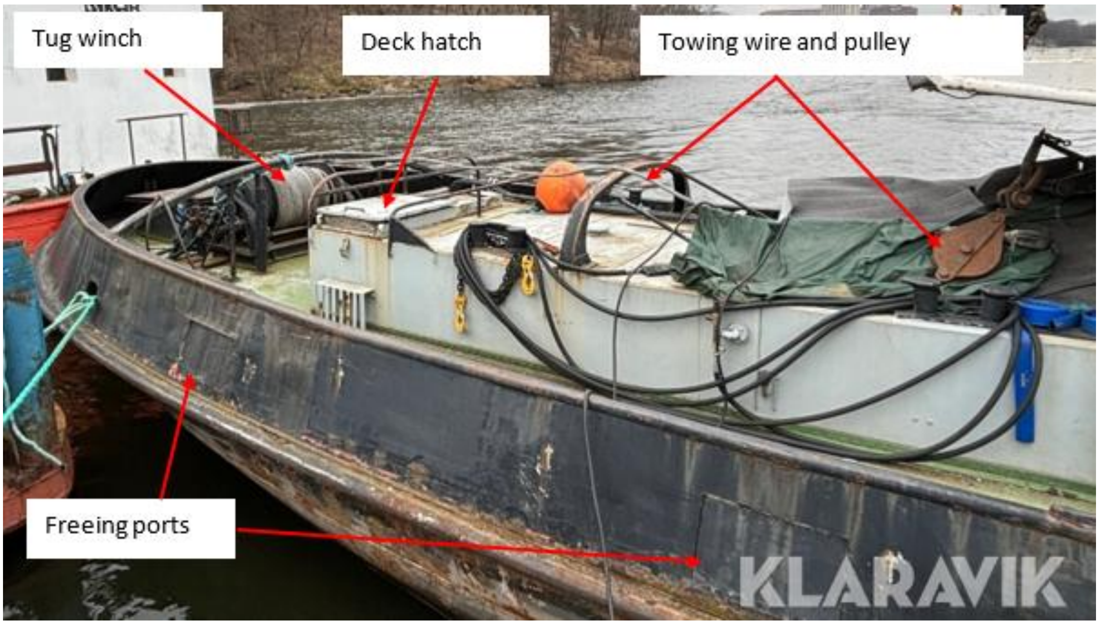

Figure 11. The vessel's aft deck, showing, among other things, the deck hatch to storeroom and the towing wire. Image: Klaravik. Annotations added by SHK.

The engine room could be accessed via doors on both the starboard and port sides of the deckhouse. Both doors first led into a small workshop at the main deck level. Under and aft of the workshop were the main engines. In the aft part of the engine room, the roof was raised by just over a metre in a so-called "skylight", which provided light and ventilation to the engine room. At the aft end of the worshop, forward of the skylight, a ladder led further down into the engine room itself.

The accommodation, located forward of the engine room, was accessed via several doors on both sides of the vessel's main deck. Neither the hatch to the storeroom nor the doors were watertight, but the doors were fitted with high thresholds (just over 30 centimetres). In all compartments, loose floorboards were laid over the keel space. In the engine compartment, however, the keel space was visible without the need to lift hatches or floorboards.

The vessel had four ballast tanks: one forward of the accommodation, one aft of the storeroom, and two on either side of the storeroom. On both sides of the engine room, there were fuel and fresh water tanks evenly distributed.

On the main deck, there was a manhole to each of the ballast tanks. The manholes were bolted to the main deck. Beneath the manholes to the starboard and port ballast tanks, there was an additional manhole. According to the shipping company, both the upper and lower manholes had to be opened to fill or empty ballast.

The ballast tanks were fitted with goosenecks for ventilation. The goosenecks were located next to the rail on each side of the vessel and on the aft deck beside the towing winch. The goosenecks were fitted with socks[13] to prevent water ingress during heavy seas.

To prevent water from breaking seas from accumulating on deck, there were openings in the vessel's rail, known as freeing ports. From photographs, four freeing ports have been identified on the aft deck, evenly distributed on each side of the vessel, see Figure 12.

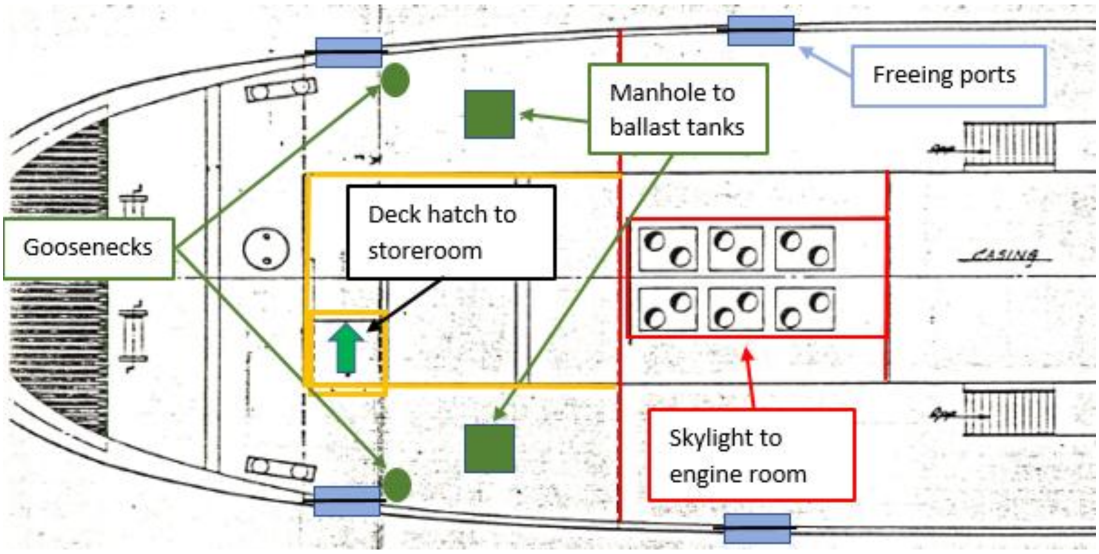

Figure 12 shows the vessel's aft deck and the locations of the freeing ports, goosenecks, and manholes to the starboard and port ballast tanks, as well as the access hatch to the storeroom and the skylight to the engine room.

1.5.3 Machinery and other systems on board

When the vessel was reflagged to Sweden, it was equipped with three main engines connected to a single propeller shaft. Subsequently, the machinery was replaced with a larger main engine and a smaller one, which could be engaged via belt drive. At the time of the incident, only the larger engine was in operation.

The vessel was fitted with a diesel generator for electricity production, as well as batteries for emergency power. If too many electrical devices were used simultaneously, the vessel's electrical system could sometimes become overloaded and caused a black out. This could, for example, occur when the combined bilge and ballast pump was started.

The engines were cooled with seawater drawn in through bottom valves in the engine room. There had previously been the possibility to recirculate seawater to the aft ballast tank (to reduce the risk of ice forming in the cooling system during winter). According to the crew, the recirculation pipe system running through the storeroom was not functional and was therefore shut off.

The steering gear was electro-hydraulic and mounted on the aft deck, aft of the towing winch. The rudder stock from the steering gear to the rudder ran in a casing vertically through the aft ballast tank.

13 Sock – A simple construction in which a piece of hose is fitted to a gooseneck to prevent water from entering the tank.

The propeller shaft first passed through the storeroom and then, in a stern tube, through the aft ballast tank. The casing was oil-filled and fitted with seals towards the storeroom and out to the water. The oil maintained a constant pressure with the help of a gravity tank. Reportedly, the stern tube was tight and oil for the gravity tank did not need to be refilled often. Figure 13 shows the keel space beneath the storeroom. The image shows various pipes, the hull with riveted joints, as well as some form of fixed ballast blocks lying against the hull.

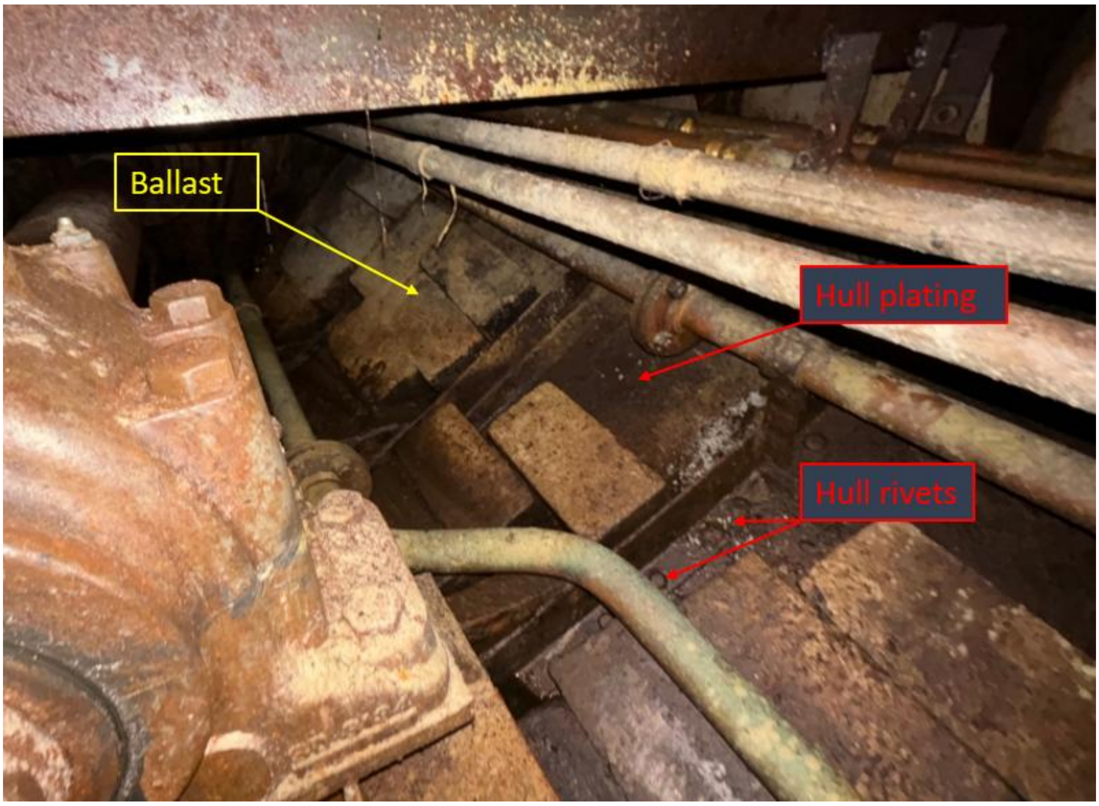

Figure 13. Port side of the keel beneath the storeroom. The image highlights the hull plating, hull rivets, and ballast blocks. Several pipes for the ballast, cooling water, and bilge systems are also visible in the image. Image: Klaravik. Annotations added by SHK.

The bilge system was operated by a combined bilge and ballast pump. It is unclear whether the pump also functioned as a fire pump. The pump was electrically powered and has been described as large. It was connected to the respective pipe systems via a so-called bilge box. This consisted of two rows of three-way valves, with three valves in each row, see Figure 14.

Figure 14. The image shows the bilge box, consisting of two rows with three valves in each. These are connected to several different pipe systems. Image: Klaravik and Swedish Transport Agency (inserted image). Annotations added by SHK.

By setting the valves in different positions, the pump could be connected to the various systems. As the pump was very noisy and also placed a significant load on the electrical system, it was not used. Instead, the crew used smaller electrically powered portable submersible pumps to empty and fill the ballast tanks. When filling, the portable pump was lowered into the sea and water was pumped into the ballast tank via a manhole on the main deck. To empty the ballast tanks, the process was reversed.

The ballast system was used frequently during towing operations to ensure the vessel's propeller was deeper in the water, thereby increasing propeller efficiency. Normally, the aft ballast tank was filled completely and the side tanks to 50% when towing heavy loads. When only the barge was being towed, only the aft ballast tank was filled. Previous owners had used the ballast system in the same way.

The vessel was equipped with three different bilge alarms, one for each watertight compartment.

1.5.4 Vessel draught

According to older drawings (from 1961), the vessel's draught in an unladen condition was just over 2.4 metres. The vessel's draught marks[14] had been painted over, and it was therefore no longer possible to read the exact draught. The crew stated that they normally aimed for a draught of 2.8 metres at the stern.

Photographs taken by the Swedish Coast Guard on 31 May have been compared with older images of the vessel when the draught marks were still visible. The comparison shows that the draught mark (for 2.9 metres) is below the waterline in the photographs from 31 May. This indicates that the draught on 31 May was likely greater than 2.9 metres, see Figure 15.

[14] Markings at the bow and stern of the hull indicating the vessel's draught.

Figure 15. The images are enlargements from Figure 1. The image on the left shows the port forward half of the hull. The waterline, indicated by the transition from black antifouling paint to red hull paint, is clearly visible at the bow but disappears towards the stern. In the right-hand image, which shows the stern, the waterline is not visible at all. This suggests that the draught was significant at the stern. Photo: Swedish Coast Guard. Annotations added by SHK.

1.5.5 Bridge equipment

The vessel's navigation bridge was, among other things, equipped with an autopilot which automatically corrected the vessel's course to a pre-set value.

1.5.6 Lifesaving equipment

The vessel was equipped with two inflatable life rafts of the brand SEA-SAFE, each with a capacity for six persons. The rafts were manufactured in 2024 and had recently been taken ashore for annual servicing. They were returned on board by the owner on 20 May 2025. The painter lines on the rafts were 35 metres long. The rafts were equipped with emergency equipment in accordance with SOLAS[15] A (unrestricted or ocean-going service), and first aid equipment for CAT-C (coastal service, 20 nautical miles from the coast). Each life raft, including its protective casing, weighed 71 kg.

The rafts were mounted in individual cradles on the port and starboard sides of the vessel, level with and aft of the wheelhouse. They were secured in the cradle with a lashing to prevent them from falling out. The lashing was fitted with a hydrostatic release unit, which would automatically release the lashing if the vessel sank. A painter line for each life raft was attached to a weak link in the cradle. The purpose of the weak link was to be strong enough to deploy the life raft, but to break if the vessel sank deeper than the length of the painter line.

The starboard life raft was automatically released from its cradle when the vessel sank. The raft inflated as the painter line was stretched out, but it ended up upside down. However, it was not released, as the painter line attached to the vessel was not sufficiently stretched for the weak link to break.

The port life rafts lashing was released by the master, who loosened the lashing after making the distress call. During diving surveys, the life raft was found inside the workshop on the starboard side, in the upper part of the engine room. The painter line then ran through the

[15] The SOLAS Convention (Safety of Life at Sea) – An international convention regulating safety standards for the construction, equipment, and operation of merchant vessels.

workshop, through the engine room door on the port side (which was closed at the time), and up to the weak link, which was attached to the port cradle.

Two of the crew members were equipped with red immersion suits of the brand Crewsaver. These were thick neoprene suits, size large (170–210 centimetres), and marked with a temperature range of -1.9 °C to 35 °C. They were manufactured in accordance with an older standard (prEN 1913–2). The suits were intended to be used together with a lifejacket. The suits were also equipped with emergency lights with an expiry date of 2017, but which were still functioning.

The master wore a newer, orange immersion suit of the brand Aquata. This suit was made of seven-millimetre neoprene, size 205 (the largest size), and designed to keep the wearer warm for six hours in cold water without becoming chilled. It was manufactured in accordance with the EU MED Directive[16]. The suit was intended to be used without a lifejacket. The emergency light on this suit had an expiry date of 2027.

The fourth crew member was only equipped with an inflatable lifejacket and regular work clothes.

Footage from the diving survey shows a couple of lifebuoys and a smoke signal for a lifebuoy. The vessel was also equipped with an EPIRB, which was activated during the sinking. However, only the lifesaving equipment that was used by the crew or recovered after the incident has been possible to examine.

1.5.7 The barge

The barge being towed was named OSKAR and was registered and inspected in Finland under the name "ÖSKAR". It was due for a renewed inspection in April 2025. OSKAR was 38 metres long and 13 metres wide, and was authorised to carry 600 tonnes of timber. At the time, the barge was loaded with approximately 900 tonnes of timber. This resulted in the barge sitting lower in the water and the freeboard being reduced. Based on photographs, the freeboard[17] is estimated to have been around 0.5 metres. The barge was equipped with a diesel generator used to operate support legs and other equipment.

1.6 Survey and maintenance

1.6.1 Surveys

The vessel has been subject to regular surveys by the Swedish Transport Agency and the Swedish Maritime Administration since it was registered in Sweden in 1988, with the exception of the years 2020 to 2024 when the vessel was laid up.

Over the past 15 years, Swedish Transport Agency has carried out four hull and bottom inspections: 2011, 2016, 2019, and 2024. Notes from these surveys are recorded in the Transport Agency's SITS[18] system regarding the hull. In 2011, superficial rust was observed in the aft ballast tank, but according to the report, the frames were in good condition. In

[16] Directive 2014/90/EU of the European Parliament and of the Council of 23 July 2014 on marine equipment and repealing Council Directive 96/98/EC.

[17] Freeboard is the vertical distance between the waterline and the main deck.

[18] SITS – The Inspection and Supervision System of the Maritime and Aviation Department.

2016, it was noted that the bottom plate in the aft section on the port side was beginning to show thinner plates, measuring five to six millimetres in thickness.

After the shipping company took over the vessel, several measures were taken to make the vessel seaworthy and to renew the operating certificate, which had expired during the period when the vessel was not in use. The owner reactivated the vessel in EKAN[19] on 29 April 2024 and took the vessel to Öregrund Shipyard for a hull survey in the summer of 2024.

The hull survey was carried out without any remarks. The survey included, among other things, the thickness of the hull, measurements of the clearance between the propeller shaft and the rudder stock[20] bearings, as well as the bottom valves. The thickness measurements[21] did not show any significant deterioration of the plate thickness, and the clearances in the bearings were normal.

After the shipyard visit in 2024, the Swedish Transport Agency carried out further surveys; a seaworthiness and freeboard survey, as well as a check of the safety organisation on board. During the seaworthiness survey, two of the bilge alarms and the fire pump were checked without remarks. Several other deficiencies were noted. These deficiencies were rectified over time and a new operating certificate for the vessel was issued in July 2024. However, seven deficiencies remained, including the absence of a load line[22] and draught marks.

The owner recorded the latest self-inspection in EKAN on 28 May 2025.

1.6.2 Maintenance

In addition to the surveys, extensive renovation work was carried out during 2024. Most of the work was performed by the owner’s own staff. The engines and the accommodation were refurbished. One engine broke down and had to be replaced, the oil cooler for the gearbox was changed, the fuel tanks were cleaned, the fresh water tanks were rebuilt, the anchor winch was overhauled, a new autopilot was installed on the bridge, and new GPS and navigation systems were fitted. The ballast tanks were inspected and found to be rusty, but not so severely that any action was deemed necessary.

The shipping company was aware of previous water damage and therefore checked for leaks in the systems. All the tanks were filled and the respective pipe systems were inspected for leaks. According to the interviewees, no major leaks were found in the engine room or the storeroom.

During 2024, the bilge alarm in the storeroom had malfunctioned and raised alarms even though there was no water in the compartment. Therefore, in 2025, the company purchased three new bilge alarms, but they had not yet been installed. The crew stated that this task

[19] EKAN (self-inspection of vessels in domestic shipping) – The Swedish Transport Agency’s digital system for reporting self-inspection.

[20] Rudder stock – A structural element between the steering gear and the rudder on a vessel, whose function is to transmit rotational movement to achieve the desired rudder angle.

[21] Thickness measurement – A spot-check procedure in which a number of points, each about one square centimetre in size, on the hull are measured using ultrasound. During the most recent measurement, approximately 140 measurement points were taken across the entire hull.

[22] Load line – A marking amidships on the hull indicating the minimum freeboard to which the vessel may be loaded.

was noted on a work list prior to departure from Gävle on 28 May 2025. No one in the crew could confirm whether the alarm was functioning up until the sinking.

1.7 Organisational and management information

1.7.1 The operation

T. Ekstrand Sjötjänst AB carried out various types of contracting work in both Sweden and Finland, with maritime transport forming a significant part of its operations. At the time, the company owned several tugboats and barges and had around ten employees. The owner had extensive experience in marine contracting and, over the years, had owned several different vessels.

After the company acquired the vessel, it was used in late summer 2024 to tow timber from Rånön, outside Luleå, to Piteå. During the winter and up to May 2025, the vessel mostly remained stationary in Hörnefors and Gävle before returning to service in May 2025, when it undertook an assignment in the Stockholm area. From the end of April, the vessel was bearthed in Gävle. On 28 May, the vessel, together with the barge OSKAR, proceeded to the Bothnian Bay to resume previous timber towing operations, this time from Hindersön.

The company had experience operating in waters with inadequate depth information. They were aware of the risks around Hindersön and understood that they would need to navigate across very shallow waters. Similar operations had previously been conducted with the vessel. The company also received information about a navigable route, that had been surveyed by the client. SHK has no information regarding the date of the survey or the water level at the time the measurements were taken.

In the winter of 2024, another of the company's vessels, PAMPUS, ran aground outside Hörnefors and began taking in water. Due to the list, the goosenecks ended up below the waterline, allowing water to enter the engine room and accommodation. Unaware that the vessel remained aground, the crew abandoned it. The vessel partially flooded but remained aground and could be salvaged a few weeks later; however, due to extensive water damage, it was scrapped.

1.7.2 Safety management system

A safety manual was available for the vessel, describing the systematic approach to maritime safety on board. SHK has reviewed a digital copy of the manual, which was valid from May 2024. The manual contained a concise checklist for

- introduction of new employees
- handling of various emergency situations
- checklists for daily routines and bridge start-up
- maintenance schedule for machinery
- drill schedule including monthly evacuation drills
- risk assessment template
- deviation report

The document lacked images of equipment and more detailed descriptions of the checklists, as well as descriptions of the vessel's equipment, such as pumps and bilge alarms.

One of the checklists addressed grounding and water ingress. Another concerned the abandonment of the vessel. The grounding checklist stated that one should check if the vessel was taking in water and, if so, begin pumping out. It also stated that if the leak was serious, "the master should consider abandoning the vessel". The other checklist described how the vessel should be abandoned. When the master ordered the abandonment, everyone was first to put on immersion suits and lifejackets. Once this was done, the master was to inform the JRCC, and when all were dressed, the liferaft was to be launched. Only when everyone in the crew was safe was the master to enter the liferaft, and then "only if his own life is in danger; otherwise, he should remain on board." According to the crew, no drills had been carried out prior to departure.

1.7.3 The crew

The crew had come on board the vessel in the days prior to its departure from Gävle. None of them had registered any active sea days on the vessel in 2024. According to testimonies, however, all had worked on board during 2024, including when timber was transported from the Luleå archipelago to Piteå in late summer.

The master had worked at sea since the early 2000s. He had previously served as an able seaman, chief officer, and since 2019 as master on smaller vessels operating in domestic waters. Over the past six years, he had a total of just under 100 days registered as master on Swedish vessels. He held a valid medical certificate, a valid nautical qualification Class III, and an engineering certificate Class VIII. His basic safety training was no longer valid as it was more than five years old. In 2025, he had 30 registered sea days on the vessel.

The chief officer had begun his nautical officer training in the late 2010s and obtained his qualification, Ship's Officer Class V, in 2021 He had worked on the owner's various vessels, under both Swedish and Finnish flags. The chief officer held a valid medical certificate and a valid basic safety training certificate. In 2025, he had 30 registered sea days on the vessel.

Deckhand 1 had worked with vessels (mainly the company's own vessels) for the past eight years. In addition to crew duties, he was also involved in project management and administration within the company. He held a valid medical certificate and a valid basic safety training certificate. He had 30 registered sea days on board the vessel in 2025.

Deckhand 2 had been employed by the company during two different periods in recent years and had no previous experience from other shipping companies. He worked both ashore, carrying out refurbishment work on board while the vessel was berthed, and at sea. He had been trained by another crew member responsible for machinery, who was present when the vessel was commissioned after the company acquired it. According to testimonies, deckhand 2 was the member of the current crew with the most knowledge of the vessel's machinery and was responsible for the operation and maintenance of the onboard machinery. He held a valid medical certificate and valid basic safety training from Latvia. He had 60 registered sea days on the vessel in 2025. However, these were probably registered under the wrong year and most likely referred to 2024.

After the company purchased the vessel in 2024, it had been at sea for about 100 days, of which 30 days were in 2025. The seafarers' register listed four different masters registered on the vessel, two of whom were the current master and chief officer. Only one of the masters had registered sea days (10) during 2024. The remaining 100 sea days were registered in 2025.

Both the chief officer and deckhand 1 participated in the salvage operation when the vessel PAMPUS ran aground.

1.8 Meteorological information

SMHI[23] has provided weather information for the area. The relative water level at the nearby Strömören measuring station was, on the evening before the incident, just over one decimetre above normal water level (RH 2000). During the preceding week, the water level had varied between a maximum of three decimetres and a few centimetres above normal.

The wind in the Piteå/Luleå archipelago was west-north-westerly to north-westerly. From the evening of 31 May, the wind began to increase. The mean wind speed then remained at 6–8 m/s until 09:00 on the morning of 1 June. Gust speeds during the night and morning were between 9–12 m/s, with the highest values recorded between 03:00 and 06:00.

A rain area was present over the Bothnian Bay on the evening of 31 May but dissipated around midnight. Around Rödkallen, conditions were mainly dry, except for a small amount of rain measured between 04:00 and 05:00. It was overcast with complete cloud cover. At around 05:00, the cloud base was at approximately 500 metres. Visibility was good. The air temperature was about 8 °C. This information is based on weather analysis charts and observation data from the Rödkallen measuring station.

According to model calculations/forecasts, the surface water temperature was 5–7 °C. The closest measured water temperature was at Strömören quay (Luleå), where the temperature near the bottom was recorded at 05:00 as 4 °C (measurement depth not specified). At Furuögrund (north of Skellefteå), the surface water temperature was measured at 08:00 on 30 May and 2 June as 9 °C and 10 °C, respectively.

1.9 Further investigations

1.9.1 Search and examination of the wreck

When the JRCC had concluded its operation, the barge remained secured to the vessel. The towing wire prevented diving operations on the wreck, which could therefore only be carried out once the barge had been removed.

The Swedish Coast Guard conducted the first dives on 3 June. The purpose was to search for the missing crew member and to seal the vent pipes to the bunker tanks. The Coast Guard used both ROV[24]s and divers but was unable to locate the crew member.

In the following days, the police and the Coast Guard carried out several more dives. Visibility was about one to two metres. As the vessel was at a significant depth, the duration of each operation was short. On 6 June, the police assessed that the missing person was likely outside the vessel and the dives were discontinued.

Following a tip from a recreational diver, the police conducted another dive on 16 July. On this occasion, the missing crew member could be located and recovered. The crew member was found on the inside of the starboard door to the upper part of the engine room. He was

[23] SMHI – The Swedish Meteorological and Hydrological Institute.

[24] ROV (Remote Operated Vehicle) – A remotely operated underwater robot.

wearing an inflatable lifejacket, which had been inflated. There were no visible injuries on the body.

With the assistance of the police, SHK carried out two further diving surveys on 7 November 2025. During these dives, the port-side life raft was recovered. The life raft was examined, deployed, and found to be functioning correctly. The painter line, which had remained in the protective casing, measured just under 28 metres. The hydrostatic release units for both life rafts had activated, and the weak link for the starboard life raft had broken.

1.9.2 Stability analysis

To gain a better understanding of the vessel's stability characteristics, SALTECH Consulting AB carried out stability analysis, which are presented in a separate stability report. The following section summarises the key findings of the report.

Conclusions

There are some uncertainties regarding the input values for the calculations. Despite these shortcomings, the calculations provide an indication of the vessel's critical stability properties. The calculations show, among other things, that:

- the vessel's initial stability was soft, meaning it moved slowly in the sea, and was sensitive, for example, to water accumulating on deck
- if the vessel was ballasted aft, its initial stability and freeboard were significantly reduced and did not meet the standard stability criteria
- for stability to be completely lost, water had to accumulate on deck and create free liquid surfaces
- for this to occur, the vessel first had to have taken in a large amount of water, further reducing the freeboard
- the vessel had a low initial righting moment[25]. This low initial righting moment meant that the vessel was sensitive to external factors such as wind, waves, weight distribution, or water ingress, and responded slowly when righting itself.

The storeroom was the only compartment that was not checked during the night between 31 May and 1 June. Therefore, the calculations are based on the assumption that water entered the storeroom. The calculations show the following:

- If approximately 17 cubic metres of water enter the storeroom, the aft deck and the aftmost freeing ports will be level with the water surface.
- A hole in the hull of about 1-4 square centimetres is sufficient for this amount of water to enter the storeroom within six hours.
- The vessel's trim[26] is only marginally affected by the calculated amount of water.
- When the water surface is level with the aft freeing ports, water can begin to accumulate on deck and create free liquid surfaces, which drastically reduce the vessel's stability.
- At this stage, only a very small additional influence, such as from waves or weight distribution, is needed for the vessel to develop a permanent list.

[25] A vessel's righting moment is the force that acts to return a vessel to an upright position when it heels or deviates from its equilibrium state.

[26] A vessel's trim is the difference in draught between the bow and the stern, that is, how much the vessel inclines forwards or backwards along its longitudinal axis.

- If even larger quantities of water enter the storeroom, more water can accumulate on deck and cause the vessel to lose its stability completely.

Calculations and assumptions

As there was no stability booklet for the vessel, old steel drawings were used to create a model in the NAPA calculation software. In order to determine how much water needed to enter the storeroom before the vessel lost its stability, calculations were made for different degrees of filling of the compartment.

The stability calculations were carried out for three different scenarios:

- The vessel in intact condition and loading state according to crew statements: 50% bunker, 50% side ballast tanks, and the aft peak just over 80% filled.
- The vessel in intact condition with the same loading state as in point 1, but with the side ballast tanks also fully filled.
- The vessel as in the loading state in point 1, but with the storeroom gradually filling with water.

The following assumptions were made for the calculations:

- Water ingress occurred in the storeroom.
- To calculate the size of the damage, it was assumed that the damage occurred in connection with departure from Gåsören, i.e. six hours before the sinking.

Uncertainties in the calculations

There are several uncertainties to consider in the calculations. Primarily, the geometry of the model was based on limited drawing material. The inclining test was also carried out on the vessel as it appeared and was equipped nearly 50 years ago. Other uncertainties concern how much the vessel was ballasted and how the ballast was distributed. There is a total lack of information regarding the fixed ballast.

Water ingress in the storeroom

The calculations show that if just over 17 cubic metres of water enter the storeroom, the aft deck and the aftmost freeing ports will be level with the water surface. At this point, the vessel has no remaining freeboard at the stern. In this situation, the freeing ports risk letting in as much water as they let out. The vessel's trim at this stage has increased from the original approximately 0.7 metres to about 1.3 metres aft trim. This difference is barely perceptible to the crew, see Figure 16.

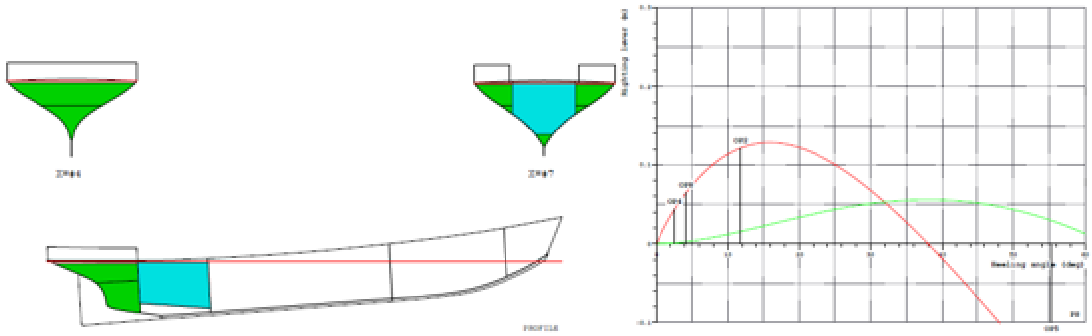

Figure 16. Excerpt from the stability report by SALTECH. The figure shows the vessel's floating position when 17 cubic metres of water have filled the storeroom. The red curve in the diagram indicates that the maximum righting lever is greatest, at 0.11 metres, a t 15 degrees of heel.

According to the calculations, the vessel's list is not significantly affected by the storeroom becoming flooded. The calculations show that as water begins to enter the storeroom, stability gradually deteriorates until there is no remaining freeboard at the stern. It is only when water starts to accumulate on deck, creating free liquid surfaces, that the vessel develops a permanent list. The towing of the barge had only a marginal effect on the vessel's trim.

1.9.3 Electronic tracks

The vessel's navigation computer could not be salvaged. Nevertheless, it was possible to determine the vessel's route from its AIS equipment.

SHK, together with the Swedish Transport Agency, has analysed information on course and speed transmitted by the AIS transponder up to the final position at 04:48.

The speed remained relatively constant after the vessel reached open water, which is consistent with the crew's statements. However, the variation in course over ground gradually increased from just before 03:00. A summary of the variation in course over ground during the last three hours is shown in Figure 17.

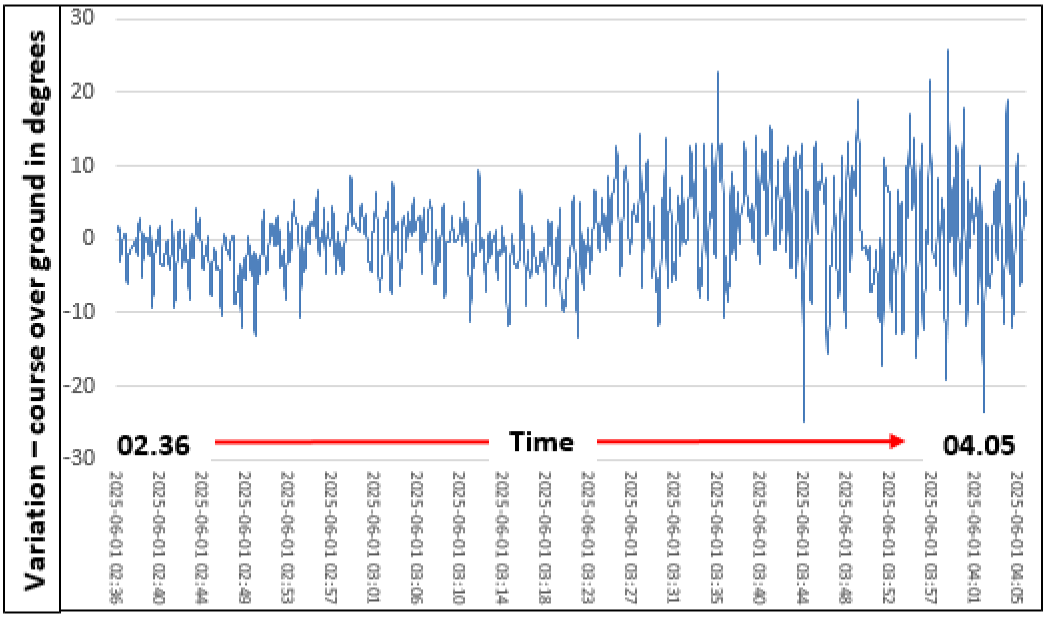

Figure 17. The diagram shows a gradual increase in the variation of the vessel's course over ground.
Source: Swedish Transport Agency. Annotations added by SHK.

During the final hour, the course variation increased to over 25 degrees, having previously been less than 10 degrees. A comparison of AIS data from the vessel's previous passages in the same area between 2024 and 2025 did not show the same variation in course over ground.

In addition to information on the vessel's position, SHK has received data from the Swedish Armed Forces indicating that the barge maintained a constant distance from the vessel but was positioned slightly further east. This was likely due to drift caused by the prevailing wind conditions.

1.10 Regulations

All vessels engaged in commercial shipping are subject to the Vessel Safety Act (2003:364). In order to operate a vessel with a length overall exceeding 15 metres in commercial shipping, a valid safety certificate is required. For the Swedish Transport Agency to issue a safety certificate, the vessel must meet the requirements set out in the Agency's regulations. The certificate remains valid indefinitely, but subject to certain conditions.

For vessels used in domestic shipping with a gross tonnage under 500, the Swedish Transport Agency's regulations and general advice on vessels in domestic shipping (TSFS 2017:26) apply. These regulations contain provisions on how vessels should be designed, equipped, loaded, maintained, inspected, and documented, as well as how systematic maritime safety and occupational health and safety work should be conducted. The regulations include several functional requirements regarding, among other things:

- buoyancy
- the impact of free liquid surfaces
- the ability to pump out water that leaks into the vessel
- how water should be drained if it accumulates on deck
- the requirement for markings on the hull to determine the vessel's floating position.

There must also be calculations or tests showing various loading conditions. There are no performance requirements for this category of vessel, nor is it required for the vessel to be equipped with a bilge alarm.

Once the vessel has received its safety certificate, it is the responsibility of the vessel owner to inspect the vessel and report their inspection in EKAN. In addition to the owner's inspections, the Swedish Transport Agency must carry out regular hull inspections.

How vessels should be manned is governed by other regulations: the Swedish Transport Agency's regulations on manning and the Agency's regulations on watchkeeping (TSFS 2012:67). According to these, the vessel did not require a specific decision regarding the safety crew.

2. Analysis

The vessel sank in open water and in relatively calm weather. In connection with the sinking, one of the four crew members on board lost their life.

The following analysis addresses two main questions:

- Why did the vessel sink?
- Why was the vessel not evacuated in time?

At the location where the vessel sank, there were no shoals and no other vessels with which it could have collided. There is nothing to suggest that the pull from the barge had a decisive impact on the sinking. SHK has not been able to carry out a complete examination of the vessel and has therefore based its assessment on a number of different damage hypotheses that could have led to water ingress into the vessel.

2.1 Why did the vessel sink?

2.1.1 Water ingress into the storeroom

Before the list occurred, the crew had not noticed any signs that something was wrong with the vessel or that it was taking in water. Nor did the crew observe any water in the accommodation or the engine room, which were two of the vessel's watertight compartments, during their attempts to correct the list. However, they never entered the vessel's third watertight compartment, the storeroom.

When the list was discovered, the crew observed water standing on the starboard aft deck, and more water risked being washed in by the waves. Given the moderate sea state, this suggests that the vessel's freeboard at the stern was likely close to zero at that time.

These circumstances strongly indicate that, already when the list was noticed, there must have been a significant amount of water in the storeroom. As the storeroom was a watertight compartment, large quantities of water could accumulate there. In the following sections, SHK sets out several possible causes as to how water could have entered the storeroom.

Thru-Hull fittings

The propeller shaft was the only known thru-hull fitting in the storeroom. The propeller shaft was housed in an oil-filled stern tube with sleeve bearings. The stern tube was sealed with both an outer and an inner seal. Had the seals to the stern tube leaked, water would gradually have replaced the oil inside. This would likely have caused vibrations and affected the main engine, and eventually led to a loss of speed. This does not correspond with the crew's statements or with the AIS information from the vessel. SHK therefore considers it unlikely that a fault in the propeller shaft and stern tube sealings caused the water ingress.

Pipe systems in the storeroom

In the storeroom, there were pipes for the ballast, bilge, and cooling water systems. The cooling water system was reportedly disconnected due to a previous leak in the engine room.

The ballast and bilge systems were partly interconnected with the bilge box in the engine room. These systems were only used after the crew had discovered that something was wrong. There are several indications that, by that time, water had already entered the vessel. It is therefore unlikely that a fault in the ballast or bilge system caused the water ingress.

Hull deficiencies

The vessel's hull was a 95-year-old riveted steel hull. A hull corrodes both on the inside and outside, but corrosion develops differently depending on where it occurs. For example, the rivets and hull plates corrode differently, as they are made of different steel grades.

Photographs of the hull show plates that were visibly corroded, but not remarkably poor. According to hull thickness measurement reports, the Swedish Transport Agency noted in 2016 that the bottom plates in the aft section were starting to become thin, "between 5–6 mm", but the most recent bottom inspection in 2024 indicated no significant deterioration in plate thickness. The photographs from that inspection are not detailed enough to allow an assessment of the hull's condition. Furthermore, thickness measurements do not account for localised corrosion, but only provide a general picture of the hull's condition.

There were conditions for internal localised corrosion in the keel of the storeroom; it was damp, above freezing, and there were plenty of concealed spaces, for example at frames and under fixed ballast lying directly against the hull. Depending on what the ballast consisted of, it could have promoted corrosion, but above all, it could have concealed any localised corrosion. A localised corrosion damage could have caused a localised weakening or a hole, which slowly filled the storeroom with water. With such an effect, however, the water ingress would likely have increased gradually over a much longer period, which should have been noticed by the crew.

If a rivet starts to fail, it usually begins with a small leak before the rivet comes loose. This is visible as rust streaks or "bleeding" on the outside of the hull. If a rivet in the bottom had come loose, it could have resulted in a hole in the hull with a diameter of between one and two centimetres. However, there are no remarks about poor rivets in the Swedish Transport Agency's bottom inspections. The photographs from these inspections showing the outside of the hull are not detailed enough to see individual rivets under the storeroom. In photographs from inside the keel space beneath the storeroom, a number of rivets can be distinguished. These do not appear to be significantly affected by corrosion. As only a few of the rivets are visible, it is not possible to determine whether some rivets were weakened.

External factors

The photographs taken by the Swedish Coast Guard at Gåsören indicate that the vessel had a draught exceeding 2.9 metres. It has not been possible to clarify whether this was the actual draught when the vessel called at Gåsören, or if it was already been affected by water ingress when the photograph was taken

Depth measurements showed that there were shoals in the area which posed a risk to the vessel. Although the depth along the route into Gåsören had been checked with an echo sounder, the vessel did not fully adhere to the marked channel, and it is likely that there were more shoals along the route than those that had been indicated.

There is therefore much to suggest that a grounding may have occurred in the area around Hindersön, even if the crew did not perceive it. The condition of the vessel and the aforementioned risks of localised weaknesses or poor rivets meant that a grounding could have been sufficient to cause minor damage. This likely resulted in water ingress, which subsequently gradually filled the storage compartment.

2.1.2 The water ingress was not detected

As the crew had not noticed any grounding, nor were aware that the vessel was taking in water, no inspection of all the vessel's watertight compartments was carried out, as prescribed by the vessel's post-collision routine.

During the troubleshooting, the engine room and accommodation were checked without any significant amounts of water being discovered. The storeroom was not checked, and since the towing wire ran across the aft deck where the access hatch to the storeroom was located, it was not easy to inspect the compartment.

The presence of water on the aft deck was an indication that the freeboard at the stern was close to zero and that the vessel was affected by water ingress. However, the crew never realised that the freeboard had been reduced.

Nor did the crew carry out any systematic troubleshooting to determine what might have caused the list. The bilge alarm in the storeroom did not sound on the bridge, but this was probably because it was not functioning, which was known to the crew. Had it been working, it would have provided the crew with early information that the vessel was taking in water and where. Taken together, this meant that the water ingress in the storeroom went undetected.

When the list was noticed, the stability analysis shows that around 17 cubic metres of water had already entered the storeroom. Even if the crew had discovered the water ingress when the list appeared, it cannot be said with certainty whether the sinking could have been avoided. However, the crew would have had more time to prepare for an evacuation if they had been aware of the water ingress.

It has not been possible to determine when the water ingress began. The variation in course over ground noted two hours before the sinking suggests that a larger amount of water was already present in the storeroom at that time. In the stability analysis, the size of the damage has been estimated on the assumption that it occurred in connection with departure from Gåsören. As the size of the damage is unknown, however, the water ingress may have been ongoing for a longer period. The vessel's draught at the time of loading, which exceeded

2.8 metres according to the Swedish Coast Guard's photograph from the site, is an indication of this.

2.2 Why was the vessel not evacuated in time?

When the crew discovered that the vessel was listing, it was already close to completely losing its stability. From that moment, barely 40 minutes passed before the evacuation was initiated. During that time, the crew was entirely focused on resolving the problem with the list. From the start of the evacuation until the vessel sank, it took approximately 10 minutes.

2.2.1 The crew did not realise that the vessel was already sinking

As previously described, the crew had not realised that the vessel was taking in water, despite clear indications that the vessel was in a serious condition. The gravity of the situation evidently came as a surprise to the crew and created a sense of considerable stress. The perceived stress affected their situational awareness, which in turn made it more difficult to manage the situation appropriately. The crew's handling of the incident is also considered to have been further complicated by a number of additional factors:

- The organisation on board.
- The crew's knowledge of the vessel.
- Prior experience.

The master is responsible for all critical decisions on board, such as evacuation. Given that the crew was small and knew each other well, decisions were likely made more through collective agreement. When the crew initially gathered on the bridge, what needed to be done was discussed jointly. The chief officer and deckhand 2 carried out the measures, while the master and deckhand 1 remained on the bridge. At that time, deckhand 1 mentioned, among other things, when the vessel should be abandoned and how it should be done: when the goosenecks were underwater and by swimming to the barge. Deckhand 1's statement was not challenged by the master or the rest of the crew and became the guiding principle.

Another factor affecting the crew's ability to take appropriate action was their knowledge of the vessel. Deckhand 2 was the only person on board with knowledge of the machinery. In addition, the vessel's stability characteristics were known only through practical experience. The crew therefore could not know how the vessel would react to water ingress or how critical the situation was when water began to accumulate on deck. The fact that changes in the vessel's trim were only marginal probably contributed to the crew never intuitively associating the list with the vessel becoming heavier at the stern.

A further decisive factor was the experience that parts of the crew had from the sinking of PAMPUS, of which also the others were aware. These experiences led the crew to assume that the sinking process would be similar and that they therefore had time to try to resolve the problem with the list. Furthermore, the crew on PAMPUS had successfully evacuated to a barge, which became the guiding principle for how the evacuation would be carried out this time as well. However, since the incidents were not comparable, this experience gave the crew a false sense of security. PAMPUS was aground, there was ice, and the vessels were not identical.

As previously described, the crew experienced significant stress. The master has stated that he tried to evaluate different options for resolving the problem with the list while simultaneously maneuvering the vessel, which likely also meant a high workload. The measures taken were solely aimed at correcting the list. No preparations for evacuation were made, no distress call, the life rafts were not launched, and the crew did not don their personal lifesaving equipment.

It is natural for a person in a stressful situation to become deeply focused on solving the immediate problem, which aligns with a "fight or flight" response. This is an automatic physiological reaction intended to quickly counter an immediate threat, but which in turn impedes thoughtful and forward-looking management of the overall sequence of events.

The stress experienced by the crew negatively affected their situational awareness. As a consequence, the crew was not able to adequately evaluate what was happening to the vessel. The workload also became very high, and they became fixated on trying to solve the most obvious problem, which was the list. Therefore, the evacuation routine was not initiated until a very late stage, when it was obvious to the crew that the vessel was sinking.

2.2.2 The execution of the evacuation

Once the crew had decided to abandon the vessel, the list increased so rapidly that the evacuation procedure became difficult to carry out. Of the life rafts, only the one on the port side was accessible, but it could not be launched in the usual manner due to the now severe list, which also made it difficult to move around the vessel.

Only two of the crew members managed to put on immersion suits before the vessel lay completely over on its starboard side. The master, who had made the distress call, just managed to get out from the bridge and then released the lashing on the life raft. Instead of launching the life raft, he decided to don his immersion suit. Deckhand 2, who was the last to reach the bridge, was offered a suit but chose only to put on a lifejacket. According to procedure, all crew members should have put on personal lifesaving equipment during an evacuation, but this did not happen. This indicates that the crew had not sufficiently practised evacuation or tried out their personal lifesaving equipment. Furthermore, it was not ensured that all crew members donned their personal lifesaving equipment.

From the moment the crew realised the vessel was going to founder and until it sank, less than ten minutes elapsed. The crew perceived this time as very short, which was likely due to a significant stress response, which in turn negatively affected their ability to act.

2.2.3 After the vessel was abandoned

Three of the crew members quickly made contact with each other shortly after the vessel sank, but deckhand 2 was missing. The three survivors gathered in the water and searched for the missing person, but after a while abandoned the search to make their way to the barge. When they reached the barge, the chief officer informed SOS Alarm that one person was missing.

Deckhand 2 was later found by divers in the upper part of the engine room. None of the surviving crew members have been able to explain why he was there. In the recorded emergency call, it can be heard that the crew, in connection with the master's distress call, shouted for deckhand 2 to come up. It is likely that deckhand 2 was then on deck after having carried out several actions to try to correct the list. Deckhand 2 was last seen by the other crew members when everyone was assembled on the bridge deck and he was standing furthest forward.

After the vessel had been lying completely on its side for a few minutes, it sank rapidly in the final stage. The port engine room door was probably left open, which created an opening down into the vessel when it was lying on its side. Somehow, deckhand 2 ended up in the upper part of the engine room, most likely during the final phase of the sinking. The door to the engine room was probably shut closed when the vessel rose almost vertically by the stern before it sank.

2.3 Safety management

Since the vessel was registered in Sweden, it has undergone regular surveys by the Swedish Maritime Administration and the Swedish Transport Agency. During these surveys, the vessel was deemed suitable for the type of traffic it was used for. The most recent survey in 2024 also covered the vessel's safety organisation. The vessel had thus undergone the prescribed supervision.

The systematic maritime safety work was described in a vessel-specific safety manual. The manual was not fully completed but included key elements such as induction, drills, and emergency procedures for, among other things, evacuation and grounding. The vessel was equipped with relevant lifesaving equipment; the life rafts had recently undergone annual servicing and were operational, as were the EPIRB, radio, and AIS system. The vessel was fitted with personal lifesaving equipment and had established emergency routines. Despite this, neither the routines were followed nor was all equipment utilised during the course of events.

In order for the crew to become familiar with the vessel's procedures and to be able to apply them practically in an emergency situation, it is necessary to carry out drills. The purpose of these drills is also to ensure that the procedures are appropriate and that the equipment works as intended. This must be done continuously so that the crew always has the proper conditions to handle an emergency situation.

It has not been possible to determine to what extent the training and drills described in the vessel's safety manual were actually carried out on board. However, the crew's actions during the critical phase indicate that they did not have sufficient preparedness to handle the situation they faced.

Against this background, there is reason for the shipping company to take measures to strengthen the crew's knowledge of the vessel's equipment and systems, as well as their ability to act in emergency situations.

2.4 The rescue operation

The rescue operation was initiated immediately after the first alert, with both sea and airborne units dispatched to the scene of the accident. When the first units arrived on site, they attended to the crew. An extensive search operation was conducted involving a large number of units. As it later emerged that the missing person was still inside the vessel at a depth of 40 metres, there was no possibility of rescuing him. SHK has therefore not conducted a more detailed analysis of the rescue operation.

3. Conclusions

3.1 Findings

a. The vessel was 95 years old.
b. The shipping company had acquired the vessel one year prior to the accident and had used it for one season for towing operations.
c. In 2024, the Swedish Transport Agency had deemed the vessel seaworthy and issued a new operating certificate.
d. The Swedish Transport Agency had carried out bottom, seaworthiness, and freeboard inspections, as well as an inspection of the vessel's safety organisation.
e. The vessel had seven outstanding deficiencies, including the absence of draught marks and a freeboard mark.
f. The bilge alarm in the storeroom was not functioning and was to be replaced
g. The crew had not practised abandoning the vessel since they last signed on.
h. The vessel was to tow a timber barge from Hindersön to Piteå. The waters around Hindersön were shallow and the depth information was unreliable.
i. A route had been prepared, but the vessel partially deviated from the marked route.
j. After departing from Hindersön and reaching deeper water, the crew informed the company that had surveyed the fairway that the passage had gone well and that they had not experienced any grounding.
k. Approximately six hours after leaving Hindersön, the crew discovered that the vessel had developed a list and that water was accumulating along the starboard walkway on the aft deck.
l. The crew attempted to pump out water from the port ballast tank, but when the ballast pump was started, the vessel's power supply was temporarily cut.
m. The crew managed to restore power but made no further attempts to start the ballast pump.
n. Initially, no actions were taken to prepare for evacuation.
o. Approximately 40 minutes after the crew discovered the list, the master made a distress call to JRCC on the vessel's VHF radio.
p. Prior to abandoning the vessel, the crew assembled aft on the bridge deck.
q. Only one crew member managed to don their immersion suit correctly. Two crew members donned their suits inadequately, and the fourth only put on an inflatable lifejacket.
r. The vessel heeled over onto its starboard side and sank stern first.
s. When the vessel sank, all those on board were pulled some way underwater.
t. When the crew resurfaced, one crew member was missing.
u. The remaining crew gathered in the water and swam together to the barge, where they climbed aboard.
v. Three crew members were rescued by an SSRS vessel after just over an hour on the barge.
w. One crew member lost their life.

3.2 Causes of the accident

The direct cause of the foundering was that a large amount of water entered one of the vessel's watertight compartments, most likely as a result of a minor hull damage. As the bilge alarm in the storeroom was out of order, the crew did not detect the water ingress.

Contributing factors to the accident:

- No systematic troubleshooting was carried out to determine what might have caused the list.
- The crew had limited knowledge of the vessel's technical systems and stability characteristics.
- The high workload and stress during the incident affected the crew's situational awareness.

Taken together, this meant that the crew did not realise that the vessel was taking in water and was in the process of sinking. As a result, evacuation was initiated at a late stage and the crew did not have time to prepare for a safe evacuation.

4. Safety recommendations

The shipping company T. Ekstrand Sjötjänst AB is recommended to:

- Take measures to strengthen the crew's knowledge of the vessel's equipment and systems, as well as their ability to act in emergency situations (see section 3.3). *(SHK 2026:09 R2)*

The Swedish Accident Investigation Authority respectfully requests to receive, **by 04 September 2026 at the latest,** information regarding measures taken in response to the recommendations included in this report.

On behalf of the Swedish Accident Investigation Authority,

Krisitna Börjevik Kovaniemi Per Jakobsson