Statens haverikommission

MESHKA – grounding in Öresund

The Swedish Accident Investigation Authority has investigated a marine accident that occurred in Öresund, Skåne County, on 31 May 2025

01 June 2026

Final report
SHK 2026:10e

About 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, organisations, 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.

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Content

Summary

On 31 May 2025, the bulk carrier MESHKA was transiting southbound through the Sound (Öresund) on a voyage from Tarragona in Spain to Vysotsk in Russia. The vessel was in ballast. The crew were navigating using an electronic chart and navigation system that lacked detailed chart coverage of the Sound. Only a small-scale chart cell was installed in the system. The route through the Sound was planned directly across a shoal area off Landskrona. During the passage, the bridge team also failed to notice that several navigational marks they passed were missing from the electronic charts onboard.

The ship reporting system in the Sound (SOUNDREP) only contacted the vessel once it had already entered shallow water, at which point grounding was unavoidable. The grounding resulted in only minor damage. The vessel was refloated after discharging ballast and being towed, and was subsequently able to continue its voyage.

The accident can also be viewed in the context of an increasing trend in which many vessels are passing through the Sound for the first time, with crews lacking previous experience of the area. This was also the first time MESHKA and her crew had transited the Sound. This places particularly high demands on voyage planning being carried out and reviewed thoroughly.

Causes of the accident

The accident was caused by inadequate voyage planning. As a result, the ECDIS used by the bridge officers for navigation lacked detailed chart cells (ENC) for the Öresund. Contributing factors included:

- the bridge officers' insufficient knowledge of the ECDIS and its limitations
- deficiencies in adherence to the vessel's navigation procedures
- shortcomings in bridge teamwork and lookout procedures
- delayed intervention by the ship reporting system.

The underlying causes of the accident were deficiencies in the company's implementation of the safety management system and its adherence on board, as well as shortcomings in the chart ordering process.

Safety recommendations

The shipping company Makareb Shipmanagement DMCC is recommended to:

- ensure that the vessel's crew have sufficient knowledge of the safety management system and that the existing procedures and checklists are used correctly (see section 3.2.3). *(SHK 2026:10 R1)*

The ECDIS manufacturer Danelec is recommended to:

- inform ECDIS users of the limitation and update the information in the manual (see section 3.1.3). *(SHK 2026:10 R2)*

The chart provider Elcome is recommended to:

- take measures to clarify when available chart cells (ENC) have been deselected along a planned route (see section 3.1.1). *(SHK 2026:10 R3)*

The Swedish Transport Agency is recommended to:

- consider whether there is reason to promote the implementation of international regulation imposing requirements on chart supplier software (see section 3.1.1*)*. *(SHK 2026:10 R4)*

The investigation

SHK was notified on 1 June 2025 that a grounding involving the dry bulk carrier MESHKA, with IMO number 9588380, had occurred in Öresund (henceforth the Sound), on 31 May 2025 at 09:54.

The accident has been investigated by SHK, represented by Kristina Börjevik Kovaniemi, Chair, Björn Ramstedt, Investigator in charge and Jörgen Zachau, Operations Investigator.

Linda Eliasson participated as coordinator for the Swedish Transport Agency, and Ulf Holmgren as coordinator for the Swedish Maritime Administration. Panama, as the flag State, has been notified of the incident.

Investigation material

Interviews have been conducted with, among others, the crew, representatives of the shipping company, the classification society, product manufacturers and the authorities responsible for traffic monitoring in the Sound.

A site visit was conducted on board the vessel on 5 June 2025, while it was still aground.

A technical processing of the audio files from the ship's voyage data recorder has been carried out with support from Magnic AB.

A fact finding presentation meeting with the interested parties was held on 3 December 2025. At the meeting SHK presented the facts discovered during the investigation, available at that time.

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Ship particulars	
Flag/register	Panama
Identification IMO identification/ call sign	9588380/3E6865
Type of ship	Bulk carrier
New building shipyard/year	Qidong Daoda Heavy Industry, 2011
Gross tonnage	23,460
Length, over all	180 metres
Beam	31 metres
Draft, max	7.21 metres
Deadweight at max draft	35,829 ton
Main engine, output	7,900 kW
Propulsion arrangement	One propeller with fixed blades
Lateral thruster	No
Rudder arrangement	Semi-spade rudder
Service speed	12 knots
Ownership and operation	Ownership: Meshka Shipping Co. Shipping company: Marakeb Shipmanagement DMCC
Classification society	DNV
Minimum safe manning	15 persons

Voyage particulars	
Ports of call	Tarragona, Spain to Vysotsk, Russia
Type of voyage	International
Cargo information/passengers	Ballast condition
Manning	24 persons

Marine casualty or incident information	
Type of marine casualty or incident	Serious marine casualty
Date and time	31 May 2025, at 09:56 LT.
Position and location of the marine casualty or incident	55° 52,01’N 12° 46,02’E
Weather conditions	Westerly wind 3-7 m/s, wave height 0,2 metre, westerly current, good visibility
Other factors	After the incident, the ship has been renamed to RAHMA
Consequences	
- Personal injuries	No
- Environment	No
- Vessels	Yes

1. Factual information

1.1 Description of the course of events

The bulk carrier MESHKA was on a voyage from Tarragona in Spain to Vysotsk in Russia. It was in ballast condition, i.e. without cargo. On the evening of 30 May 2025, the vessel anchored east of Skagen and bunkered fuel. The voyage towards the Sound was resumed at around half past nine that evening. The following morning, the vessel had reached the traffic separation scheme between Helsingör and Helsingborg. The vessel's route was planned to follow the traffic separation scheme, then continue east of the island of Ven, proceed into the Flint channel under the Öresund Bridge, and finally out into the Baltic Sea. The route up to the grounding site is shown in figure 1.

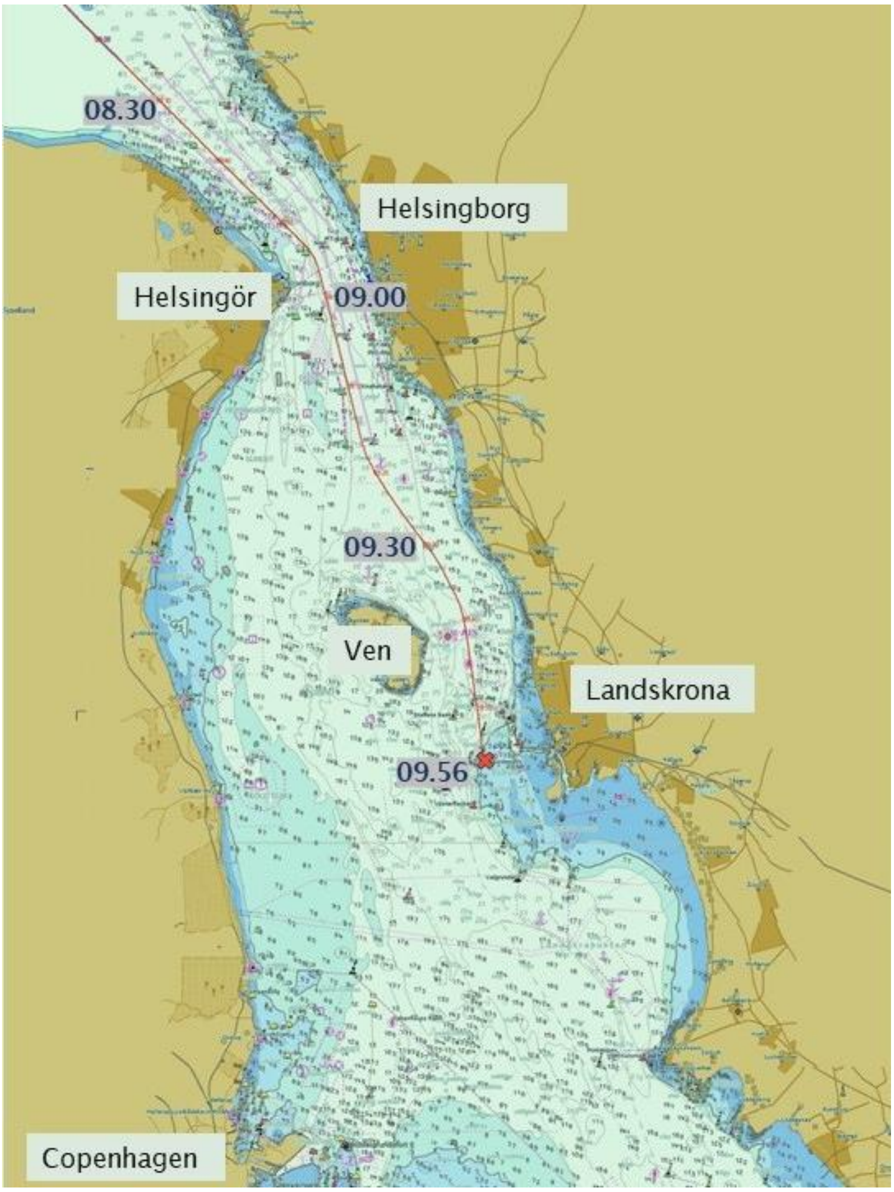

Figure 1. Chart of the Sound with MESHKA's track indicated. © Swedish Maritime Administration No. 26-00511. Annotations added by the Swedish Accident Investigation Authority (SHK).

The master arrived on the bridge at 07:30. He assumed responsibility for the vessel's navigation when the chief officer was relieved by the third officer at 08:00. When the vessel entered the traffic separation scheme at 08:30, there were three persons present on the bridge:

- The master, who was responsible for the navigation and handling of the vessel.
- The third officer, who had assumed the role of lookout and was to report observations, while also assisting with navigation using the vessel's technical navigational aids.
- The able seaman, who had been assigned the task of steering the vessel manually according to the master's instructions.

For the passage through the Sound, detailed electronical navigational charts (ENC) were missing in the vessel's ECDIS[1]. As a result, navigational marks and detailed depth information were not displayed in the chart image presented by the ECDIS.

The third officer had the bridge watch and assisted the master with navigation and lookout duties. The vessel maintained a speed of approximately 12 knots while proceeding south through the Sound and had passed the traffic separation scheme at 09:15. Thereafter, the vessel continued southwards, east of the island of Ven. At 09:40, the vessel passed half a nautical mile[2] east of a virtual AIS[3] buoy (M8) intended to separate northbound and southbound traffic in the Sound. A virtual buoy is a digital navigational mark represented by an AIS signal. The signal is received by the AIS receiver. It can be displayed as an AIS target on the vessel's electronic chart and radar systems. Figure 2 shows that the AIS buoy was visible on MESHKA's navigation display.

[1] ECDIS (Electronic Chart Display and Information System) – An electronic nautical chart that also displays information from the vessel's various sensors, such as position and course.

[2] Nautical mile – 1 852 meters.

[3] AIS (Automatic Identification System) – A maritime safety system used to identify and track a vessel with equipment that transmits a radio signal.

Figure 2. The image shows the chart in MESHKA's ECDIS after the grounding. The ENC is SE2BHS1C, which was the ENC active in the ECDIS system at the time of the grounding. The yellow circle marks the virtual AIS buoy. The image from MESHKA's ECDIS was taken by the Swedish Transport Agency's on-call ship inspector 31 May 2025. The image has been edited by SHK.

Southbound traffic is recommended to pass west of the buoy and northbound traffic east of the buoy, as is clearly indicated on the chart. According to the Swedish Maritime Administration's pilot area manager, it is extremely uncommon for southbound vessels to pass east of the AIS buoy.

The vessel continued east of the shallow area known as Staffan's shoal (*Staffans bank*), located off Landskrona. According to the pilot area manager for the Malmö pilot district, it is not normal practice for southbound vessels to pass east of the Staffan's shoal buoy.

At 09:53 hrs, on a southerly course, the vessel passed west of the north cardinal mark that marks the shoal area west of Landskrona and shortly thereafter entered shallow water. At the same time, the master observed a port lateral mark slightly ahead of the vessel on the starboard side and noted that it was missing from the vessel's ECDIS. Shortly afterwards, the ECDIS gave an alarm because the vessel was approaching the 10-metre depth contour. The alarm was, however, acknowledged without any action being taken.

The master observed additional navigational marks around the vessel and asked the third officer whether he had seen them, which he had not. Initially, the bridge team did not understand why the navigational marks were missing from the vessel's ECDIS.

The master realised that the vessel was heading towards a shoal area and ordered the able seaman to apply 20 degrees of starboard rudder while at the same time reducing the propulsion engine revolutions. Shortly thereafter, the vessel ran aground at a depth of 3.2 metres. The vessel's track up to the grounding position is shown in figure 3.

Figure 3. The image shows the grounding position with the plotted track. © Swedish Maritime Administration 26-00511. Annotations added by SHK.

At 09:56 hrs, an operator at the ship reporting service, SOUNDREP[4], called up MESHKA and warned that the vessel was heading towards shallow water. SOUNDREP instructed the master to alter course to starboard. At the time of the call, however, the vessel had already entered shallow water and the first bottom contact occurred while the conversation with SOUNDREP was ongoing. Shortly afterwards, the vessel came to a complete stop and remained aground, see figure 4.


Figure 4. The image shows MESHKA after the grounding.

[4] SOUNDREP – A ship reporting system (SRS), which is mandatory for all vessels over 300 gross tonnage operating in the Sound. The purpose of the ship reporting system is to enhance safety in the Sound.

1.2 Damage to the ship

Minor damage occurred to the hull (amidships) during the grounding. In addition to long scrape marks in the paintwork, a localised dent of up to 3 mm occurred in the bottom plating. There were also small cracks at the outer edges of the propeller blades and the rudder, which most likely arose during the grounding. The damage to the propeller blades was repaired by divers while the vessel was berthed in Landskrona.

1.3 Place of occurrence

The waters of the Sound are divided into Swedish and Danish territorial waters. Until 1857, Denmark levied a toll on all traffic passing through the Sound. However, in 1857 the Sound Treaty was concluded, abolishing these tolls and thereby granted the right of free passage for merchant vessels, but in practice also for naval vessels. This means that vessels may pass freely through the Sound and there is no requirement to engage a pilot. However, for oil tankers with a draught exceeding 7 metres, chemical and gas tankers, as well as vessels carrying nuclear fuel, it is recommended to take a pilot when passing through the Sound.

A vessel approaching from the north first passes two traffic separation schemes that regulate northbound and southbound traffic between Helsingör and Helsingborg. South of the traffic separation scheme, vessels may sail on either side of the island of Ven and then continue in either Swedish or Danish territorial waters. In the area east of Ven, half a nautical mile[5] from Haken lighthouse, there is a virtual AIS buoy, as mentioned in section 1.1.

Maritime traffic in the Sound is monitored via the ship reporting system SOUNDREP, which provides information services. SOUNDREP is located in Malmö. Maritime traffic is monitored by radar and AIS[6]. Vessels over 300 gross tonnage or more, entering the area are required to report in accordance with procedure to SOUNDREP at designated reporting points south or north of the Sound, respectively. Among other things, vessels must state both their intended route and draught. MESHKA had reported a maximum draught of 7 metres to SOUNDREP. The majority of the information can be pre-notified digitally, but vessels are required to contact SOUNDREP by VHF radio when entering the area.

On the Danish side, vessels proceed southwards through the Drogden Channel outside Copenhagen. On the Swedish side, vessels proceed down to the Flint Channel, which passes under the Öresund Bridge. Both fairways are dredged to a depth of 8 metres. The fairways converge at the latitude of Falsterbo.

The sailing directions[7] for the Sound state that the maximum permitted draught is 7.2 metres. The same draught restriction applies to piloted vessels in the Flintrännan. At the time of the incident, MESKHA's maximum draught was 7.21 metres.

Vessels of MESHKA's size pass through the Sound daily. According to information from the SOUNDREP, the number of vessels transiting the sound for the first time has increased in recent years, which may be related to the current sanctions against Russia.

[5] Nautical mile – 1 852 metres.

[6] AIS (Automatic Identification System) – System for identifying and tracking a vessel.

[7] NP 18, Öresund Baltic Pilot 1, § 5.153.

1.4 Ship particulars

MESHKA was built in 2011 in China at the Qidong Daoda Heavy Industry shipyard. The vessel was operated by Marakeb Shipmanagement DMCC, based in Dubai, United Arab Emirates, and owned by Meshka Shipping Co. MESHKA was classed by DNV. The vessel was 180 metres long and 31 metres wide.

The current owner took over the vessel in 2021. It was registered under the flag of Panama. MESHKA operated in various areas around the world without fixed routes, in so-called tramp service. This was the first time the vessel had passed through the Sound. After the grounding, the vessel's name was changed to RAHMA.

The propulsion consisted of a two-stroke, five-cylinder main engine with an output of 7,900 kW, which was directly coupled to a fixed-pitch propeller shaft. The vessel had five cargo holds for bulk cargoes, and a deck crane was positioned on the centreline between each cargo hatch. The four deck cranes were used for cargo operations.

On the voyage in question, the vessel was in ballast and the displacement[8] was 24,444 tonnes. At the time of the grounding, the vessel had a stern trim[9] of 2.21 metres, with a forward draft of 5 metres and an aft draft of 7.21 metres.

1.4.1 Description of equipment and systems in relevant parts

At the front of the bridge was a console with the main instruments for operating the vessel, see figure 5.

Figure 5. Image from inside MESHKA's bridge. A person in the image has been edited out by SHK.

[8] Displacement – The weight of the water displaced by the ship, which corresponds to the ship's total weight.

[9] Trim – The difference between the vessel's forward and aft draught.

On the centreline was the steering console for manual steering and autopilot. In the ceiling above the steering console was a panel with a rudder angle indicator, rate gyro[10], and a slave display for the echo sounder, which showed depth data. To starboard of the steering console was the control lever for the main engine's revolutions. There were also two screens, one connected to the primary ECDIS and the other to an S-band radar[11]. To starboard of the screens was a VHF radio for communication. The X-band[12] radar was positioned to port of the steering console.

At the aft end of the bridgehouse, there were workstations partitioned off with curtains. Among these was a planning station for the ECDIS, as well as a computer with internet access. A chart ordering programme was installed on the computer. The main panel for the echo sounder was also located here.

The bridge had open bridge wings with control stations that could be used when manoeuvring in port.

1.4.2 Voyage data recorders

The vessel was equipped with a Voyage Data Recorder (VDR), which is a type of data logging system that, among other things, recorded information from the X-band radar, certain engine data, gyro, echo sounder, and audio recordings from the bridge.

Data from the incident were recorded in the VDR system and have been analysed by SHK.

From the audio recordings, SHK noted that communication between the bridge team members was sparse. The master gave helm orders and courses to the able seaman, but communication between the master and the third officer was sporadic until the master noticed the navigational marks that were not included in the ECDIS. Shortly thereafter, the vessel ran aground.

1.4.3 ECDIS

The ECDIS was type-approved by the classification society DNV and met the IMO's[13] performance standards. The primary ECDIS was mainly used for the vessel's navigation. The secondary system was normally used as a planning station. The ECDIS had the capability to receive radar images from the radar systems, so-called radar overlay.

The ECDIS was manufactured by Danelec (version DM800E). The company discontinued the production of ECDISs in 2021 in order to focus on other products for the maritime industry. However, Danelec still provides user support to existing customers.

The ECDIS was constructed with an internal chart database, the System Electronic Navigational Chart (SENC). ENCs could be added to or removed from the database, which was originally empty, as required. The system issued an alert for underzooming (underscale) when the chart was too far zoomed out, as well as when details in the chart data were missing. If there was a complete lack of chart data for an area the vessel was passing through, the system also alerted for this. The bridge officers had completed general ECDIS training at an accredited training centre. In addition, they had undergone familiarisation training for the ECDIS on board. The training was carried out in connection with crew

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[10] Rate gyro – Instrument indicating the vessel's rate of turn.

[11] S-bandradar – Operates at a wavelength of 10 cm.

[12] X-band radar – Operates at a wavelength of 3 cm.

[13] IMO (International Maritime Organisation) – A UN agency for international cooperation on the rules and practices governing safety at sea.

changes on the vessel together with each relieving officer, and followed a two-page checklist. The checklist covered, among other things, how the voyage plan and the chart inventory were to be checked to ensure that the ENCs required for the voyage were correct, how ENCs were updated, and how new ENCs were ordered.

Data from the incident were stored in the ECDIS and have been analysed by SHK.

1.4.4 The chart provider

Previously, ECDIS were updated using storage media that were sent out to the vessels, such as CD-ROMs and USB drives. This was done partly because there was limited internet connectivity on board the vessels. However, developments have since progressed, and today chart updates are downloaded directly from the internet.

To enable the vessel to easily obtain chart updates and to order new ENCs and the nautical publications required for a voyage, a chart-ordering program, Elcome Challenger ENC Chart Ordering System, was used. The program was installed on a dedicated chart computer with internet access. According to Elcome, the company that produces the software, this chart application had been installed on just over 1,000 vessels worldwide. Several subscription service options were available from the company. On MESHKA, the ENCs needed for each voyage were ordered individually. Through the chart ordering programme, chart cells distributed by the UK Hydrographic Office (UKHO), Admiralty[14] Digital Chart Catalogue, were ordered and downloaded.

In order to sell material from the UKHO, the chart supplier must meet the UKHO's criteria, which include, among other things, a requirement that the chart reseller be ISO 9001[15] certified. The UKHO imposes no requirements regarding the functionality or design of the chart ordering software. Elcome operates globally and is a member of the Chart and Nautical Instrument Trade Association (CNITA), an association of suppliers of ENCs, nautical publications, compass manufacturers, and compass adjusters. Elcome is approved as a supplier of nautical publications and ENCs by the vessel's flag state, Panama.

Users of the chart ordering software could select which ENCs to order, and the programme included a register of the ENCs that were already present in the vessel's ECDIS. Weekly chart updates for the ENCs could also be downloaded using the software.

There was a function in the software that controlled which scale of ENCs would be ordered, see figure 6.

[14] UK Hydrographic Office, Admiralty Digital Chart Catalogue – The UK Hydrographic Office (UKHO) is the United Kingdom's authority responsible, among other things, for distributing electronic and produce printed charts.

[15] ISO 9001– An international standard for quality management systems.

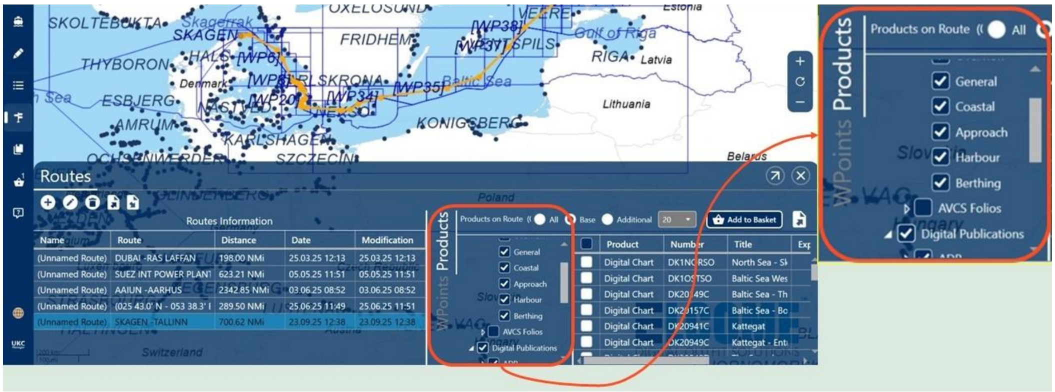

Figure 6. The image shows a section of the chart-ordering program. In the red circle, options for chart scales that can be ordered are listed. The planned route is shown in the chart display of the chart-ordering program. Elcome© Annotations added by SHK.

In the advanced system settings, the user could also choose to completely hide detailed ENCs in the software. According to the chart providing company, this feature was introduced after users had requested the ability to avoid accidentally ordering large scale charts for, for example, a port, simply because the planned voyage passed close to the port.

The bridge officers and the shipping company have stated that they have previously experienced problems downloading certain ENC and have had to request additional items such as the associated licences, which were sent separately by e-mail.

The investigation has reviewed chart ordering software from other suppliers. In these softwares, unlike the programme currently under investigation, the deselected ENCs along the route are always listed when a new order for ENCs is placed.

1.4.5 The voyage planning process

For the planning of a voyage, several sub-steps had to be carried out. The second officer was responsible for preparing the voyage plan. The overall process included the following steps:

- Updating existing ENCs and supplementing with new ENCs in ECDIS.
- Adjustment of the depth parameters in ECDIS.
- Planning the route in ECDIS.
- Review and validation the route in ECDIS.
- Preparation a voyage planning document.
- Review the voyage planning.

When all steps in the process had been completed and the voyage planning had been approved by the master, the route could be activated and the voyage commenced. Each step in the process is described in more detail below.

Updating and ordering Electronical Navigational Charts

Based on the programme's internal route database, an approximate route between the specified ports was generated. Along the proposed route, the chart ordering software's chart display showed the ENCs that covered the relevant areas. The ENCs were also listed beneath the chart image.

The second officer downloaded the ENCs and corresponding licences required for the voyage and saved them onto a USB flash drive. The chart data was then uploaded into ECDIS.

Setting of the depth parameters in ECDIS

In order for ECDIS to present depth information appropriately and to generate alarms if the vessel approached shallow areas, the depth parameters needed to be set correctly. The relevant settings were specified in the vessel's checklist "ECDIS safety parameter setting". This checklist was based on the document "ECDIS voyage safety parameters" in the vessel's safety management system.

In the voyage planning for the voyage in question, several depth parameters in the ECDIS were to be adjusted for the route.

The shallow contour was set to 8.1 metres in accordance with the checklist. The area inside the shallow contour was to be displayed as a dark blue area in the ECDIS.

The safety depth was set to 9.91 metres in accordance with the checklist. In the ECDIS, soundings that were equal to or less than the safety depth were shown in black, while greater depths were shown in grey.

The safety contour, according to the checklist, was to be set at 9.91 metres in harbour areas and 22.15 metres at sea. In the vessel's safety management system, the limit was set at 25.31 metres. As ECDIS lacked the capability to distinguish between safety contours for port and sea, the value for the safety contour was set to 9.90 metres for the entire voyage. ECDIS was configured to generate an alarm when the vessel approached this contour. The safety contour was clearly marked in the ECDIS chart data. With the chart data covering the Sound, the safety contour was automatically adjusted to 10 metres. This is a function in the ECDIS which means that the safety contour is always adjusted to the next greater depth available in the chart dataset. When transiting the Sound, the consequence is that if the safety contour is set to between 5 and 9.9 metres in the ECDIS, the 10-metre contour will be displayed on the ECDIS screen.

The safety contour was the function in ECDIS that was intended to provide a warning when the vessel approached shallow water. In voyage planning, it is standard practice not to plot routes that cross the safety contour, thereby avoiding taking the vessel into waters assessed as unsafe.

Voyage planning and route validation

Prior to the voyage planning, the master had provided comments on the route's course and other factors that the vessel needed to take into account during the voyage. The second officer carried out detailed voyage planning based on this input. In addition, the second officer utilised information from sailing directions and other nautical publications.

After the voyage planning had been entered into ECDIS, the route was validated using the "grounding check" function. The function automatically checked for any hazards along the planned route.

According to Danelec's manual for ECDIS, the results of the grounding check should then be reviewed. This review was carried out by panning along each leg of the route[16]and identifying the risks present along the route segment. If there were hazards associated with a particular leg, the system would highlight that leg in red. Hazards referred to immediate critical risks, such as depths along the leg being less than the minimum depth alarm threshold specified in ECDIS.

[16] Leg of the route – A straight line between two navigation points.

If there were warnings along the route leg, the section was highlighted in yellow. Warnings referred to lower-priority risks, such as the route approaching a high-traffic area or a traffic separation scheme. If the route leg was uncoloured, there were neither hazards nor warnings along the section up to the next waypoint, see figure 7.

Figure 7. Example image showing the “grounding check” function in the ECDIS. The risk level for each leg is indicated by a red or yellow line. In this image, the shallow pattern function is activated, displaying a grid over areas with depths of less than 10 metres. Photo: Danelec.

After the grounding check, a table was also presented in which each leg of the route was listed. The bridge officers could use a drop-down menu to review the risks along a selected leg, see figure 8. When reviewing the current route validation, the second officer based the assessment on the information in the table.

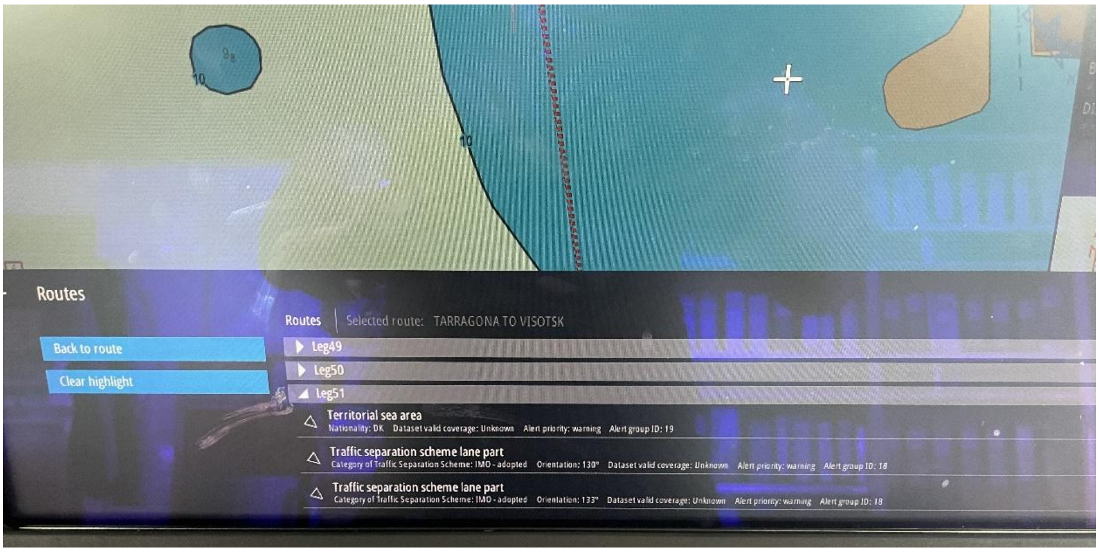

Figure 8. Validation list in ECDIS. The picture was taken on board MESHKA. For each leg, it is possible to expand rows containing information about the risks associated with the respective leg.

Preparation of the voyage planning document

When the voyage planning and grounding check were completed, the second officer prepared a voyage planning document. The document contained information about the voyage, including courses, positions, and the vessel’s minimum under-keel clearance for each route leg. Certain information, such as coordinates, route legs, and courses, was sourced from ECDIS. Other information, such as the minimum under-keel clearance for each specific route leg, was entered manually based on the vessel's maximum draught.

Along the route leg where the vessel ran aground, the voyage planning specified that the minimum under-keel clearance should be 1.87 metres, meaning that the minimum water depth limit was set at 9.08 metres.

In the voyage planning document, there was a column indicating the method to be used for determining the vessel's position. Throughout, it was specified that the vessel's position should be determined visually as well as by means of the vessel's GPS system. The document also included a list of nautical publications to be used in the voyage planning. The sailing directions for the Sound contained, among other things, information about the virtual AIS buoy between the island of Ven and the Swedish mainland, as well as information on the geographical limitations of the area.

The review of the voyage plan

After the voyage planning had been completed, the master reviewed the route in ECDIS. Since the route validation function had been carried out in the system, the master interpreted this as confirmation that the route passed over waters with sufficient depth for the vessel to be navigated safely. On this basis, he approved the voyage planning. The other bridge officers read through the plan and, by signing it, confirmed that they understood the arrangements for the voyage. As support, the document "Passage plan appraisal" was available in the shipping company's safety management system.

Execution of the voyage

When the vessel commenced its voyage towards Vysotsk, the route was activated in ECDIS. At the same time, a function was initiated that monitored a predefined area around the vessel's position. In ECDIS, it was possible to define this area and specify whether the system should issue an alarm at a certain distance or a certain time before the vessel – based on its current course and speed – reached the identified hazard. If the vessel entered an area where the ECDIS chart data identified dangers, warnings, or other circumstances requiring caution, notifications or alarms were triggered in ECDIS.

1.4.6 Observation onboard after the grounding

Chart coverage in the ECDIS

The chart order placed for the voyage included large-scale charts with detailed chart data for Skagen, where the vessel bunkered, as well as for the departure and arrival ports. However, for the area where the grounding occurred, there was only a small-scale[17] ENC at a scale of 1:180,000 available in ECDIS. This ENC covered the Swedish west coast at the latitude of Gothenburg down to the territorial boundary with Germany. Because the scale of this ENC was so small that it lacked detailed information, such as navigational marks and accurate seabed data for the Sound. Nevertheless, the bridge officers believed that they had the charts required for the passage through the Sound.

[17] A small-scale chart covers a large area and often lacks detail. A large-scale chart normally covers a smaller area and is more detailed.

Function of the ECDIS

A review of ECDIS revealed that the grounding check function had a limitation: it could only list up to 51 route legs in tabular form. MESHKAs voyage plan contained 92 route legs. Validation continued for routes with more than 51 legs, but in order for the system to display hazards along each leg, the bridge officers themselves had to pan along the route. With this method, there was no limitation on the number of legs that could be reviewed. The limitation to 51 route legs was not mentioned in the ECDIS instruction manual and was not known to the bridge officers on board.

The echo sounder's settings

During the vessel inspection of MESHKA, SHK observed that the ship's echo sounder was set to display water depth measured from the water surface. The vessel's draught was set to 7 metres on the echo sounder. The echo sounder indicated a water depth of 8.9 metres when, in fact, the vessel was aground, see figure 9. According to the safety parameter checklist, the echo sounder should trigger an alarm when the *under keel clearance* (UKC) was 1 metre in port and 10 metres at sea. At the time of the vessel inspection, the echo sounder alarm was set to activate when the water depth was less than 8 metres. The echo sounder's transducer was mounted in the bow of the vessel, where the draught was significantly less than at the stern. The echo sounder did not alarm as the vessel approached shallow water because the vessel had a substantial trim by the stern (2.2 metres) and the settings for the echo sounder transducer had not been adjusted accordingly.

Figure 9. Image of MESHKA's echo sounder. The picture was taken during SHK's onboard visit.

In the checklist "ECDIS voyage safety parameters", which formed part of the company's safety management system, it was stated that the echo sounder should always display the depth under the keel in order to avoid misunderstandings.

1.4.7 The crew

The crew consisted of 24 persons. The master was from Turkey and the other crew members were from Syria. The crew members' first language was Arabic, except for the master, whose first language was Turkish. The working language on board was English.

The master had served in his current position for nine years. He had been with the shipping company since it was established in 2021. On MESHKA, he was serving his second contract. At the time of the grounding, he had been on board for six months. The master was not assigned to watchkeeping duties.

The second officer began working at sea in 2015 and had served as an officer since 2022. Among other duties, he was responsible for preparing the voyage planning. This was his first contract on MESHKA, and he had been on board for seven months at the time of the grounding. The second officer stood watch from 00:00–04:00 and 12:00–16:00.

The third officer had served as an officer for 19 months. He had been on board for six months at the time of the grounding. During the visit of SHK, it was observed that there were limitations in the officer's knowledge of English. The third officer stood watch from 08:00–12:00 and 20:00–24:00. He was on watch during the grounding.

At the time of the grounding, there was also an able seaman on the bridge at the helm.

There was also a chief officer on board, who stood watch from 04:00–08:00 and 16:00–20:00.

None of the bridge officers had previously transited the Sound.

1.5 Meteorological information

The SMHI[18] has produced data for the weather and current conditions at the grounding position at the time of the grounding. A ridge of high pressure from central Europe extended over Denmark and was slowly shifting eastwards towards western Sweden. The wind is estimated to have been westerly at 3–7 m/s. After being overcast in the morning, the cloud cover began to break up at around 10 o'clock. Visibility is assessed to have been good. The wave height in the area was approximately 0.2 metres and the wave direction west-southwest. Subject to uncertainties in the model data, the surface current was westerly at up to 0.6 knots. The water level was falling during the day and was 17 centimetres above the reference water level (RH 2000).

1.6 Emergency response

According to the Act (2003:778) on Civil Protection Act (LSO), "rescue services" refers to the rescue operations for which the State or the municipalities are responsible in the event of an accident, in order to prevent and limit damage to people, property or the environment.

At around ten o'clock, the SOUNDREP informed the Swedish Maritime Administration's Joint Rescue Coordination Centre (JRCC) that MESHKA had run aground. As the situation on board was unclear, a maritime search and rescue operation was initiated. The JRCC immediately informed the Coast Guard's command centre, which had also received information from SOUNDREP. The Coast Guard assessed that there was a risk of environmental

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

damage, as the vessel had both bunker oil and diesel on board, and therefore decided to initiate environmental rescue operations.

Units from the Swedish Sea Rescue Society arrived at MESHKA and were unable to observe any signs of discharge.

After the grounding, the master made two attempts to refloat the vessel by engaging astern propulsion, but without success. Ballast water was then pumped out in an effort to lighten the vessel and free it from the shoal. Initially, the authorities had difficulty establishing contact with the vessel. Once contact had been established, the Coast Guard instructed the master to immediately cease attempts to refloat, as there was a risk of further damage and possible oil leakage.

At 11:40, the maritime search and rescue operation was concluded, as the rescue coordinator deemed that there was no immediate danger to life.

At around 13:30, representatives from the Coast Guard and the Swedish Transport Agency boarded the vessel. The Swedish Transport Agency carried out a port state control inspection, during which deficiencies were found in the ship's ECDIS, voyage planning, and SMS[19]. The Swedish Transport Agency required the shipping company to produce a salvage plan, even though the shipping company initially did not intend to engage a salvage contractor. The shipping company eventually hired a salvage firm, which produced a plan that was reviewed by the Swedish Transport Agency and the Coast Guard. That same evening, the Coast Guard carried out an underwater inspection of MESHKA's hull to assess the extent of the damage.

Due to the assessed risk of a major discharge of bunker oil and diesel, the County Administrative Board of Skåne convened coordination conferences during the days MESHKA was aground. Among the participants at these coordination conferences were the Coast Guard and several municipalities.

On the morning of 7 June, the vessel had been emptied of ballast water, refloated and subsequently towed to safe water depth by two tugboats. Thereafter, MESHKA proceeded under its own power to Landskrona for a further underwater inspection of the hull. The Coast Guard concluded its environmental response operation on 7 June when the vessel was berthed.

As no serious damage was found, the vessel was able to resume its voyage to Vysotsk on 10 June.

1.7 Requirements for the ECDIS

During the 1990s, the development of electronic nautical charts gathered pace. In 1995, the IMO[20] produced the first version of performance standards for the design of electronic nautical charts. At this time, navigation with paper charts was mandatory in commercial shipping. The paper charts were to be updated weekly, and chart corrections were usually sent on board by post. For the purpose of voyage planning, chart catalogues containing lists and overview charts were available, showing which charts were accessible for the intended

[19] SMS-system – Safety management system.

[20] IMO (International Maritime Organisation) – UN body for international cooperation regarding regulations and practices governing safety at sea.

route. Using these, the bridge officers on board could acquire any missing paper charts prior to the voyage.

The ECDISs were improved. At the same time, the availability of electronic chart data published by, or on behalf of, an authorised hydrographic office or other relevant government institutions increased. Approved electronic charts, known as Electronic Navigational Charts (ENC), became available for large parts of the world. The IMO published a resolution which entailed that vessels engaged in international traffic could discontinue the use of paper charts, provided that an approved ECDIS with an approved backup arrangement and approved ENCs, was carried on board.

Solutions also emerged that enabled electronic nautical charts to be downloaded and updated using the vessel's internet connection. Digital chart catalogues containing approved ENCs were offered by several providers.

The International Hydrographic Organization (IHO) is an intergovernmental organisation that works to ensure all the world's seas and oceans are surveyed and charted. The organisation works to ensure that waters are surveyed and charted.

The IHO has developed several standards governing the design of digital chart systems and the adaptation of hydrographic data to enable the distribution of ENCs to ECDIS. The standards include specifications and guidance for the publication and updating of ENCs, as well as how these should be presented in ECDIS.

1.8 The Shipping company's safety management system

In its safety management system, the shipping company had detailed procedures and checklists for voyage planning and bridge watchkeeping. Among other things, there were checklists for how the depth parameters should be entered into ECDIS, how voyage planning should be reviewed, and what the safe depth should be at the ports of arrival and departure.

1.9 Ship reporting system in the Sound

The Sound is covered by a ship reporting system named SOUNDREP. The purpose of the system is to enhance navigational safety and protect the marine environment. It is operated jointly by the Swedish Maritime Administration and the Danish Navy, Søværnet. The operators are from both Denmark and Sweden. SOUNDREP is based at Malmö VTS.

SOUNDREP has established prerequisite requirements for operators serving in maritime traffic surveillance, including a requirement for Master Mariner education. Newly appointed operators are also required to complete an internal training programme, which includes, among other elements, a VTS operator course developed by the Swedish Maritime Administration. Before being permitted to work independently, the operators must complete the training programme and pass a final examination.

1.10 Regulations and supervision

MESHKA transited the Sound in accordance with the provisions on free passage as described in section 1.3. Consequently, the international regulations under the IMO's SOLAS[21] Convention are applicable.

1.10.1 ECDIS

Under SOLAS Chapter V, Regulation 19.2.1.4, it is stipulated that nautical charts and nautical publications shall be used to plan and display the ship's route for the intended voyage and to plot and monitor positions throughout the voyage. An Electronic Chart Display and Information System (ECDIS) is accepted as meeting the chart carriage requirements.

Under SOLAS Chapter V, Regulation 27, it is stipulated that nautical charts and nautical publications, such as sailing directions, lists of lights, notices to mariners, tide tables and all other nautical publications necessary for the intended voyage, shall be adequate and up to date.

IMO Resolution MSC.232(82) *Revised performance standards for Electronic Chart Display and Information Systems (ECDIS)*, addresses scale in ECDIS (section 6.1). It stipulates that the ECDIS should provide an indication if the displayed image has been overscaled (i.e. zoomed in beyond the compilation scale of the ENC), or if the ship's position is covered by a ENC compiled at a larger scale than that provided by the ECDIS display.

1.10.2 Regulations concerning traffic monitoring

As per the regulation containing instructions for the Swedish Transport Agency (2008:1300), the Swedish Transport Agency is the competent authority for Vessel Traffic Services (VTS) and Ship Reporting Systems (SRS) in Sweden.

The regulation containing instructions for the Swedish Maritime Administration (2007:1161) states that the Swedish Maritime Administration shall provide Vessel Traffic Services (VTS) and Ship Reporting Systems (SRS) in accordance with IMO Resolution A.1158(32). The regulation also states that the Swedish Maritime Administration shall be responsible for monitoring and for taking all necessary and appropriate measures to ensure that ships participate in and comply with the rules for Sweden's Vessel Traffic Services (VTS).

The guidelines to IMO Resolution A.857(20) on vessel traffic services state that the purpose of the service is to enhance the safety and efficiency of navigation. The purpose also includes the protection of the marine environment. The vessel traffic service should have the capability to interact with vessel traffic and to respond to developing traffic situations within the area.

The Swedish Transport Agency intends, together with the Swedish Maritime Administration, to initiate work regarding regulation within VTS and SRS areas.

[21] SOLAS convention (Safety of Life at Sea) – An international convention that regulates safety standards for the construction, equipment and operation of merchant ships.

2. Actions taken

2.1 Marakeb Shipmanagement DMCC

The shipping company has implemented a training programme for all nautical officers. The programme includes Bridge Resource Management as well as both general and type-specific ECDIS training, which all officers are required to complete. The shipping company has also issued a safety bulletin relating to the incident to all vessels it operates.

Following the incident, the shipping company decided to change chart service providers and the account was deleted. As the agreement has been terminated, the chart provider is unable to restore the orders that were placed for the voyage during which the grounding occurred. According to the shipping company, the new system is clearer, and also enables the shipping company to perform a detailed review of chart orders.

The shipping company is also in the process of implementing an electronic navigation aid intended to simplify voyage planning on board and, among other things, facilitate the identification of limiting depths along a planned route.

2.2 SOUNDREP

After the grounding of MESHKA, SOUNDREP adjusted the alarm limits for when operators should call vessels suspected of being on the wrong course. The staff at the traffic monitoring centre have continuously attended further training courses. Even before the grounding, a decision had been made to change the training provider and to conduct training sessions, although with a slightly different focus at that time.

3. Analysis

MESHKA was en route to Vysotsk in Russia when the vessel ran aground in the Sound. Without the crew's knowledge, the vessel's planned route had been plotted over a shallow area west of Landskrona. SOUNDREP intervened only when MESHKA was already heading into shallow waters, and the grounding could no longer be prevented.

The investigation reveals shortcomings both in the voyage planning and in the execution of the voyage. These issues are addressed in the analysis, together with the limitations present in the vessel's navigational aids.

The damage sustained in the grounding is not considered to have posed any risk to either the safety of the vessel or the environment. Therefore, the rescue efforts are not analysed in further detail.

3.1 Preparations

Since the vessel was unladen, the master chose the shortest route into the Baltic Sea, which passes through the Sound.

The second officer, who was responsible for the voyage planning, was supported in this task by the procedures and checklists contained in the vessel's safety management system. A prerequisite for planning a safe voyage was that correct and up-to-date chart data was available in the ECDIS.

3.1.1 Ordering of electronic navigational charts (ENC)

The order placed prior to the voyage did not include ENCs in a suitable scale for the Sound. As a result, the chart coverage in the ECDIS was inadequate. This was not noticed by any of the bridge officers, either during voyage planning or during the passage through the Sound.

In its review of the chart order, SHK has found that for other areas along the vessel's route, chart cells had been ordered which included large-scale (detailed) chart cells. It is therefore considered unlikely that large-scale ENCs were deliberately excluded. Instead, it is likely that an error occurred during the ordering process which the officers failed to detect.

The bridge officers and the shipping company have stated that they have previously experienced difficulties in obtaining the ENCs they required when placing orders. Another challenge has been that the chart ordering programme does not clearly indicate when detailed ENCs have been deselected.

To ensure that a vessel has the correct chart data, detailed ENCs should only be able to be deselected in the chart ordering programme as an exception when it has generated a proposed set of ENCs along a suggested route. The software should also clearly indicate which ENCs are available along a proposed route but have not been included when an order has been placed.

If the chart ordering software had featured a function that listed the chart cells that had been actively excluded along a proposed route and which were also missing from the ECDIS internal database, the officers would have been better equipped to identify that the chart data in the system was inadequate. This is a function that is available from other providers of similar chart services. The chart provider Elcome should therefore take measures to clarify when available chart cells (ENC) have been deselected along a planned route.

Elcome was approved by the chart producer UK Hydrographic Office (UKHO) as a distributor of chart data and nautical publications. UKHO requires distributors to have a certified quality management system (ISO 9001).

The incident in question demonstrates the possible consequences of deficiencies in chart data. At present, there is no international regulation regarding the functionality and user-friendliness of chart ordering software. The Swedish Transport Agency is the authority that represents Sweden in international organisations such as the IMO. The Swedish Transport Agency should therefore consider whether there is reason to work towards the implementation of international regulations imposing such requirements on chart ordering software.

3.1.2 Limitations of the ECDIS

According to IMO requirements for ECDIS, the system must issue a warning if there are no ENCs at all for a given area. The system must also alert the user if the internal database contains ENCs at a larger scale – and thus more detailed information – than those currently displayed in the ECDIS. However, there is no requirement for the system to warn if ENCs at an appropriate scale are missing.

During the voyage in question, there was only a small-scale ENC for the Sound in the ECDIS. The ECDIS interpreted this to mean that there was chart coverage for the area. As the ECDIS could only refer to the ENCs stored in its internal database (SENC), no warning was generated regarding missing chart data. This limitation in current ECDISs is in accordance with existing regulations.

This incident demonstrates the importance for navigational officers to be aware that, even if a vessel's ECDIS is approved, the chart data may still be inadequate. This means that the details of the chart data must be carefully reviewed during voyage planning. If necessary, an additional verification may need to be carried out against the databases of the IHO or other external chart catalogues to ensure that the ECDIS has comprehensive chart coverage for the planned route.

3.1.3 Voyage planning

None of the bridge officers had previous experience of transiting the Sound. This placed considerable demands on the officers to carefully review and take into account all relevant information in nautical publications and nautical charts during voyage planning.

The ENC covering the Sound in the ECDIS did not contain navigational marks or the depth restrictions in the Sound area. The sailing directions did include certain information about the limitations of the waters, which could have been taken into consideration by the officers during the preparation and subsequent review of the voyage plan. However, this was not done to a sufficient extent to prevent the route from being planned over the shallow area off Landskrona, where the vessel ran aground.

The function of the safety contour in the ECDIS

According to the vessel's checklist for depth settings, the safety contour was to be set to a depth of 22.15 metres. With this depth setting, the function would, in practice, have been of little use for much of the passage between Sweden and Denmark. However, the safety contour setting in the ECDIS was not made in accordance with the checklist for sea passage but was instead set to a depth of 9.9 metres, which was intended for ports of arrival and departure.

In the area where the vessel ran aground, it would have been possible to avoid the shoal even with the chart material available in the ECDIS, as the chart clearly marked the 10-metre contour. By plotting the route slightly further west of Landskrona and thereby avoiding crossing the 10-metre contour, the grounding could have been prevented. Furthermore, the ECDIS gave an alarm when the vessel approached the safety contour. However, the bridge officers took no action, as they assumed that the route planning had been carried out correctly and that the vessel could safely pass over the shoal.

The fact that the safety contour was not adjusted for the passage and that the route was plotted across the safety contour indicates shortcomings in the bridge officers' understanding of the safety contour function in the ECDIS. The shipping company has initiated training for its officers in the use of the ECDIS. In addition to the training initiative that the shipping company has commenced, the company should also ensure that the procedures and checklists set out in the vessel's safety management system are implemented and adhered to in an appropriate manner.

Validation of the route

According to the ECDIS manufacturer, the results of the grounding check function were to be reviewed using a prescribed method. In the ECDIS, this was done by the bridge officer panning along the route and reviewing the risks for each leg. There was also an alternative function, where the results of the grounding check could be displayed in a list, allowing up to 51 legs to be reviewed.

The second officer reviewed the route from Tarragona to Vysotsk using the alternative list function. As the list was limited to 51 legs, the area where the grounding occurred, which was at leg 55, was not displayed.

This limitation in the grounding check function is not stated in the ECDIS manufacturer's manual. Such a limitation may pose risks to navigational safety. The manufacturer, Danelec, should therefore inform ECDIS users of the limitation and update the information in the manual.

The master stated that he reviewed the route in the ECDIS by panning along the entire route in the normal chart view. He then noted that there were legs passing over areas shallower than the safety contour. However, the master assumed that there was no risk of grounding, as he believed the grounding check function would warn of any potential dangers. Following the incident, the shipping company has strengthened ECDIS training for its bridge officers, and therefore no recommendation is made to the company in this regard.

The voyage planning document

The voyage planning document stated that the minimum under keel clearance for the leg where the grounding occurred was 1.87 metres. However, at the location where the vessel ran aground, the actual depth was barely three metres, which is significantly less than the vessel's maximum draught of 7.21 metres. It has not been possible to establish the origin of the incorrect depth information in the voyage planning document, but the data had been entered manually into the document.

The incorrect depth information led the master to believe that the voyage could be undertaken across the shoal without risk of running aground. For other legs along the route as well, the depth information was incorrect, which posed risks to the vessel.

3.1.4 The echo sounder settings

The echo sounder was set to display the water depth instead of the dept under keel. This was a deviation from the requirements in the vessel's safety management system, which stipulated that the echo sounder should always show the depth beneath the keel. Furthermore, the echo sounder had not been adjusted to account for the significant stern trim of the vessel, while at the same time the echo sounder transducer was located in the bow section. As a result, no alarm was triggered by the echo sounder when the vessel entered shallow water.

When the echo sounder is used to measure water depth, both the position of the transducer and the vessel's trim must be taken into account. This is particularly important when the vessel is operating with a large trim. In this case, the echo sounder displayed incorrect values because no correction had been made for the transducer's position in the bow section of the vessel. Had the echo sounder's alarm function been correctly set, it could have provided a warning for shallow water when the vessel began to leave the limits of the fairway. This would have given the bridge officers better opportunities to take action to prevent the grounding. It is therefore essential that the vessel's trim in relation to the position of the echo sounder transducer is taken into consideration when adjusting the echo sounder's depth display and alarm limits before the voyage commences. It is also important that the bridge officers are aware of any changes made to the echo sounder's settings.

3.2 The vessel's navigation

3.2.1 The bridge teamwork

When the vessel entered the traffic separation scheme between Helsingör and Helsingborg in the Sound, the master, the third officer, and the able seaman were present on the bridge. The able seaman was instructed to take the helm and steer the vessel manually, which meant that the third officer had to assume the role of lookout. Prior to the grounding, the vessel passed several navigational marks at close range. Most of these marks, as well as a number of lighthouses, were missing from the chart displayed in the ECDIS. This discrepancy between the chart and the surroundings was not noticed by the bridge officers.

No verification of the navigational marks in the ECDIS was carried out on the bridge, and observations regarding traffic or navigational marks were not communicated to the master. During navigation, it is important that the bridge team verifies both navigational marks and other traffic in order to maintain situational awareness on the bridge, thereby enabling early identification and management of risks.

The master's communication was primarily focused on giving the able seaman orders regarding course and rudder angles. Communication between the master and the officer was very limited in both directions. A prerequisite for safe navigation is that the bridge team cooperates and assists each other during navigation. The shortcomings in cooperation on the bridge meant that the officer was not included in the navigation and that his duties as look-out were not fully carried out.

From the interviews conducted and the VDR data, it is also evident that there have been challenges in communication between members of the bridge team, which are assessed to have affected the cooperation on the bridge.

In summary there have been shortcomings in lookout duties, navigation, and cooperation on the bridge prior to the grounding. It is of utmost importance that the entire bridge team participates actively in navigation, especially in areas with restricted draught and dense traffic. In view of the fact that the shipping company has initiated further training of its nautical officers, including bridge resource management (BRM), no recommendation is made in this regard.

3.2.2 Actions onboard after the grounding

After the grounding, the vessel attempted to reverse off the shoal without having a sufficient understanding of the situation on board or the extent of the damage sustained by the vessel. The attempts were only discontinued when the Coast Guard intervened.

If a vessel is refloated after a grounding before a thorough assessment of the damage has been carried out, the situation may, in the worst case, escalate. In addition to potentially serious consequences for the vessel and its crew, this may also pose a risk of environmental damage. In light of this, the shipping company should evaluate whether the procedures following a grounding are effectively implemented and ensure that these are adhered to on board in accordance with the vessel's safety management system. This evaluation should aim to ensure that measures are taken to guarantee a thorough assessment of the vessel's damage and position before any attempts are made to refloat the vessel.

3.2.3 Overall assessment

The voyage planning, execution of the voyage, and the subsequent attempts to reverse the vessel off the shoal indicate deficiencies in the company's implementation of the safety management system and its adherence on board. In addition to the measures already undertaken by the company as a result of the accident, the company should also ensure that the vessel's crew have sufficient knowledge of the safety management system and that the existing procedures and checklists are used correctly.

3.2.4 Pilotage through the Sound

Both Sweden and Denmark offer pilotage through the Sound, but there is no requirement to use a pilot. This was the first time the vessel and its crew were passing through the area. The vessel's maximum draught corresponded to the maximum recommended for vessels piloted by the Swedish Maritime Administration through the Flintrännan. Engaging a pilot would therefore have been an option to enhance safety.

3.3 Actions taken by SOUNDREP

The vessel passed on the wrong side of the virtual buoy to the east of the island of Ven and was travelling in the opposite direction to the recommended route. Had SOUNDREP called the vessel and enquired about its intentions at this stage, the risk of grounding would have been reduced. As a minimum measure, enhanced monitoring of the vessel's onward journey could have been initiated.

The vessel then continued southwards, east of the shallow area known as Staffan's shoal, which, according to the pilot area manager, is highly unusual for southbound vessels. This too could have prompted an intervention by SOUNDREP. By the time SOUNDREP finally called the vessel, it had already entered shallow waters and the grounding was unavoidable.

Following the incident, the alarm boundaries for operators at SOUNDREP have been adjusted to enable earlier intervention and thereby prevent similar incidents in the future. Training for SOUNDREP operators was already in place prior to the incident, but the focus of the training has been partly revised as a result of the grounding. In light of the measures taken, SHK refrains from issuing any recommendation regarding Soundrep.

4. Conclusions

4.1 Findings

a) The vessel MESHKA was on a voyage between Tarragona and Vysotsk via the Sound.
b) It was the first time that the vessel and its crew were passing through the Sound.
c) During the voyage planning, only a small-scale ENC for the Sound was ordered.
d) The chart data in the ECDIS was inadequate and lacked detailed chart information.
e) Due to the deficiencies in the chart data, the vessel's route was plotted across a shallow area.
f) The ECDIS grounding check function had limitations.
g) The crew were not aware of these limitations, and they were not stated in the ECDIS manual.
h) The deficiencies in the chart data were not discovered during the review of the voyage plan.
i) While transiting the Sound, the crew did not notice that several navigational marks being passed were missing from the ECDIS.
j) Shortly before the grounding, the master observed several navigational marks that were not shown in the ECDIS and ordered the vessel to alter course to starboard while reducing speed.
k) The vessel ran aground on a shoal off Landskrona.
l) SOUNDREP called the vessel when it was already in shallow water, and it was too late to avoid the shoal.
m) After the vessel had run aground, attempts were made to reverse off the shoal without sufficient information about the extent of the damage to the vessel.
n) No structural damage occurred to the vessel and no pollution was released into the environment.

4.2 Causes of the accident

The accident was caused by inadequate voyage planning. As a result, the ECDIS used by the bridge officers for navigation lacked detailed chart cells (ENC) for the Öresund. Contributing factors included:

- the bridge officers' insufficient knowledge of the ECDIS and its limitations
- deficiencies in adherence to the vessel's navigation procedures
- shortcomings in bridge teamwork and lookout procedures
- delayed intervention by the ship reporting system.

The underlying causes of the accident were deficiencies in the company's implementation of the safety management system and its adherence on board, as well as shortcomings in the chart ordering process.

4.3 Safety recommendations

The shipping company Makareb Shipmanagement DMCC is recommended to:

- ensure that it is clearly indicated in the chart ordering software when electronic chart cells (ENC) are missing or have been deselected along a planned route (see section 3.1.1). *(SHK 2026:10: R1)*

The ECDIS manufacturer Danelec is recommended to:

- inform ECDIS users of the limitation and update the information in the manual (see section 3.1.3). *(SHK 2026:10 R2)*

The chart provider Elcome is recommended to:

- take measures to clarify when available chart cells (ENC) have been deselected along a planned route (see section 3.1.1). *(SHK 2026:10 R3)*

The Swedish Transport Agency is recommended to:

- consider whether there is reason to promote the implementation of international regulation imposing requirements on chart supplier software (see section 3.1.1*). (SHK 2026:10 R4)*

The Swedish Accident Investigation Authority respectfully requests to receive**, by 11 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,

Kristina Börjevik Kovaniemi Björn Ramstedt