Joint safety investigation into the collision between the Maltese bulk carrier **GOLDEN TRADER** and the Belgian fishing vessel **VIDAR**

21 nautical miles west of Thyborøn, Denmark on 10 September 2011

and subsequent severe pollution of the Bohuslän Archipelago, Sweden on 15 September 2011

201109/011

MARINE SAFETY INVESTIGATION REPORT NO. 18/2012

FINAL

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The objective of this safety investigation report is precautionary and seeks to avoid a repeat occurrence through an understanding of the events of 10 and 15 September 2011. Its sole purpose is confined to the promulgation of safety lessons and therefore may be misleading if used for other purposes.

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A translation to the Swedish language, with an attached report of the Swedish authorities’ response to the oil spill, is available on www.havkom.se.

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Malta
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Danish Maritime Authority
Lloyd’s Register of Shipping
Managers - MV Golden Trader
Master and crew members – MV Golden Trader
Merchant Shipping Directorate – Transport Malta
Swedish Coast Guard
Fire Brigade of Tjörn’s Community
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIS</td>
<td>Automatic identification system</td>
</tr>
<tr>
<td>ARPA</td>
<td>Automatic radar plotting aid</td>
</tr>
<tr>
<td>BRM</td>
<td>Bridge Resource Management</td>
</tr>
<tr>
<td>COLREGs</td>
<td>International Regulations for Preventing Collisions at Sea 1972</td>
</tr>
<tr>
<td>CPA</td>
<td>Closest point of approach</td>
</tr>
<tr>
<td>cm</td>
<td>Centimetre</td>
</tr>
<tr>
<td>cST</td>
<td>Centistokes</td>
</tr>
<tr>
<td>E</td>
<td>East</td>
</tr>
<tr>
<td>EEZ</td>
<td>Exclusive Economic Zone</td>
</tr>
<tr>
<td>EMSA</td>
<td>European Maritime Safety Agency</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>IFO</td>
<td>Intermediate fuel oil</td>
</tr>
<tr>
<td>iwo</td>
<td>In way of</td>
</tr>
<tr>
<td>JRCC</td>
<td>Joint Rescue Coordination Centre</td>
</tr>
<tr>
<td>Km</td>
<td>Kilometre</td>
</tr>
<tr>
<td>kW</td>
<td>Kilowatt</td>
</tr>
<tr>
<td>LR</td>
<td>Lloyd’s Register of Shipping</td>
</tr>
<tr>
<td>Ltd.</td>
<td>Limited</td>
</tr>
<tr>
<td>m</td>
<td>Metres</td>
</tr>
<tr>
<td>m³</td>
<td>Cubic metres</td>
</tr>
<tr>
<td>mm</td>
<td>Millimetre</td>
</tr>
<tr>
<td>MSIU</td>
<td>Marine Safety Investigation Unit</td>
</tr>
<tr>
<td>mt</td>
<td>Metric tonnes</td>
</tr>
<tr>
<td>mtm³</td>
<td>Metric tonnes per cubic metre</td>
</tr>
<tr>
<td>N</td>
<td>North</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>nm</td>
<td>Nautical mile</td>
</tr>
<tr>
<td>no.</td>
<td>Number</td>
</tr>
<tr>
<td>OOW</td>
<td>Navigational officer of the watch</td>
</tr>
<tr>
<td>POLREP</td>
<td>Pollution report</td>
</tr>
<tr>
<td>POLWARN</td>
<td>Pollution warning</td>
</tr>
<tr>
<td>RPM</td>
<td>Revolutions per Minute</td>
</tr>
<tr>
<td>SHK</td>
<td>Statens haverikommission (Swedish Accident Investigation Authority)</td>
</tr>
<tr>
<td>SITREP</td>
<td>Situation report</td>
</tr>
<tr>
<td>SLAR</td>
<td>Side Looking Airborne Radar</td>
</tr>
<tr>
<td>SMC</td>
<td>Swedish Maritime Clearance</td>
</tr>
<tr>
<td>SMHI</td>
<td>Swedish Meteorological and Hydrological Institute</td>
</tr>
<tr>
<td>SMS</td>
<td>Safety Management System</td>
</tr>
<tr>
<td>SOK</td>
<td>Søværnets Operative Kommando</td>
</tr>
<tr>
<td>SOLAS</td>
<td>International Convention for the Safety of Life at Sea, 1974, as amended</td>
</tr>
<tr>
<td>SSN Alert</td>
<td>SafeSeaNet Alert</td>
</tr>
<tr>
<td>(T)</td>
<td>True</td>
</tr>
<tr>
<td>TCPA</td>
<td>Time to closest point of approach</td>
</tr>
<tr>
<td>UTC</td>
<td>Coordinated Universal Time</td>
</tr>
<tr>
<td>VDR</td>
<td>Voyage Data Recorder</td>
</tr>
<tr>
<td>VHF</td>
<td>Very high frequency</td>
</tr>
</tbody>
</table>
SUMMARY

On 10 September 2011 at 1237 UTC, the Maltese flagged bulk carrier MV *Golden Trader* and the Belgian flagged fishing vessel *Vidar*, collided in the North Sea, off the Danish coast. There were no reported casualties. *Golden Trader* was proceeding Southbound, off the fishing port of Thyborøn while *Vidar* was steaming an Easterly course. Although visibility at the time was reduced, both the navigational officer of the watch (OOW) and the look-out on board *Golden Trader* reported sighting *Vidar* visually at about three nautical miles. The OOW on board *Golden Trader*, who had been observing the fishing vessel on radar for some time, explained that he could not alter course to starboard due to the presence of other fishing boats.

Several days after the collision, the Swedish Accident Investigation Authority informed the Marine Safety Investigation Unit of a severe pollution, which had been reported on the Swedish Western coast. Analysis carried out during the course of the safety investigation confirmed that the oil washed ashore had leaked from a breached heavy fuel oil storage tank fitted on *Golden Trader*. The heavy fuel oil storage tank had been damaged during the collision. It was estimated that the total amount of heavy fuel oil (IFO 180 cST, density 0.991 mtm$^{-3}$) lost on board was approximately 450 m$^3$.

A safety investigation was conducted jointly by Malta (lead investigating State) and Sweden (substantially interested State). The Swedish Accident Investigation Authority’s contribution is presented in sub-sections 1.4 and 2.6. The safety investigation identified several factors in the navigation procedures on both vessels which led to a close quarter situation and subsequent collision. Other factors related to the aftermath of the collision, and which were relevant to the severe pollution on the Swedish coast, were also identified.

The immediate causes of the collision were determined to be an inaccurate interpretation on board *Golden Trader* of the developing close quarter situation and potential navigational practices on board *Vidar*. It has also been determined that the major oil spill that reached the Swedish coast had not been detected because calculations and estimates were based on inaccurate information.
One recommendation has been made to the managers of *Golden Trader*, aimed at addressing Bridge Standing Orders.
1 FACTUAL INFORMATION

1.1 Vessels, Voyage and Marine Casualty Particulars

Name: Golden Trader
Flag: Malta
Classification Society: Lloyd’s Register of Shipping
IMO Number: 9041459
Type: Bulk Carrier
Registered Owner: Melia Shipping Ltd.
Manager(s): Goldenport Shipmanagement Ltd.
Construction: Steel
Length overall: 192.0 m
Registered Length: 184.01 m
Gross Tonnage: 28420
Minimum Safe Manning: 16
Authorised Cargo: Cargo in bulk

Port of Departure: St. Petersburg, Russia
Port of Arrival: Chennai, India
Type of Voyage: International
Cargo Information: 38000 mt of Muriate of Potash
Manning: 24

Date and Time: 10 September 2011 at 1437
Type of Marine Casualty: Very Serious Marine Casualty
Location of Accident: 56° 44.78’N  007° 38.57’E
Place on Board: Ship side in way of starboard bunker tank no. 1
Injuries/Fatalities: None
Damage/Environmental Impact: Damage to side shell plating on Golden Trader, resulting in instantaneous spill of heavy fuel oil, resulting in an oil spill and severe damage to the Swedish coast
Ship Operation: On passage
Voyage Segment: Transit
External & Internal Environment: Southerly winds, moderate seas and moderate visibility
<table>
<thead>
<tr>
<th><strong>Name</strong></th>
<th><strong>Vidar</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flag</strong></td>
<td>Belgium</td>
</tr>
<tr>
<td><strong>Classification Society</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Port Number</strong></td>
<td>B.462</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Twin beam trawler</td>
</tr>
<tr>
<td><strong>Registered Owner</strong></td>
<td>Shannon NV</td>
</tr>
<tr>
<td><strong>Manager(s)</strong></td>
<td>Shannon NV</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>Steel</td>
</tr>
<tr>
<td><strong>Length overall</strong></td>
<td>37.81 m</td>
</tr>
<tr>
<td><strong>Registered Length</strong></td>
<td>32.98 m</td>
</tr>
<tr>
<td><strong>Gross Tonnage</strong></td>
<td>385</td>
</tr>
<tr>
<td><strong>Minimum Safe Manning</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Authorised Cargo</strong></td>
<td>Fish</td>
</tr>
<tr>
<td><strong>Port of Departure</strong></td>
<td>Unknown</td>
</tr>
<tr>
<td><strong>Port of Arrival</strong></td>
<td>Zeebrügge, Belgium</td>
</tr>
<tr>
<td><strong>Type of Voyage</strong></td>
<td>International</td>
</tr>
<tr>
<td><strong>Cargo Information</strong></td>
<td>Unknown</td>
</tr>
<tr>
<td><strong>Manning</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>Place on Board</strong></td>
<td>Stem</td>
</tr>
<tr>
<td><strong>Injuries/Fatalities</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Damage/Environmental Impact</strong></td>
<td>Structural damage to the stem. No environmental damage</td>
</tr>
<tr>
<td><strong>Ship Operation</strong></td>
<td>Underway</td>
</tr>
<tr>
<td><strong>Voyage Segment</strong></td>
<td>Transit</td>
</tr>
</tbody>
</table>
1.2 Description of Vessel

1.2.1 Golden Trader

Golden Trader was a five-hatch, geared bulk carrier, owned by Melia Shipping Ltd. and managed by Goldenport Shipmanagement Ltd. of Greece. The vessel was built by Brodogradiliste Split in Croatia in 1994 as Hull Number 378. Golden Trader was registered in Malta\(^1\) and classed by Lloyd’s Register of Shipping (LR).

Golden Trader had a length overall of 192.00 m, a moulded breadth of 32.00 m and a moulded depth of 15.70 m. It had a summer draught of 10.70 m and a summer deadweight of 48,170 mt.

Golden Trader had one continuous deck, a forecastle deck, raked stem, and a transom stern. The vessel was also fitted with double bottoms and the engine-room forward bulkhead was fitted at frame 42. The distance between the forward and aft engine-room bulkheads was 24 m. Golden Trader had two main heavy fuel oil storage tanks fitted in the engine-room, which served as the vessel’s bunker tanks. The port side heavy fuel oil storage tank was smaller than the one on starboard side (Figure 1) owing that the former had a recess for the heavy fuel oil settling and service tanks. The capacity plan indicated that the starboard heavy fuel oil storage tank had a capacity of about 886 m\(^3\). When leaving St. Petersburg, the starboard bunker tank contained high sulphur fuel oil (which is not allowed to be consumed in the Baltic Sea and North Sea), and the port side tank had low sulphur fuel oil.

Golden Trader’s hull was fitted with a fore peak, double bottom and topside tanks, and an aft peak. All tanks were segregated by seven watertight transverse bulkheads. The double bottoms extended from the fore peak to the aft peak bulkheads. The fore and aft peak tanks, the five port and starboard double bottoms (which were fitted below the cargo holds and engine-room), and the five port and starboard topside tanks could be interconnected by a series of valves and all formed part of the ballast system. Cargo hold no. 3 was also strengthened for the carriage of water ballast. Golden Trader was designed to carry grain cargo with untrimmed ends, ore, and similar bulk cargoes.

The vessel was equipped with four electro-hydraulic type deck cranes on the upper deck for cargo handling purposes. An electrically driven travelling hoist, used for the transfer of

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\(^{1}\) On the request of the owners, the vessel was cancelled from the Register of Maltese Ships in terms of Article 28(1) of the Merchant Shipping Act, on 27 January 2014.
supplies for the provision store and the engine-room, was fitted aft of the superstructure bulkhead.

Propulsive power was provided by a 6-cylinder B&W 6L60MC, slow speed direct drive diesel engine, producing 9,180 kW at 111 RPM. This drove a single, four-bladed fixed pitch propeller, 6400 mm diameter.

*Golden Trader* was equipped with a range of bridge and navigational equipment in accordance with the relevant SOLAS requirements. The equipment included two radars (a Kelvin Hughes Manta 2300 S-Band and a Kelvin Hughes 6000 (ARPA) X-band), a Furuno GP 80 GPS and Magnavox MX 200 GPS.

*Golden Trader*’s crew comprised 24 Ukrainian nationals. All the crew members were appropriately qualified to serve on board the ship. The master had 14 years of command experience on bulk carriers. At sea, the three mates kept the traditional 4-on 8-off navigational watches.
1.3 Narrative

1.3.1 Events leading up to the collision

On 06 September 2011, after completing the loading operation of 38,000 mt of Muriate of Potash at St. Petersburg, Russia and after taking bunkers, Golden Trader departed on a voyage to Chennai, India via the Suez Canal.

On 10 September 2011, Golden Trader was navigating around the Northwest coast of the Jutland peninsula. Navigational watches were uneventful during the morning. The weather was logged on board Golden Trader as Southerly wind force 5, moderate sea and moderate visibility. The third mate handed over the navigational watch to the second mate at around noon and the handover checklist was logged as duly completed. At the time, the vessel was steering a course of 206° and making approximately 11.7 knots.

Voyage Data Recorder (VDR) data indicated that although Golden Trader had two radar sets, only one set was being used for navigation. The second set was switched off although visibility at the time was recorded as poor. The radar set in use was set on True Motion Display.

At 1300 that day, the vessel approached its next waypoint and the navigational officer of the watch (OOW) altered course to 218°. The master, who was on the bridge but left at about this time, recalled that the visibility was about three nautical miles (nm), with 7/8 cloud cover and a Southwesterly light to gentle breeze.

The second mate recalled observing a radar echo about 6 nm on his starboard bow, crossing from starboard to port, i.e. at a bearing of 251°, and making 10.2 knots. The target’s closest point of approach (CPA) was 0.3 nm astern of Golden Trader. The target turned out to be a fishing vessel although the name was not showing on the AIS. Going by the observed bearing of 251° and the course of 218°, which was being followed by Golden Trader, the fishing vessel was approximately 033° on the starboard bow of the vessel.

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2 Unless otherwise stated, all times referred to in this report are local time, UTC + 2 hours.
3 One knot, or one nautical mile per hour equals 1.852 km/hr.
4 The Danish SafeSeaNet SITREP Report dated 12 September 2011 stated that Vidar reported poor visibility as low as 50 m. It must be noted that this claim of poor visibility is contradicted by both the OOW and look-out on board Golden Trader who both stated that they had observed the fishing vessel visually at a distance of three nautical miles.
The VDR data showed a target acquired by ARPA at a distance of 7.7 nm, steering a course of approximately 092°(T), with a speed of 10.9 knots. This put the target about 030° on the starboard bow of *Golden Trader* in what was essentially a crossing situation. When the distance was 5.5 nm, the information of the crossing situation was presented on the radar screen as CPA 0.0.

When about 3 nm off, the OOW on *Golden Trader* made visual contact with the target, making her the give way vessel. The OOW stated further that when the target was about 1 nm away, he went outside on the bridge wing to observe better the situation. He concluded that the fishing vessel would pass astern of *Golden Trader*.

The OOW stated that a few moments later, he noticed the fishing vessel turning to starboard. This observation was also logged in the deck logbook. A statement was entered, indicating that the fishing vessel had altered course to starboard when about 0.5 nautical miles off. The 0.5 nautical mile distance was an estimate made by the OOW. This course alteration, however, was not confirmed and the impact on the vessels indicated that there was no such course change.

The OOW stated that on finding himself in this situation, he deduced that it was not possible for him to alter course to starboard in order to avoid the collision and therefore he altered course to port. There were no indications of any attempts to warn the fishing vessel of the danger of collision over VHF radio or by sound signals. A close quarter situation had by now developed, which eventually led to the collision which occurred at 1437 in position 56°44.78’ N 007°38.57’ E. This was approximately 21 nm to the West of the Danish coast, off the fishing port of Thyborøn. The fishing vessel struck bow-on *Golden Trader’s* starboard quarter in way of (iwo) frames 29 to 34, which was iwo heavy fuel oil storage tank no. 1.

Upon impact, the master of *Golden Trader* immediately went to the bridge and took over the con. He tried to contact the fishing vessel on the VHF radio but did not get a reply to his calls. There was no AIS data received from the fishing vessel. Ten minutes later, the master

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5 Notwithstanding this assessment, it is understood that the ARPA plot had been constantly indicating a collision course even when the target was 6 nm away.

6 Judging from the resultant collision, the distance could have been much closer than what the OOW had actually estimated.

7 The time of the collision was taken from the VDR display.

8 Although this was considered to be the position where the collision happened, there were some doubts on the actual location during the initial phases of the safety investigation.
informed the coastal State (Denmark) of the collision via Lyngby Radio (OXZ). Among the first actions taken by the master when he arrived on the bridge was to stop the main engine. As the vessel had a speed of 11.7 knots, it took a considerable time before the vessel actually stopped. During the time when the speed was being reduced, the vessel did a full 360° circle to port side and finally stopped at a position Southeast of the collision. The diameter of this turning circle was around 0.9 nm\(^9\).

Lyngby Radio eventually provided identification details of the fishing vessel involved in the collision, but numerous VHF calls by *Golden Trader* to the fishing vessel on the VHF radio remained unanswered. The fishing vessel was subsequently identified as the Belgian flag *Vidar*, with a registration number B-462. According to the master of *Golden Trader*, soon after the collision, *Vidar* fell more astern and soon disappeared, apparently leaving the area\(^10\).

### 1.3.2 Reported damages

As a result of the collision, *Golden Trader* sustained damages to her side shell plating over an area approximately 3800 mm by 1600 mm, iwo frames 30 and 34 at the lower end of the sheer strake, which is iwo heavy fuel oil storage tank no. 1. At least four frames were damaged (Figures 2 to 5). The lower end of the breach was around 3000 mm above the waterline.

The breach in the hull iwo starboard heavy fuel oil storage tank no. 1, resulted in the overboard loss of heavy fuel oil. Initially, the master estimated that only a small amount of heavy fuel oil was lost. In fact, an entry in the deck logbook made at 1455 indicated “no leakage outside.” Subsequently, the master reported that approximately 4 m\(^3\) of heavy fuel oil\(^11\) were lost\(^12\).

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\(^9\) This amounts to slightly less than 1.7 km.

\(^10\) It should be observed that neither the Marine Safety Investigation Unit (MSIU) nor the Swedish Accident Investigation Authority (SHK) had access to any evidence from the fishing boat *Vidar*; hence, the focus on the context on board *Golden Trader*.

\(^11\) The amount of heavy fuel oil which was declared to have been spilled was not consistent and varied from 1m\(^3\) to, eventually, 201.5 m\(^3\).

\(^12\) The pollution aspect, including its mitigation is addressed in sub-section 1.4 of this safety investigation report.
Figure 2: Breached hull two starboard side heavy fuel storage tank no. 1

Figure 3: Breached hull above the vessel’s water line
Figure 4: Temporary repairs into starboard heavy fuel oil storage tank no. 1

Figure 5: Location of starboard heavy fuel oil storage tank no. 1 in relation with the engine-room
After the collision, *Golden Trader* remained adrift and in communication with the Danish authorities. Three officials from the Danish Navy boarded the vessel at 1735 and a detention order was eventually issued. Due to the bad weather forecast, the vessel was subsequently permitted to shift to a safe anchorage in the Vigsø bugt (near Hanstholm), Denmark, where she anchored at 0735 on the following morning (11 September 2011). On 12 September, she was requested to shift to the Ålbæk Bight off Skagen, Denmark.

Photos forwarded to the MSIU indicated that the fishing vessel had also sustained substantial damage to her stem and forecastle store area with the foredeck area and sides awash with heavy fuel oil for a length of 6 to 8 m abaft the stem. The damage to *Vidar* confirmed that the collision angle was around 030° (the indent was on the bow and to port). The crew on *Vidar* had reported that the vessel was ‘splashed over’ with heavy fuel oil (Figures 6 to 8).

![Figure 6: *Vidar* moored alongside with her bow area with heavy fuel oil, which had leaked from *Golden Trader*’s heavy fuel oil storage tank](image1.png)

![Figure 7: Damage to *Vidar*’s stem as seen from the starboard side](image2.png)
On 15 September 2011, *i.e.* five days after the collision, the SHK notified the MSIU of a substantially large oil slick in Kyrkesund and around the island of Klädesholmen. At the time, the MSIU was only aware of the collision.

### 1.4 Pollution and Clean-up Operations

#### 1.4.1 Vessels movement and Søværnets Operative Kommando reports

The master of *Golden Trader* contacted the Danish authorities within 10 minutes from the accident. The Admiral Danish Fleet (Søværnets Operative Kommando (SOK)) alerted its own environmental protection ships in the area to proceed to the accident site. The measures taken by SOK at the time was to inspect both vessels, collect oil samples from the damaged heavy fuel oil storage tank, and inspect the validity of, *inter alia*, certificates, day logbooks, and the oil record book. SOK also decided to detain both vessels.

The crew on board *Golden Trader* informed SOK that it was believed that about 1 m³ of heavy fuel oil had been released into the sea as a result of the collision.

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13 Sub-section 1.4 has been compiled by the SHK. The SHK has engaged the consultant company SSPA Sweden AB to write a report on how the oil spill was mitigated in Sweden. The report is available at the SHK.
On 10 September 2011, at 1824, SOK sent a SafeSeaNet (SSN) Situation Report (SITREP) (001) Report to EU coastal States, Norway and Iceland. The report was a notification that a collision had occurred and that the amount of spilled oil was unknown. SITREP (001) Report led to no action from any of the Swedish recipients, i.e. the Joint Rescue Coordination Centre (JRCC), the Swedish Coast Guard, the Swedish Maritime Administration and the Swedish Transport Agency. The recipient within the Swedish Coast Guard was the Swedish Maritime Clearance (SMC), which had received no instructions on how the SITREP reports should be processed.

SOK informed the Norwegian Coastal Administration of the collision, which had occurred in the Danish Exclusive Economic Zone (EEZ) by email. SOK also reported that according to the crew members on Golden Trader, the spilled oil was about 1 m$^3$. The Norwegian Coastal Administration took no action. SOK did not send a pollution warning (POLWARN) in accordance with the POLREP system described in the manuals of Bonn and Copenhagen Agreements since they did not assess the spill/pollution as “likely to constitute a serious threat to the coast.”

According to Swedish Meteorological and Hydrological Institute (SMHI), the weather at Hanstholm at the time of the accident was relatively calm, with Southwesterly winds and an average speed of about 6 m/s, and a significant wave height of about 0.5 m. Since the weather forecasts indicated that the weather conditions were worsening, on Sunday morning of 11 September 2011, SOK ordered Golden Trader to proceed to the bay of Vigsø to seek shelter from the wind and sea. The vessel eventually arrived at Vigsø at around 0800 on 11 September 2011, assisted by the vessel Vestkusten.

On 11 September 2011, at around noon, and after an inspection by the Danish Maritime Authority (Søfartsstyrelsen) in the port of Thyborön, the fishing vessel Vidar was released and allowed to proceed with her voyage to Zeebrugge, Belgium. As the flag State, Belgium was informed of this by an SSN SITREP (002) Report, which was issued by SOK.

Due to the weather forecasts for the area, SOK ordered Golden Trader to leave the area of Vigsø and proceed to the Bay of Ålbæk (on the Danish Eastern coast) for shelter. Golden Trader left the anchorage at 1450 and was escorted to the designated area by the environmental vessel Gunnar Thorson (GUTH) and re-anchored at 2255 in position
57° 39.1’N  010 36.1’E. The vessel was still under detention by the Danish authorities. No further pollution from *Golden Trader* was reported during her voyage to the Bay of Ålbæk.

During the evening of 12 September 2011, SOK sent SSN SITREP (003) Report with the information that about 60 m³ of oily-water had been collected. The distribution list of SITREP (003) Report was the same as SITREP (001) Report but initiated no response from among the Swedish recipients.

After the necessary repairs had been carried out at the roads off Ålbæk under Class supervision, *Golden Trader* was released by the Danish authorities in the evening of 20 September 2011 and allowed to proceed with her voyage to Port Said, Egypt. SOK sent SSN SITREP (004) Report with the information that *Golden Trader* had been released. The distribution list of SITREP (004) Report was the same as for SITREP (001).

### 1.4.2 Characteristics of the heavy fuel oil lost overboard

The heavy fuel oil lost overboard was high density bunker oil. The heavy fuel oil had a density of 0.991 mtm⁻³. It had a high viscosity 180 cST at 50°C and formed lumps when released into the water. Following the spill, the wind increased and hence the wave heights, which meant that in all probability, the heavy fuel oil was pushed down underneath the surface of the relatively high seas.

Furthermore, the heavy fuel oil had emulsified with water, which meant that the density of the former had increased. The emulsification took place over time. Thus, the heavy fuel oil collected between 11 and 12 September 2011 by SOK had a water contamination of about 10% to 15%. On the other hand, the heavy fuel oil that contaminated the Swedish West coast had a water content of up to and over 50%.

Heavy fuel oil below the surface was detected neither visually nor by the aircraft’s Side Looking Airborne Radar (SLAR).

### 1.4.3 The heavy fuel oil spill

Shortly after the collision, on Sunday afternoon, a crew member on board *Vidar* informed SOK that *Golden Trader* was leaking black oil.

After sounding the damaged starboard side heavy fuel oil storage tank later that same evening, it was established that about 418 mt of heavy fuel oil remained in the storage tank. It was not possible to obtain a clear indication of the quantity of heavy fuel oil that had been in the
storage tank before the collision due to the fact that the last information in the Oil Record Book was dated 04 September 2011.

As already indicated elsewhere, the master initially informed the personnel from SOK that no heavy fuel oil had been spilled into the sea, but later he changed this and said that the spill was 1 m$^3$. Based on the information of the storage heavy fuel oil tank's total capacity of 789 mt (correct volume is 886 m$^3$), SOK found during the inspection that the maximum spill could have been up to about 350 mt, had the heavy fuel oil storage tank been completely full before the collision.

SOK made an early assessment calculation, using a computer programme (SeaTrackWeb) to obtain a forecast of the oil’s path one day ahead in order to find out the spread of the presumed oil spill (Figure 9).

![Figure 9: Oil drift prognosis at 1518 for 10 to 11 September 2011 off the Danish West coast](source: SOK)

On Sunday morning, 11 September 2011, a helicopter from SOK observed collectable oil, about 10 nm Northeast of the position of the collision. The environmental vessel GUTH found the oil slick in position 56° 58.29’N 007° 48.10’E at around 1400. The calculated thickness of the oil was about 1 cm and SOK estimated the amount to be about 150 mt. By
the time it got dark and the oil recovery operation suspended, *GUTH* had already started to collect the oil and had succeeded to gather about 30 m$^3$ of oily-water.

The weather in the area during the day of 11 September 2011 was windy with speeds of 10 ms$^{-1}$ and a significant wave height of 1 m. The observation of oil was about 5 nm Northwest of the forecast position (Figure 10).

![Figure 10: Forecasts of oil drift. The observation on 12 September 2011 was made at 0835 and forecast at 1400](image)

- Yellow marker: point of collision
- Red markers: sites with visual observations of oil
- Green markers: forecasts for oil drift
- Black marker: the starting point of oil drift forecast on 13 September

Based on the two observations during the day, SOK made two oil drift calculations, the first with an assumed starting position in the morning and the other in the afternoon based on where *GUTH* had found the oil (Figures 11 and 12).
Figure 11: Oil drift prognosis at 1031 for 11 to 12 September off the Danish West coast
Source: SOK

Figure 12: Oil drift prognosis at 1602 for 11 to 12 September off the Danish West coast
Source: SOK
On Monday morning 12 September 2011, at around 0800, a Danish surveillance aircraft observed an oil slick in an area, which was centred in position 57° 15.5’N 008° 09.1’E. GUTH, which was nearby, collected about two-thirds of that oil before the oil collecting equipment developed a fault at around 1100 as a result of the bad weather. GUTH had collected a total of about 60 mt of oily-water mixture. The amount of actual oil in the mixture was estimated to be 50 mt.

The oil drift calculations that had been done on 11 September gave a drift speed of 0.8 knots, while observations on the oil on 11 and 12 September indicated a drifting speed of 1.2 knots.

The weather was about the same as the day before, although the wave heights had increased slightly to over 1 m. After the oil had been detected at around 0800 on Monday morning, SOK calculated a new forecast for the following 24 hours. The forecast track showed that the oil's path changed course by about 45° to the East, which meant that the course in general followed the coastline at a speed of about 1.3 knots (Figure 13).

Figure 13: Oil drift forecast at 0916 for 12 to 13 September off the Danish coast  
Source: SOK

On Tuesday 13 September 2011, at around 1030, a Danish surveillance aircraft observed traces of oil on its SLAR in the sea area off Hanstholm to Lökken. However, it was not
possible to see the oil visually. Due to the weather conditions, which did not allow for any collection of oil, ships were not dispatched to the area.

SOK warned the police in the Western and Northern Jylland that there was a risk of an oil spill on the beaches. Reports of oil on the beaches were received neither on 13 September nor at a later date. SOK made an oil drift calculation based on the area where traces of oil were observed in the morning (Figure 14). The forecast track continued to follow the shoreline in a Northeasterly direction, with a drift velocity of about 1.1 knots.

![Figure 14: Oil drift forecast at 1249 for 13 to 14 September off the Danish north coast](image)

Source: SOK

On Wednesday morning (14 September 2011), SOK sent a request to the Swedish Coast Guard to carry out an aerial reconnaissance with SLAR in the area West of Hirtshals, where oil had been observed the day before. During the afternoon, the Swedish Coast Guard carried out the airborne surveillance but no oil was observed.

1.4.4 Oil on the Swedish coast

The first indication of pollution on the Swedish West coast was observed at around noon on 15 September 2011 at Klädesholmen and Skärhamn. However, it was not until 16 September 2011 that it stood clear that it was a major oil spill, which demanded a full scale operation
from the Swedish Coast Guard (Figure 15). In order to get more reliable data of the extent of the oil spill, the Swedish Coast Guard carried out an aerial reconnaissance operation by helicopter during the morning and early afternoon of 16 September 2011. The amount of oil was estimated to be between 25 mt and 30 mt.

![Figure 15: A Swedish Coast Guard vessel in one of the oil-affected archipelago bays of the Swedish coast](image)

It was later discovered that the oil layer was very thick - up to 1 m. This necessitated that estimates had to be revised successively during the collection and decontamination operations.

Several authorities were involved in the decontamination operation with a large number of employees and other resources. Furthermore, two non profit organisations were helping with the clean up of birds covered in oil\textsuperscript{14} (Figure 16). By 14 October 2011, \textit{i.e.} one month after the collision, the Swedish Coast Guard and the Tjörn fire brigade had recovered a total of some 500 m\textsuperscript{3} of clean oil, after processing. The oil contained a high level of water before processing.

\textsuperscript{14} The accident occurred during late summer and therefore the consequences for the marine wildlife were limited.
1.4.5 Additional information

Analysis of the recovered oil, which was carried out during the course of the safety investigation and based on a total of 21 samples taken during the oil operations on the Swedish coast, showed that it had originated from one of the heavy fuel oil tanks fitted on *Golden Trader*. On a scale range of +4 to -4 (‘plus’ sign indicating the higher probability), the following incidence was noted: ten samples were +4; five samples were +3; two samples were +2; two samples were +1. Two samples contained no oil at all [Annex A].

The SMHI subsequently made drift calculations and compared three different calculations done separately in Sweden, Denmark and Norway\textsuperscript{15}. The SMHI made the following synopsis\textsuperscript{16}:

With three independent systems for oil drift calculations, the oil drift route for the heavy fuel oil spilled from *Golden Trader* has been calculated. The result from the three calculations has similar characteristics. The oil spill has drifted into Skaw with relatively high speed, passed North of Jutland, and finally reached the Swedish coast. The fact that independent calculations with three different systems for calculations provided the same route for the drift,

\textsuperscript{15} The full report is available at the SHK.

\textsuperscript{16} Free translation.
strengthened the result considerably. During most of the time from when the oil was spilled, until it was observed on the Swedish coast, weather in the area was rough, with strong winds from the Southwest, which created strong currents.

The results of the oil drift calculations showed that an oil spill in the position and time of the collision Golden Trader – Vidar could have resulted in oil reaching the Swedish West coast at some time between Wednesday, 14 September and Thursday, 15 September 2011. Due to the way the current splits up at the Swedish coast in the same latitude as Skaw, with one Southerly current South of this line and one Northern current, North of the same, the point where the oil reached the coast depended on small differences in the earlier part of the route.

The meteorological and hydrological conditions in Skaw during the period from 10 September to 15 September 2011, together with the results from three independent drift calculations, show that it is, without any doubt, possible for an oil spill at the position and time for the collision of Golden Trader – Vidar to drift and reach the area at Tjörn at the time, or earlier, the oil was first observed.

Moreover, taking into consideration the prevailing meteorological and hydrological conditions during the period from 10 September to 15 September 2011, and the results obtained from the three independent drift calculations, it is likely that the oil spill from Golden Trader was the cause of the oil contamination in the areas of Tjörn.

The European Maritime Safety Agency’s (EMSA) Clean Sea Net had a satellite picture taken over the area at 2117 on 10 September 2011 (satellite pictures are taken routinely and automatically). Specifically searching for images of the area, one of the photos (Figure 17), seemed to show an oil belt marked as 10 km from South to North. It is also possible that the picture shows two different oil belts not connected to each other. However, the quality of this image was not good enough to raise any concerns and initiate mitigating actions at the time the picture was taken.
A statement, which carried no date, was presented by the master of *Golden Trader* at a later stage when the vessel was under repair. The statement declared that 201.5 mt of heavy fuel oil were spilled into the sea. The same document stated that 15 mt of high sulphur heavy fuel oil had been used after the collision.
2 ANALYSIS

2.1 Events on Board **Golden Trader** Leading to the Collision

Analysis of the available evidence indicated that prior to the collision, a crossing situation had developed between two vessels in reduced but not restricted visibility, since visual observation between **Golden Trader** and **Vidar** was made at about three nautical miles. Furthermore, it was determined that at this distance, there was still ample time to carry out an avoiding manoeuvre with vessels in sight of one another.

The developing situation did not raise any particular concern to the OOW on **Golden Trader**. **Vidar** was approximately 030° on **Golden Trader**’s starboard bow, and the OOW was fully aware of the developing situation and of the risk of collision, given that the target was acquired by its ARPA when both vessels were at a distance of 7.7 nm. In this situation, the vessels were not in sight of each other and no action was taken by any of the two vessels to prevent the collision.

The VDR data indicated that **Vidar** was acquired by radar at 1414 (i.e. at a distance of 7.7 nm (target no. 47)). Soon after the track settled, the data showed the target was on a collision course (CPA equal to zero). Further analysis of the VDR data also showed that **Vidar** remained on a constant collision course (Figures 18-21). Moreover, within the immediate vicinity (apart from target no. 47 (**Vidar**)), the only other traffic was a stationary target to starboard and another small target fine on the starboard bow.

When the distance between the vessels was 3 nm, **Vidar** was sighted by **Golden Trader**, making **Golden Trader** the give way vessel. Yet, no action was taken to prevent the collision.

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17 The safety investigation has not achieved its full objective because neither the MSIU, nor the SHK had detailed evidence on the actual dynamics of the occurrence as they evolved on board **Vidar** (vide sub-section 2.5).
Figure 18: Target no. 47 (Vidar) acquired at 7.7 nautical miles and with a CPA zero at 5.1 nautical miles.

Figure 19: Target no. 47 at 2.4 nautical miles with the CPA still zero.
Figure 20: Target no. 47 at 1.4 nautical miles with CPA still zero (range on radar is 12 nm).

Figure 21: Target no. 47 at a range of 0.1 nautical miles with CPA zero and APRA collision warning on. The range is now reduced to 3 nm.
2.2 Close Quarter Situation

The OOW stated that he was restricted in the alterations to the course that he could have made to starboard because of other fishing vessels in the vicinity. If that was the case, then the OOW did not take alternative actions to avoid the collision; for instance, reducing the speed or stopping the main engine altogether were two available options. None were taken and it was therefore clear that whilst the OOW had a clear situation ahead of him, he did not perceive the potential hazard – which indicated (cognitive) issues with the interpretation of the close quarter situation as an integral part of the situation awareness.

The interpretation of the situation carried more weight even because there was no evidence which indicated that traffic was actually a hazard that required particular and specific attention by the OOW. Observation of the VDR data of Golden Trader showed that the only other traffic in the immediate vicinity were a stationery target wide on Golden Trader’s starboard side and another small target fine on her starboard bow. Neither targets were considered as hampering Golden Trader from altering course to starboard by 30° to 40° to avoid the collision.

Despite that the OOW on board Golden Trader was aware of the developing situation through the ARPA plot for a much longer period and distance in what was a crossing situation (Golden Trader had Vidar on a steady bearing approximately 030° on her starboard bow and being the give way vessel), the collision happened at 1437. The OOW claimed that once the close quarter situation developed, Golden Trader took action as best to avoid the collision by altering course to port. However, such an alteration, unless made at the very last moment, cannot be confirmed by AIS tracks or any other available means. Even still, the action would have been taken too late into the situation and when the collision was actually unavoidable, which is confirmed by the VDR radar images.

If one was to consider the reduced visibility factor and the avoiding action taken in accordance with Rule 19, then Golden Trader would still have been required to take action much earlier to avoid the collision and when the vessels where still not in sight of one another. In this case, once Vidar was sighted and after noting its aspect, even the 3 nm visibility range would have still allowed a safe alteration of course as an avoiding action.
2.3 True Motion Display

Perhaps one aspect of this accident is the experience of the *Golden Trader* OOW with true motion display. In a true motion display, the centre of the picture moves across the radar screen in time with the actual movement of the vessel. The vessel is then seen to pass the coastline rather than the coastline passing the vessel. Thus, stationary objects (*e.g.* buoys) would appear stationary on the radar display.

True motion is the preferred choice of many operators for inshore water navigation. True motion has an advantage in that echoes of vessels under way can be distinguished at once by their trails, indicating their respective true course. On the other hand, the echoes of stationary objects can be readily identified by the absence of echo trails. To achieve this, however, the radar must be ground stabilised.

In a true motion display, both the trace and vectors indicate the true direction of travel of the target when in actual fact, for collision avoidance what is required is the relative track of a target to own vessel. This is why a relative stabilised radar display is best for collision avoidance.

![Figure 22: True motion display](image-url)
Notwithstanding being on true motion, full CPA information was still available to the OOW at all times. Even on true motion display, the CPA information box is displayed on the bottom right hand corner of the radar display; a function, which was verified to be available from the VDR data. *Vidar* was acquired as target no. 47, which the VDR data indicated that the CPA was zero as early as at a distance of 6 nm. It appeared that the OOW did not process this information, which was available on the radar during the period leading up to the collision.

### 2.4 CPA and TCPA Settings

The VDR data indicated that the alarm for the CPA was set at 0.1 nm and that for the time to closest point of approach (TCPA) was set at one minute. It was concluded that these are not realistic settings for a vessel of the size and manoeuvrability of *Golden Trader*, which required much more room and time to manoeuvre out of a close quarter situation. In fact, it was observed that the collision occurred soon after the TCPA alarm sounded with insufficient time for the OOW to analyse the situation and act accordingly in order to take avoiding action. Though the Bridge Standing Orders highlighted the proper use of radars, there were no clear instructions on the importance of setting realistic CPA and TCPA alarm settings.

Further to the radar observations, once the fishing vessel was sighted visually at about 3 nm, the OOW did not take and observe its visual bearing to verify radar target information and evaluate the risk of collision. Moreover, *Golden Trader* was not restricted in her ability to manoeuvre due to her draft given that there was sufficient depth of water all around the area.

### 2.5 Actions by *Vidar*

Notwithstanding the lack of available evidence in order to analyse the situation on board *Vidar*, the navigational watchkeeping practices on board the latter vessel cannot be overlooked. Though *Vidar* may have been aware of the developing situation through radar observations, the level of look out maintained on board is unknown. However, given that a collision had occurred, there are doubts on the way the navigational watch was kept.

*Vidar* OOW’s claim that visibility was as low as 50 m cannot be substantiated in any way. The visibility, as stated by the OOW on board *Golden Trader* (3 nm), has been confirmed by more than one witness. In fact, even the look-out on board *Golden Trader* recalled that the
fishing vessel was sighted visually while some distance off. Moreover, he also recalled that several minutes after observing the situation, he voiced his concern to the OOW on the developing risk of collision.

Considering Vidar’s manoeuvrability (being a small vessel) as well as the 3 nm visibility in the area, Vidar can be considered as the stand-on vessel in a crossing situation for vessels in sight of one another. However, Vidar did not take avoiding action sufficiently early enough in accordance with Rule 17 (Action by stand-on vessel) to avoid the collision as soon as it became clear that the collision cannot be avoided by the give way vessel alone.

This puts the level of look out being kept on the fishing boat in doubt and raises question as to how much the situation was actually appreciated. It is also appropriate to remark that being the smaller vessel and considering her (better) manoeuvrability, Vidar would have been able to manoeuvre out of the situation as soon as it became apparent that the collision would not have been avoided by the slower manoeuvre of Golden Trader (i.e. the give way vessel) alone.

Moreover, it was not excluded that the fishing equipment and gear forward of the wheel house may have caused visual obstructions and created several blind spots.

2.5.1 Subsequent actions after the collision
Evidence suggested that Vidar did not answer the calls by Golden Trader over the VHF radio. Moreover, although fully aware that the collision had additionally resulted in a pollution 18, she apparently continued on her way without stopping and standing by to assist as necessary.

2.6 Analyse of the Oil Spill

2.6.1 The oil spill 19
The collision happened at 1437 on 10 September 2011. When Vidar’s stem crashed into the side shell plating of Golden Trader, it caused a hole of about 3 m² iwo of starboard heavy fuel oil storage tank. Given the size of the hole, the full amount of heavy fuel oil above the hole’s

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18 Given the extent of damage and amount of heavy fuel oil lost by Golden Trader on impact, there must have been a substantial and instantaneous loss of heavy fuel oil onto the foredeck of the fishing vessel.

19 The SHK has engaged the consultant company SSPA Sweden AB to write a report on how the oil spill was mitigated in Sweden. The report is available at the SHK.
lower part, would have spilled into the water very fast, likely in less than a minute. This spill has likely been 400 mt or more, causing a thick, concentrated oil slick.\textsuperscript{20}

The volume of the heavy fuel oil storage tank was 886 m\textsuperscript{3}. \textit{GUTH} had collected about 60 mt of oily-water, which was estimated to be 50 mt of oil. In total, some 500 mt were collected on the Swedish coast; remaining in the heavy fuel oil storage tank were about 418 mt (assuming that the vessel was not rolling and without a list – probably, the remaining volume in the heavy fuel oil storage tank would have been even less). This added up to more than 900 mt, which actually exceeded the capacity of the heavy fuel oil storage tank. However, some of the figures are estimates, and as such not perfectly accurate, though professionally calculated.

Nonetheless, a conclusion was reached that the starboard heavy fuel oil storage tank was full at the time of the collision (which in this case would be about 840 mt, taking into consideration density and the applicable physical parameters, \textit{e.g.} temperature ranges) and that during the voyage (before the collision), the vessel had actually been consuming heavy fuel oil from the port side heavy fuel oil storage tank. Furthermore, this was supported by the hypothesis that the vessel took full bunker before leaving St. Petersburg to commence a long passage to India. It was also supported by the fact that the heavy fuel oil in starboard heavy fuel oil storage tank was high sulphur heavy fuel oil, which may not be consumed in the Baltic Sea and the North Sea.

After the collision, \textit{Golden Trader} continued to make way with a speed of 11 knots. The main engine was stopped after a few minutes and the vessel made a full circle of 360\textdegree\ to port and finally stopped in a position, Southeast of the accident site. The diameter of this turning circle was 0.9 nm (\textit{i.e.} 1.7 km). Moreover, when the weight of the spilled heavy fuel oil (about 400 mt) was lost from starboard side, the vessel would necessarily have got a list to port.

Photos taken after the accident showed that the vessel had no list and was upright. Hence, it is understood that the crew compensated the list. If so, then it was likely that this had been done by filling ballast water to a starboard ballast tank. Thus, after the first oil spill, the vessel listed to port, and the spillage stopped, or almost stopped, for some time. Later, when the list was compensated, further oil would have leaked out\textsuperscript{21}. The vessel may also have been

\textsuperscript{20} For the purpose of this safety investigation, this is called the \textit{Northern part of the spill}.

\textsuperscript{21} For the purpose of this safety investigation, this is called the \textit{Southern part of the spill}.
listing marginally to starboard, or rather momentarily had a reduced list to port, as she turned to port. Furthermore, when stopped, the vessel was drifting, and had subsequently been laying along the seas and would probably have been rolling somewhat in the existing moderate seas. This led to a second, more or less continuous, smaller oil spill, following the first and major spill.

The motor vessel *Maria Lerche* from SOK arrived by *Golden Trader* at 1640. *Maria Lerche* made a circle around *Golden Trader* and at 1646 reported that the latter vessel had a hole in one of her bunker tanks and that it was leaking black oil into the sea. This was the first notice of the *Southern part of the spill*. The vessel also reported that there was a visible oil belt from *Golden Trader*, which was about 300 m wide. Due to the restricted visibility, it was not possible to estimate the length of the oil belt but *Maria Lerche* reported “at least 2000 m.” This oil spilling into the sea was observed by the SOK vessel about two hours after the collision. At this time, the *Northern part of the spill* had drifted to the North and could have been up to 2.7 nm North of the vessel’s position.

The *Southern part of the spill* was also noticed by a helicopter during the morning of 11 September. To a large extent, the *Southern part of the spill* was recovered by SOK and no traces of this part of the spill could be found after 13 September.

The conclusion, based on these facts and hypothesis, is that the heavy fuel oil was more or less continuously spilled but in two main parts. One large and concentrated spill was at the position of the collision (the *Northern part of the spill*) with a calculated amount of more than 400 mt which happened in a very short time, possibly in less than a minute. The later and smaller spill occurred further South and happened either when the list was compensated, by rolling movements, or as the vessel turned to port. These two parts may have been connected to each other by a string of oil, continuously spilled as the vessel moved.

When the *Southern part of the spill* was located during a helicopter search on 11 September, the search was not continued further North as it was believed that the oil belt had been found. In fact, based on reports from *Maria Lerche* (10 September), the result from the helicopter search (11 September), information from the crew on board *Golden Trader*, and inspectors who were on board *Golden Trader* on 10 September, SOK concluded that the amount of spilled heavy fuel oil was 150 mt at the most. The amount that was actually picked up by Danish authorities was some 50 mt.
The larger *Northern part of the spill* was never searched for as no one was aware of its existence. Moreover, after the first night, the *Northern part of the spill* had been more submerged and the weather and wind had increased. It was therefore not observed by other shipping traffic. This may not be hard to understand, taking into account the fact that a thickness of 1 m was measured as the oil was found on the Swedish coast. 400 mt of heavy fuel oil, with a submerged thickness of up to 1 m, would in reality be extremely difficult to find. If the real amount of spilled heavy fuel oil had been known at an early stage as well as the high density it had (one has to bear in mind that the master of *Golden Trader* misinformed the authorities) the outcome of the collision would most likely have been different. The worsening weather also made the possibilities to find any oil decreasing considerably.

### 2.6.2 Material for estimation, given to SOK from *Golden Trader*

The estimation of the amount of heavy fuel oil spilled was partly based on information given by the master and crew on board *Golden Trader*. The initial reports were that very little or no heavy fuel oil was spilled into the sea. The vessel’s Oil Record Book had not been filled in since 04 September, *i.e.* before bunkering and departure from St. Petersburg. The master did not present any other documents confirming the quantity of heavy fuel oil available on board. To this effect, inaccurate, incomplete and misleading information was given, *vis-à-vis*:

- the master’s first report to SOK, more than 10 minutes after the collision, when it was stated that a maximum of one metric tonne had been spilled into the sea from the vessel; and
- the Oil Record Book was not filled in when the first inspection by the Danish authorities took place after the collision\(^\text{22}\).

The statement delivered by the master of *Golden Trader* after the collision declared that 201.5 mt of heavy fuel oil were spilled into the sea. The same document stated that 15 mt of high sulphur heavy fuel oil had been used after the collision. It has to be remarked that whilst the use of high sulphur heavy fuel oil in the North Sea is illegal, the low sulphur oil was stored in the undamaged heavy fuel oil storage tank on port side. Moreover, comparing the figures in this statement with the heavy fuel oil consumption during the voyage from St Petersburg, there were still a minimum of 60 mt of heavy fuel oil, which were unaccounted for. Therefore, if the information in the statement was correct, the vessel should have also been running on high sulphur heavy fuel oil during the voyage in the Baltic Sea. This safety

\(^{22}\) The Oil Record Book was filled in thereafter.
investigation concluded that the information in the statement did not correspond to other available and reliable information, and was therefore not considered as factual.

2.6.3 Drift and recovery of the Southern part of the spill
The Southern part of the spill was smaller than the estimated 150 mt; most likely somewhat bigger than the collected 50 mt that was recovered by SOK. Despite that the oil drift was followed, no heavy fuel oil could be found after 12 September.

2.6.4 Drift of the Northern part of the spill
The heavy fuel oil, which was fast flowing from the punctured heavy fuel oil storage tank on Golden Trader, had formed a thick, concentrated oil belt. This oil belt had first drifted to the North, thereafter to the Northeast, passing Skaw point, and finally to the East until it reached the Swedish coast.

On Tuesday 13 September 2011, at around 1030, a Danish surveillance aircraft observed traces of heavy fuel oil on its SLAR in the sea area off Hanstholm to Løkken. However, it was not possible to visually see the heavy fuel oil. On Wednesday morning (14 September 2011), SOK sent a request to the Swedish Coast Guard to carry out an aerial reconnaissance with SLAR in the area west of Hirtshals, where oil had been observed the day before. During that afternoon, the Swedish Coast Guard carried out the airborne surveillance but no heavy fuel oil was observed. On both times, the searches were carried out South and West of the position where the Northern part of the spill actually was located. The search areas were taken from the observations done earlier and confirmed by oil drift calculations carried out afterwards.

Following the pollution on the Swedish Coast, chemical tests showed that this heavy fuel oil had originated from the starboard heavy fuel oil storage tank fitted on Golden Trader.
3 CONCLUSIONS

Findings and safety factors are not listed in any order of priority.

3.1 Immediate Safety Factors

.1 *Golden Trader* did not give way in good time as required by COLREGs. This appears to have been due to her OOW perception that the fishing vessel would pass close astern.

.2 The effectiveness of look out kept on board *Vidar* prior to the collision is questionable, given that she continued on a course and speed heading into a close quarter situation and eventual collision.

.3 Despite the risk of collision, actions in accordance with the relevant COLREGs were taken neither by *Golden Trader* nor *Vidar*. Both vessels maintained their course and speed until too late to avoid the collision.

3.2 Latent Conditions and other Safety Factors

.1 All the necessary information available on the bridge of *Golden Trader* indicated that target no. 47 on the ARPA, and later identified as a fishing vessel, was on a collision course.

.2 Although the ongoing radar plot indicated a steady collision course and eventually *Vidar* was sighted visually, the OOW did not take visual bearings to verify the risk of collision and (being the give way vessel) take timely avoiding action accordingly.

.3 VDR data did not indicate other traffic in the vicinity which could have precluded *Golden Trader* from giving way by altering the course to starboard.

.4 As a result of the OOW’s perception of the situation, no avoiding actions (by slowing down or stop his vessel) were taken by the OOW.

3.3 Other Findings

.1 The CPA and TCPA alarm settings on the ARPA on board *Golden Trader* were too low for a vessel of her size. This important defence intended to raise a timely warning of a collision risk, was rendered ineffective.
2. Had a more accurate volume of heavy fuel oil spilled into the sea at the collision been declared and made known to the authorities directly after the collision, accurate drift calculations would have been done and the drifting oil could have been discovered and (to a certain extent) collected before reaching the Swedish coast. Thereto, the master of *Golden Trader* did not even give the correct amount of heavy fuel oil stored in the starboard heavy fuel oil storage tank before the collision.

3. The Oil Record Book was not updated according to relevant international regulations.

4. The corrected port side list (which was done immediately after the collision) had actually caused another oil spill.

5. *Vidar* neither reported nor took appropriate action after the collision.
4 ACTIONS TAKEN

4.1 Safety actions taken during the course of the safety investigation

Goldenport Shipmanagement Ltd. carried out an internal investigation into the collision in accordance with the requirements prescribed in Section 9 of the International Safety Management Code.

As a result of the internal investigation, an incident report was issued on 16 November 2011 to all the vessels managed by Goldenport Shipmanagement Ltd. The investigation highlighted the safety lessons and made addressed preventive measures by addressing:

- radar parameter;
- other methods of observation;
- on time reaction
- calling the master; and
- master’s responsibilities.

Moreover, Goldenport Shipmanagement Ltd. addressed three additional areas which were intended to prevent a similar reoccurrence, i.e.:

- an additional assessment of the company’s navigational processes in order to identify additional hazards;
- amend its SMS navigation procedure (Fleet Standing Instructions) to reflect the lessons learnt and the results of the additional assessment mentioned above; and
- training in Bridge Resource Management is being provided to joining navigating officers. Refresher training is also being provided to navigating officers at 36-month interval.
5 RECOMMENDATIONS

In view of the conclusions reached and taking into consideration the safety actions taken during the course of the safety investigation,

Goldenport Shipmanagement Ltd. is recommended to:

18/2012_R1 Ensure that the relevant sections of the Safety Management System (SMS) and Bridge Standing Orders highlight:

.1 the reduction in speed as an action to avoid collision and to allow more time for better assessment and that this is entered in the Bridge Standing Orders;

.2 actions to be taken in reduced visibility, including either the use of the second radar set or its immediate availability, if needed;

.3 that radar alarm settings, including CPA and TCPA, must be set at reasonable levels, bearing in mind the manoeuvring characteristics of own ship and the ability to take avoiding action in good time;

.4 the importance of accurate and timely records in the Oil Record Book as necessary; and

.5 emphasises the requirement of reporting potential oil spills as appropriate to allow the concerned shore authorities take all the necessary mitigating actions.
ANNEX

Annex A: Sample analysis

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**Jämförande undersökning**

Vid jämförelsen av oljespillproverna med oljeprov 1 (från fartyget GOLDEN TRADER) framkom att oljespillproverna kunde delas in i fyra grupper beroende på om proverna påverkats till liten del eller stor del av vädringseffekter. Vädringseffekter är sådana förändringar av oljan som sker efter att utsläpplaget skett. Grupperna kallas A, B, C och D och oljespillproverna redovisas i den gruppindelningen i texten nedan och även under rubriken **Statuts**.

Vattenprovet 056607 (troligen blankprov från havet) bedömdes inte nödvändigt att undersöka i detta ärende.

**Grupp A**

Oljespillproverna 051570, 056603, 056605, 056608, 056609, 056610, 056611, 056612, 056614 och B146-V-11 är endast till liten del påverkade av vädringseffekter. Vädringseffekter är sådana förändringar av oljan som sker efter att utsläpplaget skett, exempelvis avdunstning av flyktiga oljekomponenter.

Vid den jämförande undersökningen framkom att oljespillproverna 051570, 056603, 056605, 056608, 056609, 056610, 056611, 056612, 056614 och B146-V-11 överensstämmer med oljeprov 1 (från fartyget GOLDEN TRADER), med hänsyn tagen till att oljespillproverna endast till liten del är påverkade av vädringseffekter.

**Grupp B**

Oljespillproverna 056284, 056285, 056323, 057940 och 057941 är endast till liten del påverkade av vädringseffekter, såsom avdunstning av flyktiga oljekomponenter. Proverna är också till liten del påverkade av biodegradering, dvs. nedbrytning av mikroorganismer.

Vid den jämförande undersökningen framkom att oljespillproverna 056284, 056285, 056323, 057940 och 057941 överensstämmer med oljeprov 1 (från fartyget GOLDEN TRADER), med hänsyn tagen till att oljespillproverna är något påverkade av vädringseffekter.

**Grupp C**

Oljespillproverna 056606 och 057939 är till viss del påverkade av vädringseffekter, såsom avdunstning av flyktiga oljekomponenter, biodegradering och utvättning av vissa oljekomponenter.

Vid den jämförande undersökningen framkom att oljespillproverna 056606 och 057939 överensstämmer med oljeprov 1 (från fartyget GOLDEN TRADER). De skillnader som finns i oljespillproverna jämfört med oljeprov 1 bedöms bero på vädringseffekter.
Grupp D
Oljespillprovet 056324 är kraftigt påverkat av biodegradering och till viss del även andra vådingseffekter. Mycket kemisk information i oljan har därmed gått förlorad.

Vid den jämförande undersökningen framkom för oljespillprovet 056324 både likheter och skillnader med oljeprovet 1 (från fartyget GOLDEN TRADER). De skillnader som finns i oljespillprovet jämfört med oljeprovet 1 bedöms bero på vådingseffekter. Mycket kemisk information har gått förlorad p.g.a. den kraftiga biodegraderingen av oljespillprovet.

Oljespillprovet 056604 är till stor del påverkat av vådingseffekter, framförallt av den oljeförhållandet av flyktiga oljekomponenter. Även andra små skillnader finns.

Vid den jämförande undersökningen framkom för oljespillprovet 056604 både likheter och skillnader med oljeprovet 1 (från fartyget GOLDEN TRADER). De skillnader som finns i oljespillprovet jämfört med oljeprovet 1 bedöms i huvudsak bero på vådingseffekter.

Slutsats
Ingen mineralolja påvisades i provent 053574.

Grupp A
Resultaten talar extremt starkt för att oljespillproverna 051570, 056603, 056605, 056608, 056609, 056610, 056611, 056612, 056614 och B146-V-11 i utsläppssögonblicket var identiska med oljeprovet 1 (från fartyget GOLDEN TRADER) (Grad +4).

Grupp B
Resultaten talar starkt för att oljespillproverna 056284, 056285, 056323, 057940 och 057941 i utsläppssögonblicket var identiska med oljeprovet 1 (från fartyget GOLDEN TRADER) (Grad +3).

Grupp C
Resultaten talar för att oljespillproverna 056606 och 057939 i utsläppssögonblicket var identiska med oljeprovet 1 (från fartyget GOLDEN TRADER) (Grad +2).

Grupp D
Resultaten talar i någon mån för att oljespillproverna 056324 och 056604 i utsläppssögonblicket var identiska med oljeprovet 1 (från fartyget GOLDEN TRADER) (Grad +1).

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