



**Bundesstelle für Seeunfalluntersuchung**  
**Federal Bureau of Maritime Casualty Investigation**  
Federal Higher Authority subordinated to the Ministry of Transport  
and Digital Infrastructure

## Investigation Report 423/16

**Serious Marine Casualty**

**Collision between the MV MERIDIAN,  
MV NEWYORKER and MSC DIANA  
at the Stromkaje, Bremerhaven,  
on 20 November 2016 at 0153**

30 July 2018

The investigation was conducted in conformity with the Law to improve safety of shipping by investigating marine casualties and other incidents (Maritime Safety Investigation Law – SUG). According to said Law, the sole objective of this investigation is to prevent future accidents. This investigation does not serve to ascertain fault, liability or claims (Article 9(2) SUG).

This report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to Article 34(4) SUG.

The German text shall prevail in the interpretation of this investigation report.

Issued by:  
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## 1 SUMMARY

At 0153<sup>1</sup> on 20 November 2016, the large container vessels NEWYORKER and MSC DIANA were moored one behind the other at the container terminal in Bremerhaven. Without any discernible alteration in course or speed, the coaster MERIDIAN first sailed into the port side of the NEWYORKER, pushed along her toward the stern into the gap between the two container vessels, where she then rammed the pier with her bow. In the prevailing situation, it seems that the rising tide played a role in that it pushed the MERIDIAN against the MSC DIANA's bulbous bow with her starboard side. Shortly after, the MERIDIAN was able to manoeuvre clear again in a sternward direction.

This contact with the bulbous bow left no visible damage on the MSC DIANA. However, it did result in indentation with cracking on the starboard side of the MERIDIAN. The MERIDIAN's crew was able to stop the slight water ingress that followed.

The shell plating of the NEWYORKER was dented several times but no cracking was caused.

The collision with the pier caused heavy damage to the MERIDIAN's fore section. The damage sustained by the pier's structure was so heavy that operation of the container gantry crane on top of it had to be suspended temporarily.

There were neither physical injuries nor environmental pollution.

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<sup>1</sup> Unless stated otherwise, all times shown in this report are local = UTC +1 (CET).

## 2 FACTUAL INFORMATION

### 2.1 Photo of the MERIDIAN



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Figure 1: MERIDIAN

### 2.2 Ship particulars: MERIDIAN

Name of ship:	MERIDIAN
Type of ship:	Multi-purpose carrier
Nationality/Flag:	German
Port of registry:	Wilhelmshaven
IMO number:	7002605
Call sign:	DDOF
Owner:	Master
Year built:	1969
Shipyard/Yard number:	Martin Janssen Schiffswerft/72
Classification society:	Germanischer Lloyd
Length overall:	74.12 m
Breadth overall:	10.5 m
Gross tonnage:	1,251
Deadweight:	1,404 t
Draught (max.):	3.65 m
Engine rating:	853 kW
Main engine:	SKL Magdeburg
(Service) Speed:	10.0 kts
Hull material:	Steel
Minimum safe manning:	4

### 2.3 Voyage particulars: MERIDIAN

Port of departure:	Swinoujscie
Port of call:	Oldenburg
Type of voyage:	Merchant shipping/ international
Cargo information:	Rapeseed meal
Manning:	4
Draught at time of accident:	F: 3.62 m – A: 3.65 m
Pilot on board:	No
Number of passengers:	0

### 2.4 Photo of the MSC DIANA



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Figure 2: MSC DIANA

### 2.5 Ship particulars: MSC DIANA

Name of ship:	MSC DIANA
Type of ship:	Container ship (ULCS)
Nationality/Flag:	Liberia
Port of registry:	Monrovia
IMO number:	9755933
Call sign:	D5KX8
Owner:	MSC Mediterranean Shipping Company
Year built:	2016
Shipyard/Yard number:	Samsung Heavy Ind./2138
Classification society:	Germanischer Lloyd
Length overall:	399.90 m
Breadth overall:	58.83 m
Gross tonnage:	193,489
Deadweight:	202,036 t
Draught (max.):	16.0 m
Engine rating:	75,570 kW
Main engine:	MAN-B&W
(Service) Speed:	19.0 kts
Hull material:	Steel

## 2.6 Photo of the NEWYORKER



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Figure 3: NEWYORKER

## 2.7 Ship particulars: NEWYORKER

Name of ship:	NEWYORKER
Type of ship:	Container
Nationality/Flag:	Panama
Port of registry:	Panama
IMO number:	9209104
Call sign:	3FIP9
Owner:	MSC Mediterranean Shipping Company
Year built:	2001
Shipyard/Yard number:	Samsung Heavy Ind./1312
Classification society:	GL
Length overall:	207.16 m
Breadth overall:	29.80 m
Gross tonnage:	25,294
Deadweight:	32,299 t
Draught (max.):	11.40 m
Engine rating:	20,954 kW
Main engine:	Sulzer, HSD Engine Co Ltd.
(Service) Speed:	22.8 kts
Hull material:	Steel



## 2.8 Marine casualty or incident information

Type of marine casualty:	Serious marine casualty – collision
Date, time:	20/11/2016, 0153
Location:	Bremerhaven, Stromkaje
Latitude/longitude:	$\phi$ 53°35'N $\lambda$ 008°32'E
Ship operation and voyage segment:	Estuary trading Arrival

Consequences (for people, ship, cargo, environment, other): Damage to two ships and the pier

Extract from Navigational Chart INT 1457,  
 Federal Maritime and Hydrographic Agency (BSH)

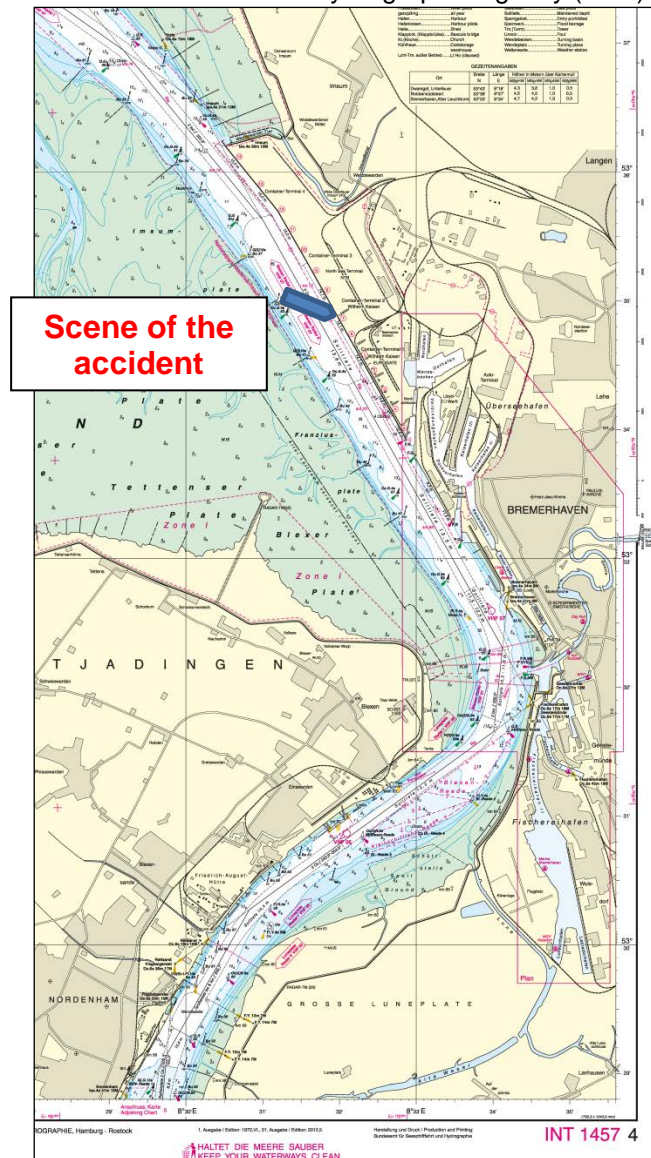


Figure 4: Navigational chart showing the scene of the accident

## **2.9 Shore authority involvement and emergency response**

Agencies involved: Bremerhaven harbourmaster, Bremen Port, Eurogate, WSP<sup>2</sup> Bremerhaven, VTS<sup>3</sup> Bremerhaven, Ship Safety Division (BG Verkehr)

Resources used: None

Actions taken: Damage determined, investigation started

Results achieved: No physical injuries, no environmental pollution, extensive damage to two ships involved and the pier

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<sup>2</sup> WSP: Waterway police

<sup>3</sup> VTS: Vessel traffic service

### 3 COURSE OF THE ACCIDENT AND INVESTIGATION

#### 3.1 Course of the accident

The MERIDIAN loaded rapeseed meal in Świnoujście for Oldenburg. On 19 November 2016, she transited the Kiel Canal (NOK). At about 1800, she departed from the lock at Brunsbüttel heading for the North Sea.

Figures 5-9 are based upon data from the AIS<sup>4</sup> provider, MarineTraffic. Inaccuracies are based upon the fact that the data from MarineTraffic are only available at 3-5 minute intervals.

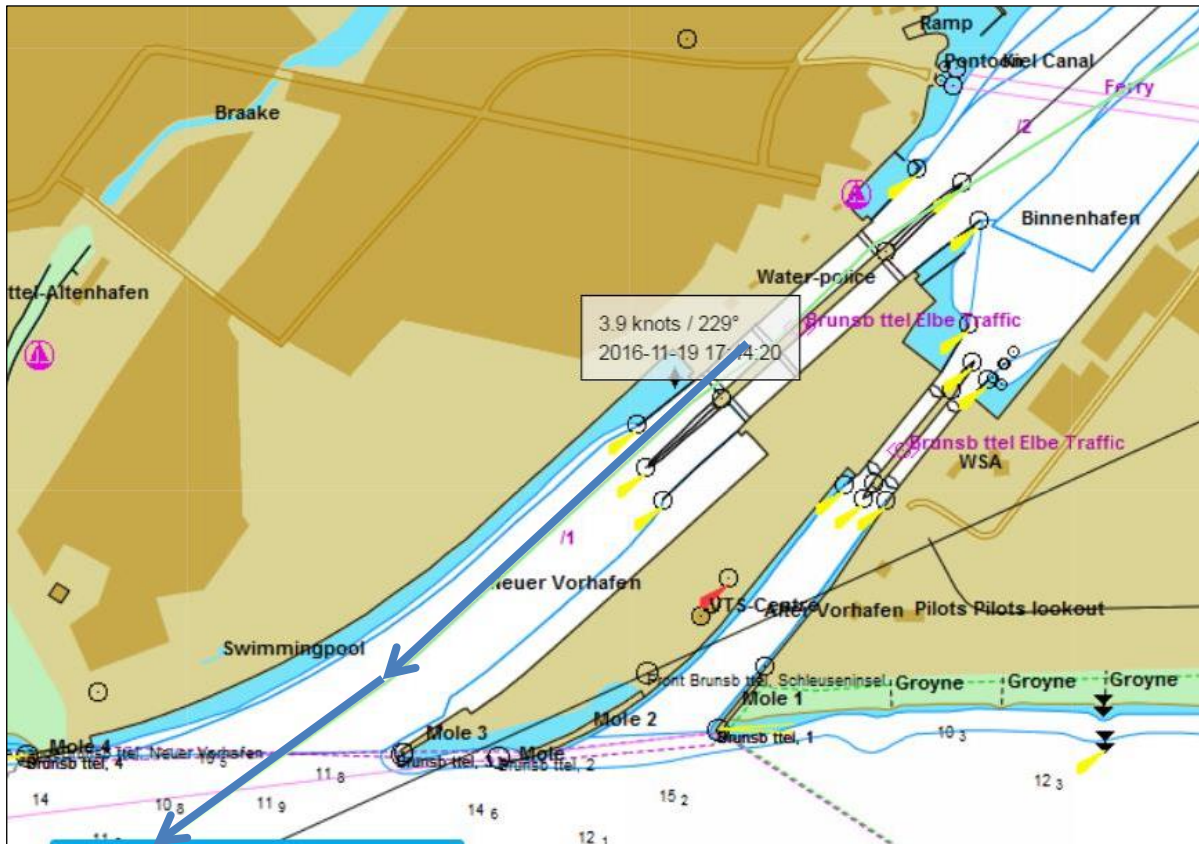


Figure 5: MV MERIDIAN transits Brunsbüttel Lock

<sup>4</sup> AIS: Automatic identification system

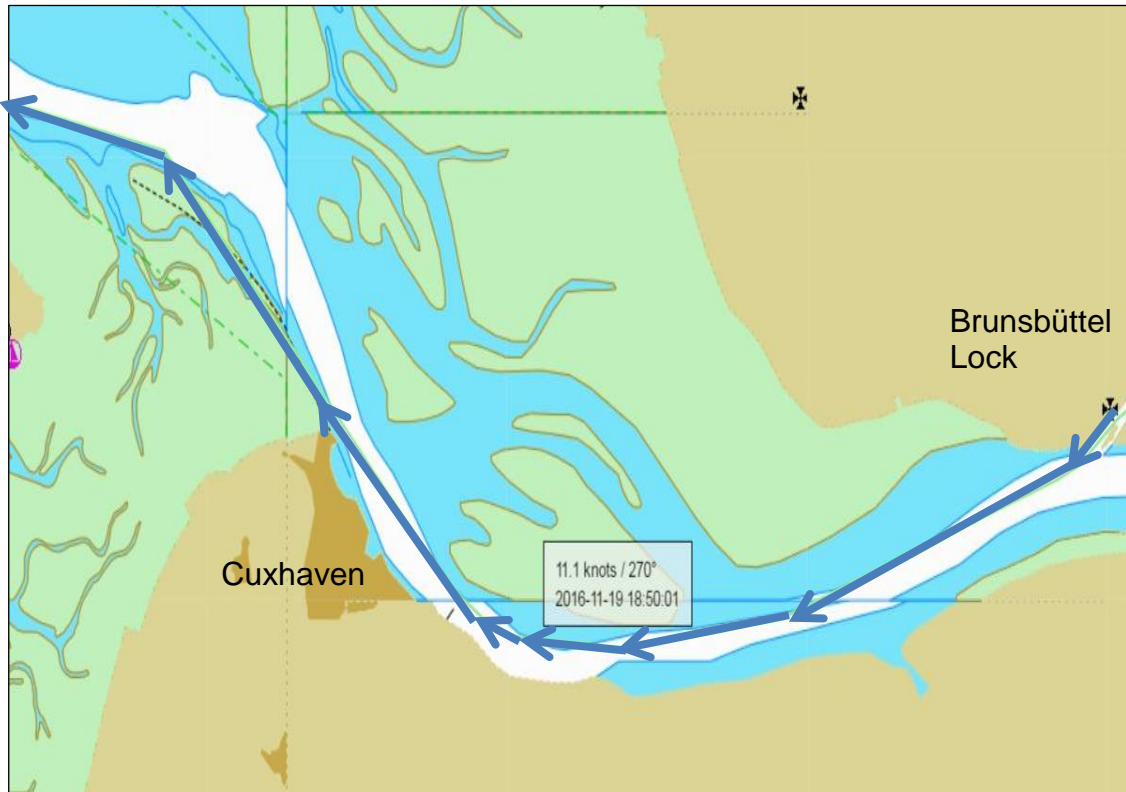


Figure 6: 1850 – the MERIDIAN sails westward at 11 kts

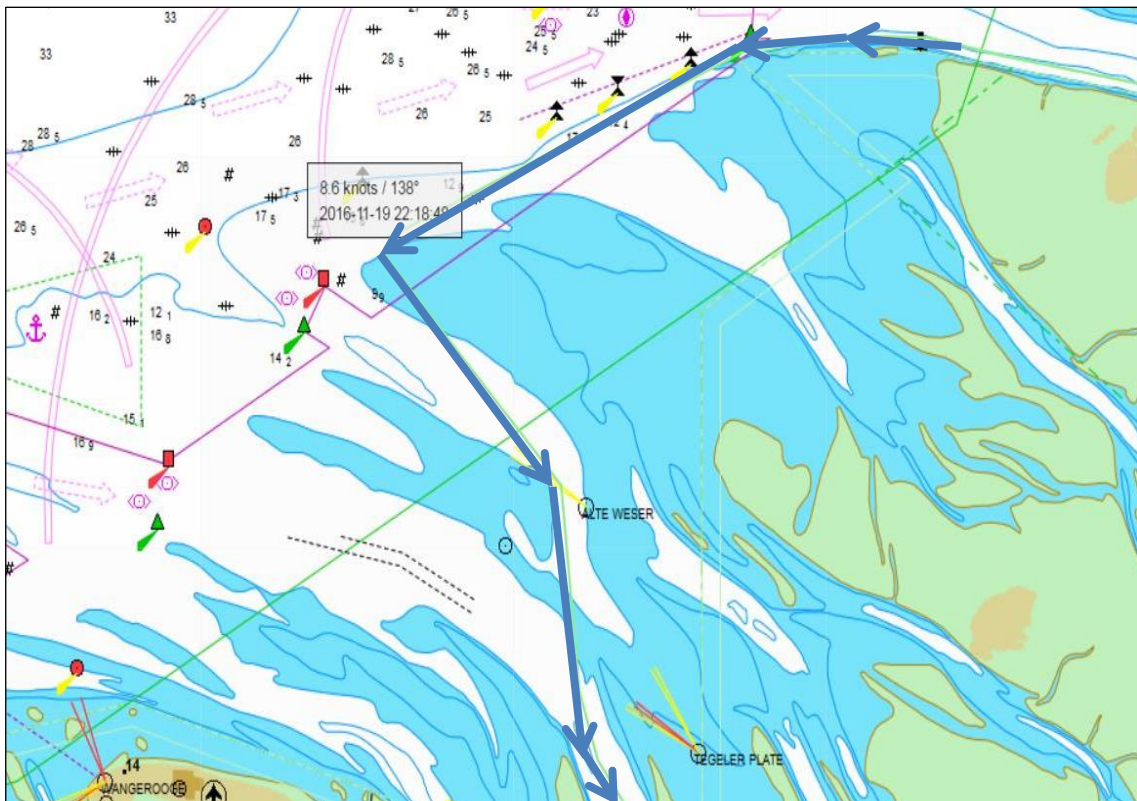


Figure 7: 2218 – she has left the River Elbe

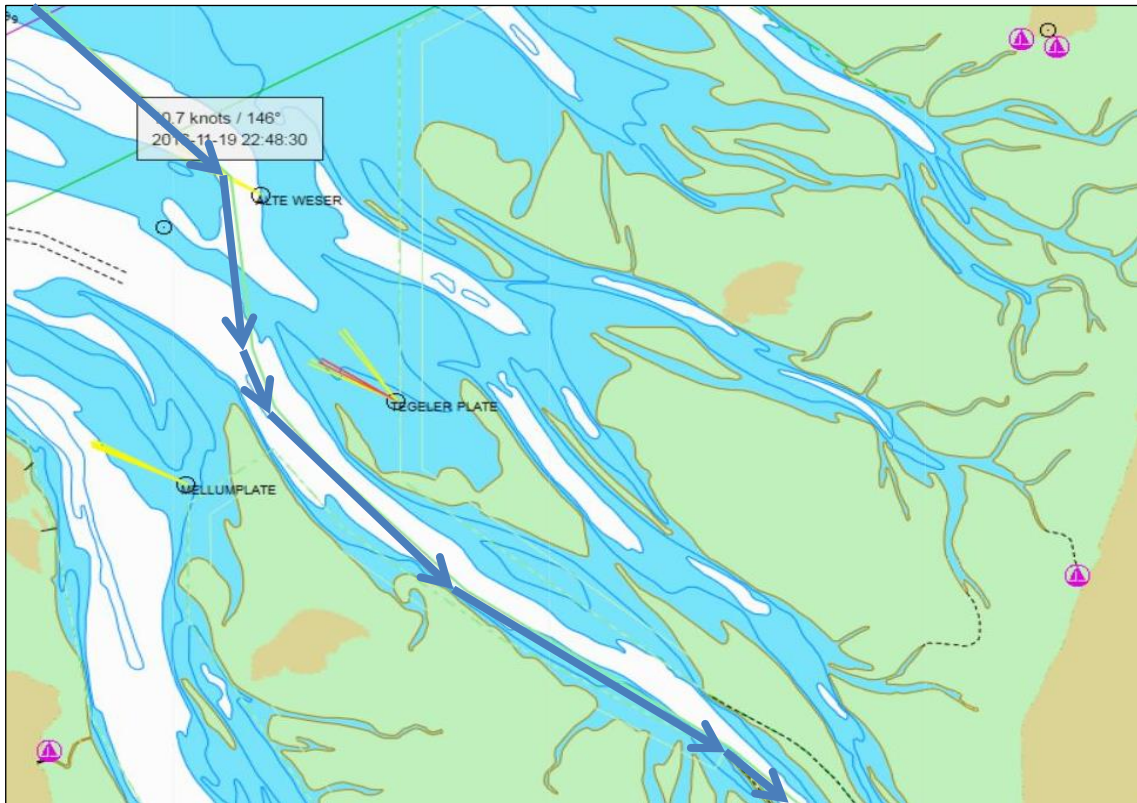


Figure 8: 2248 – she reaches the Weser estuary

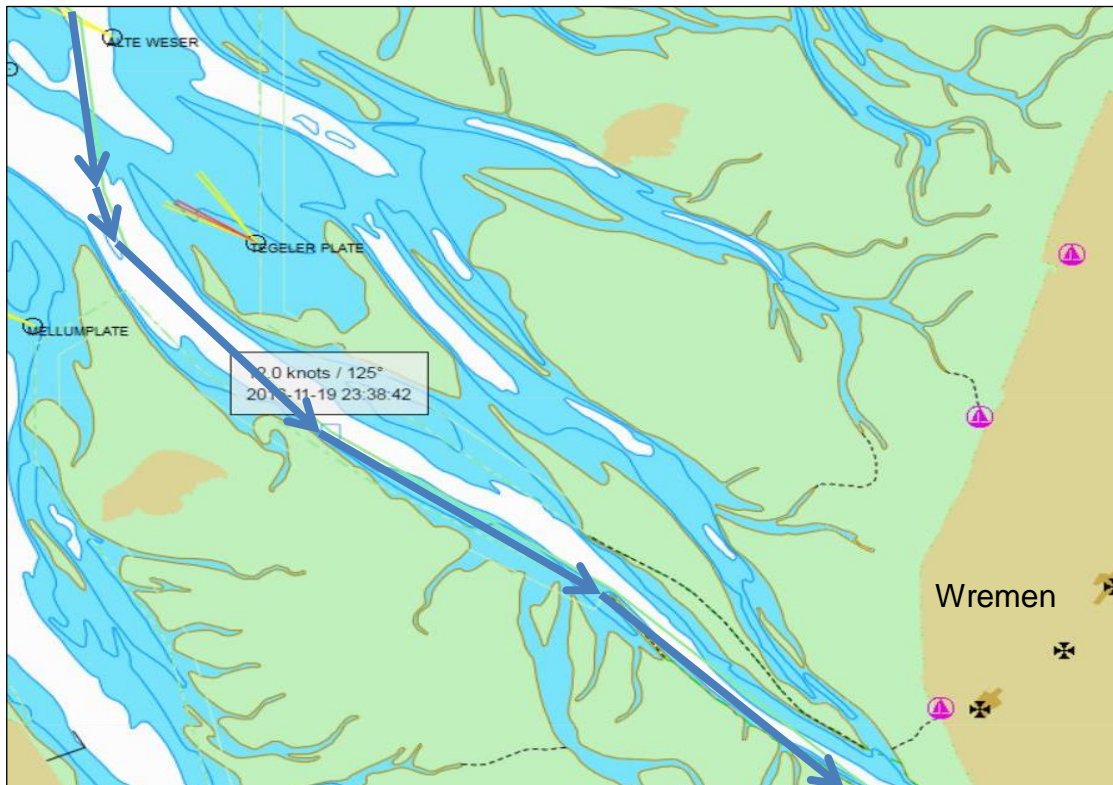


Figure 9: 2338 – the fairway of the Weser is apparently being crossed repeatedly

It seems that the MERIDIAN is crossing the fairway repeatedly. This impression arises from the fact that the AIS data from MarineTraffic are only available at 3-5 minute

intervals and the distance made good between the positions is interpolated. As of 004313, AIS data are available from the VTS at second intervals, which is more appropriate for the description of the course of the accident.

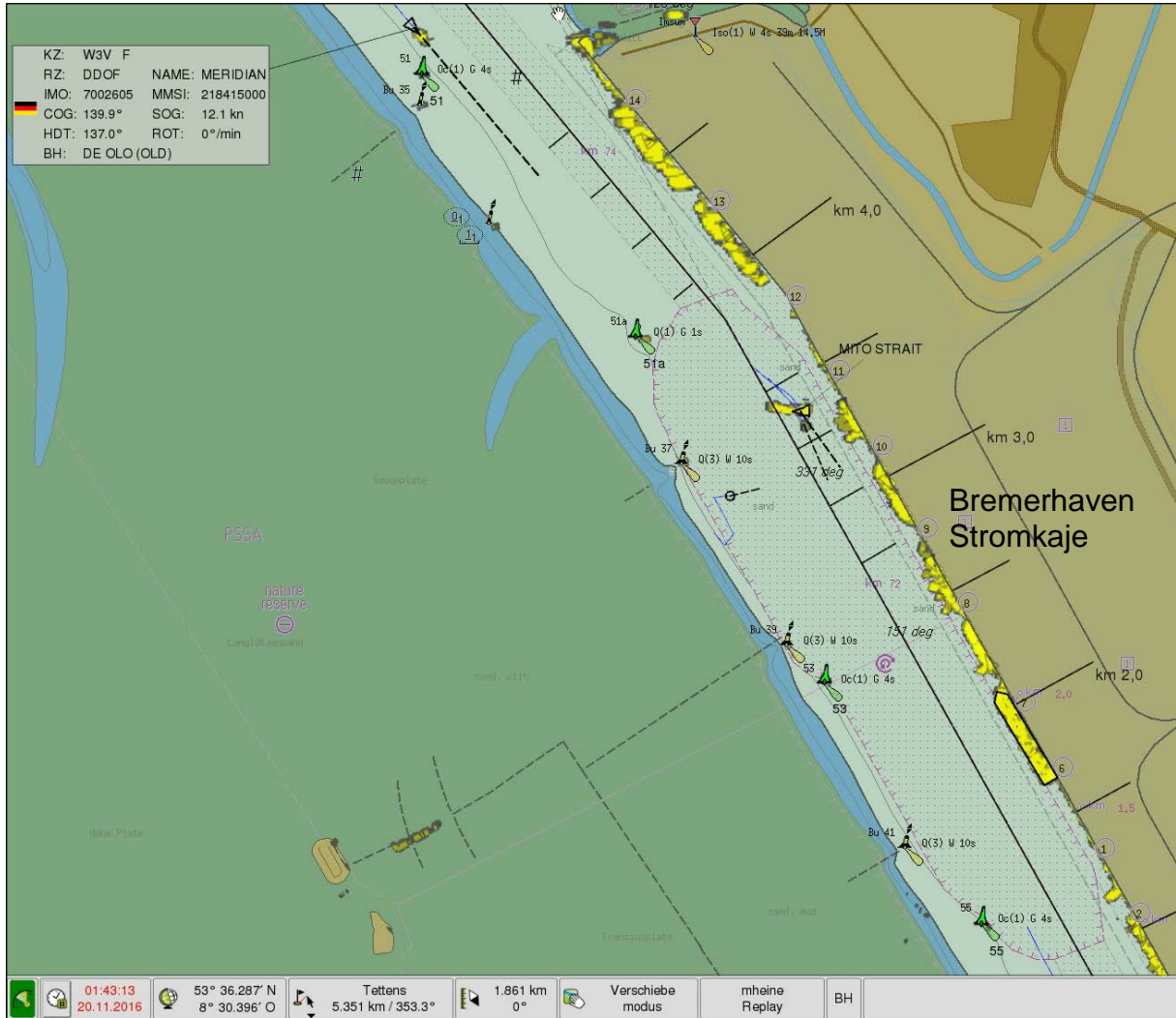


Figure 10: 014313 – shortly before passing buoy 51

Figure 10 shows the MERIDIAN shortly before she passed buoy 51. She is maintaining a course of 140° at a speed of 12.1 kts on autopilot.

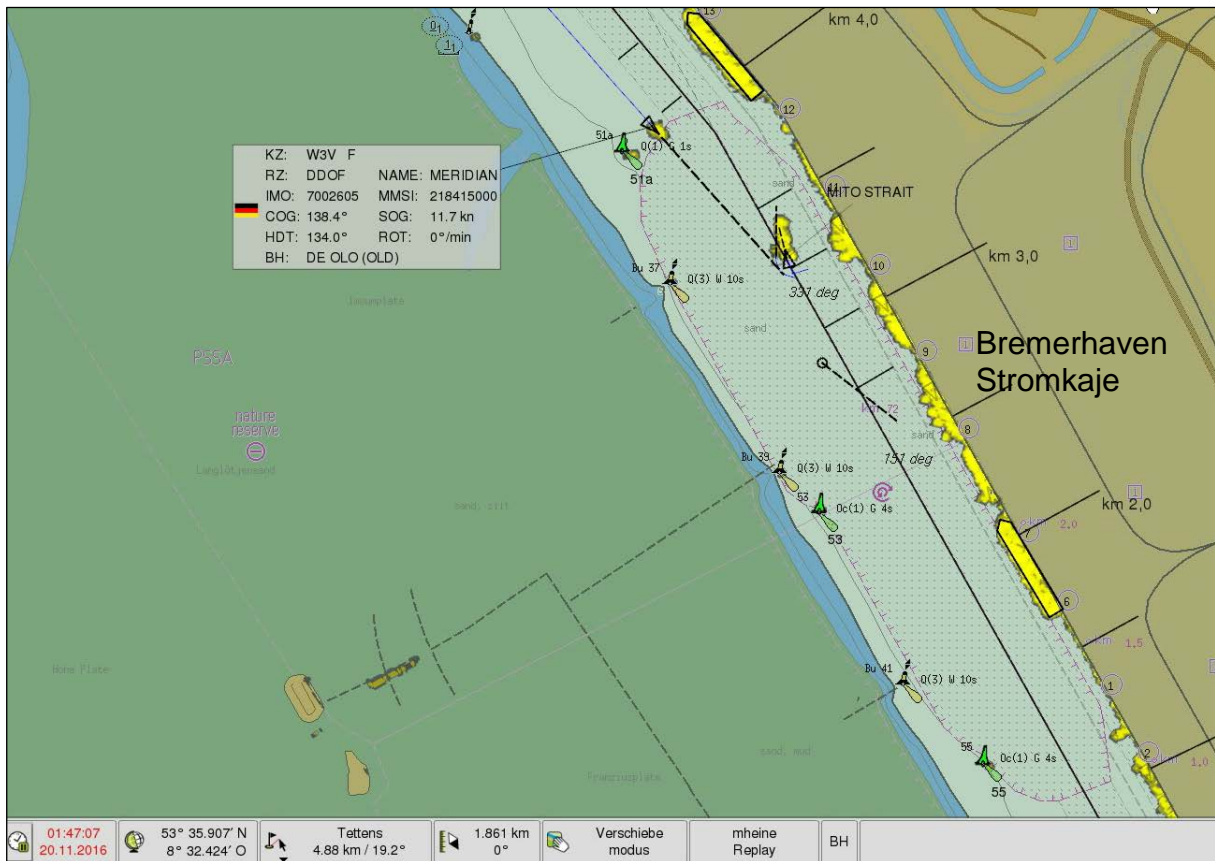


Figure 11: 014707 – buoy 51a is passed

*At the time of Figure 11, when buoy 51a was passed, the officer on watch was on the bridge and the rating on watch making a safety inspection of the ship. The fourth crew member was asleep. The master had just been woken so that he could take over the navigational watch as planned<sup>5</sup>.*

*The helmsman then switched from autopilot to riverpilot because he thought this would allow him to steer the ship better. When he intended to make the necessary course alteration to starboard about a minute later, he noticed that the rudder was not responding (not immediately but only after he had to move the tiller further and further to starboard). He then switched on the second steering gear but the rudder did not move. Following that, he set the control lever to STOP but was aware of the low effect. The AIS data in Figure 12 confirm this. At 014947, the speed dropped from 11.7 to 11.3 kts. At this point, the NEWYORKER was no more than two ship lengths away. He reportedly failed to notice the contact with the NEWYORKER (at 015136 – see Figure 13). [Rather than there being a direct collision, she probably 'slid along' because the collision angle was so shallow.] Shortly afterwards, the MERIDIAN collided with the pier at an acute angle between the NEWYORKER and the MSC DIANA and then came to a standstill (Figures 14 and 15).*

*The helmsman neither sounded a general alarm nor attempted to have the rating let go the anchor. He attributed this to the stressful situation.*

<sup>5</sup> This account of the accident (italics) is based on witness testimony.

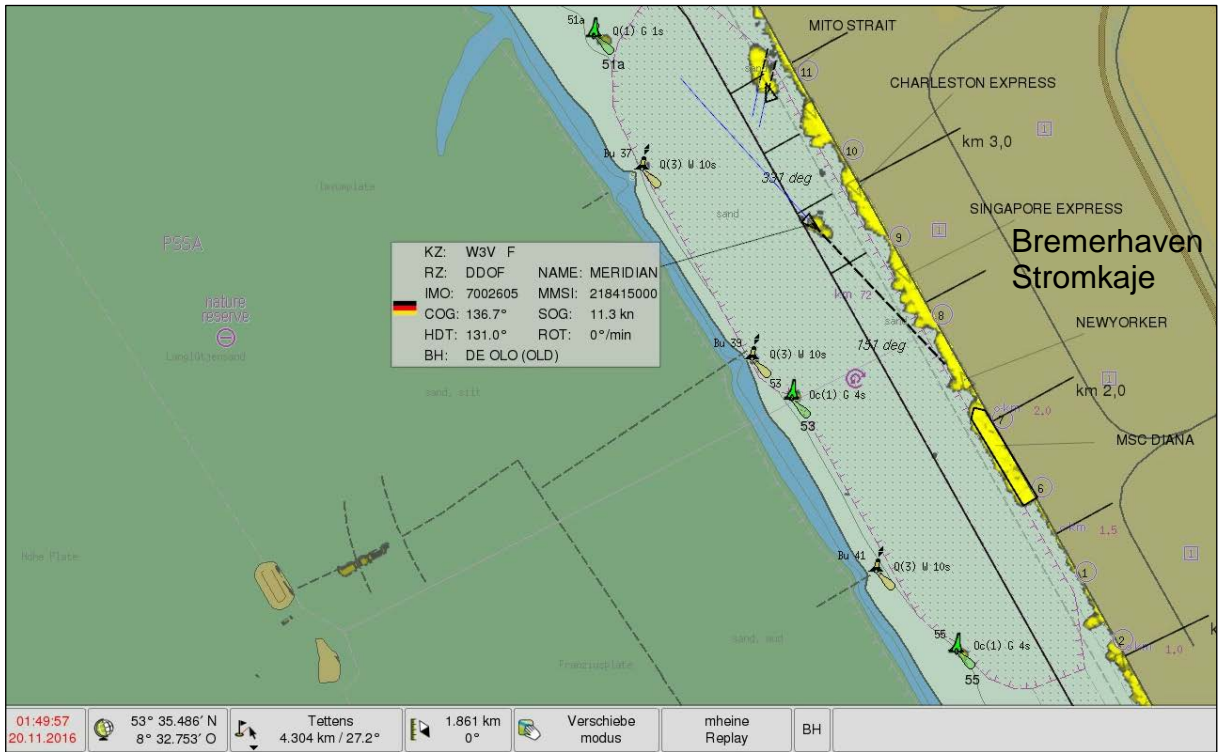


Figure 12: 014947 – the MERIDIAN slows down

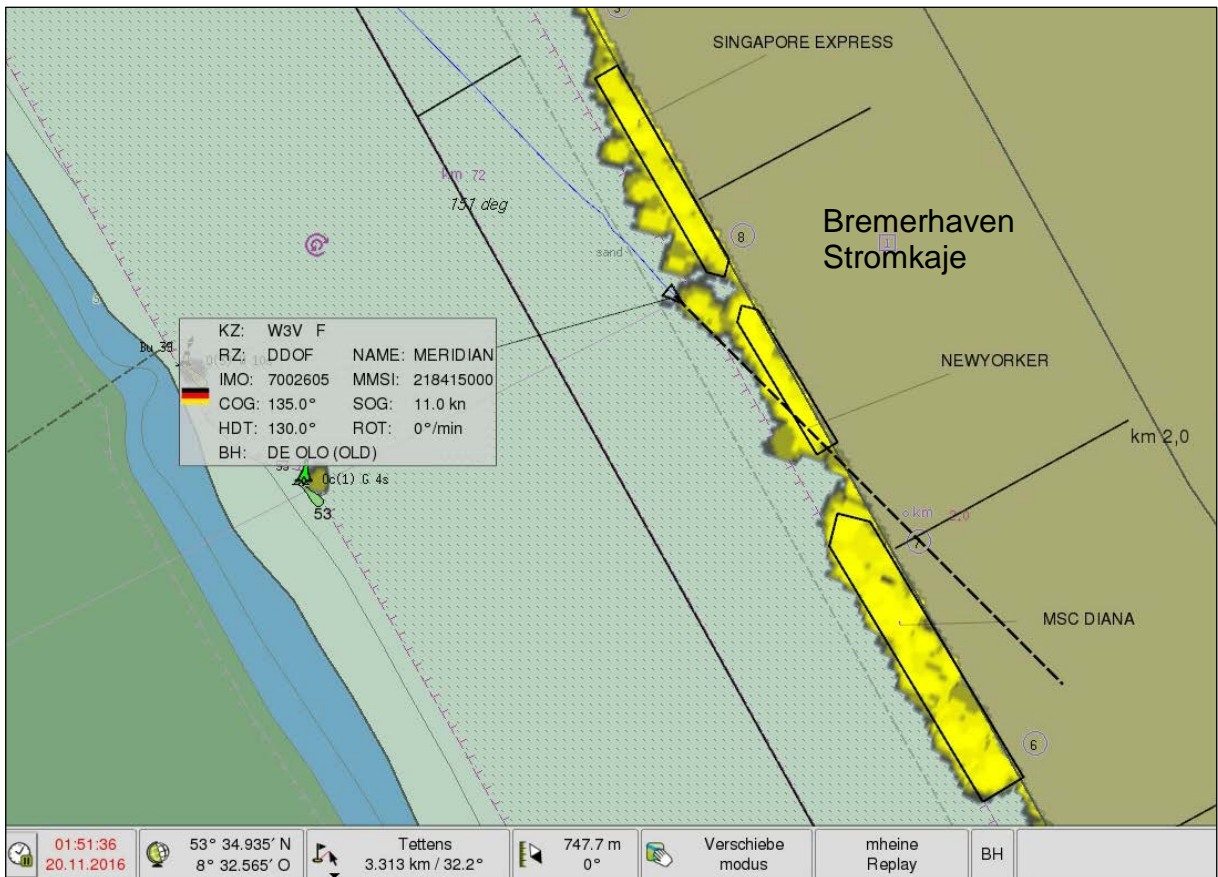


Figure 13: 015136 – collision with the NEWYORKER begins



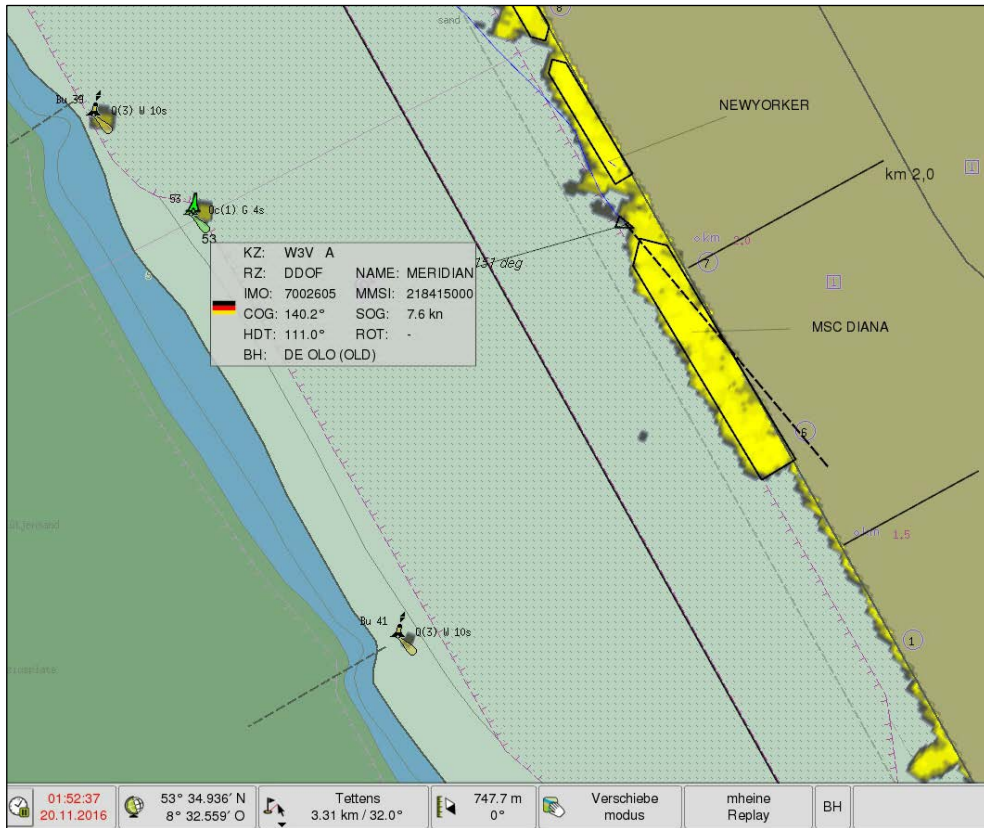


Figure 14: 015237 – collision with pier

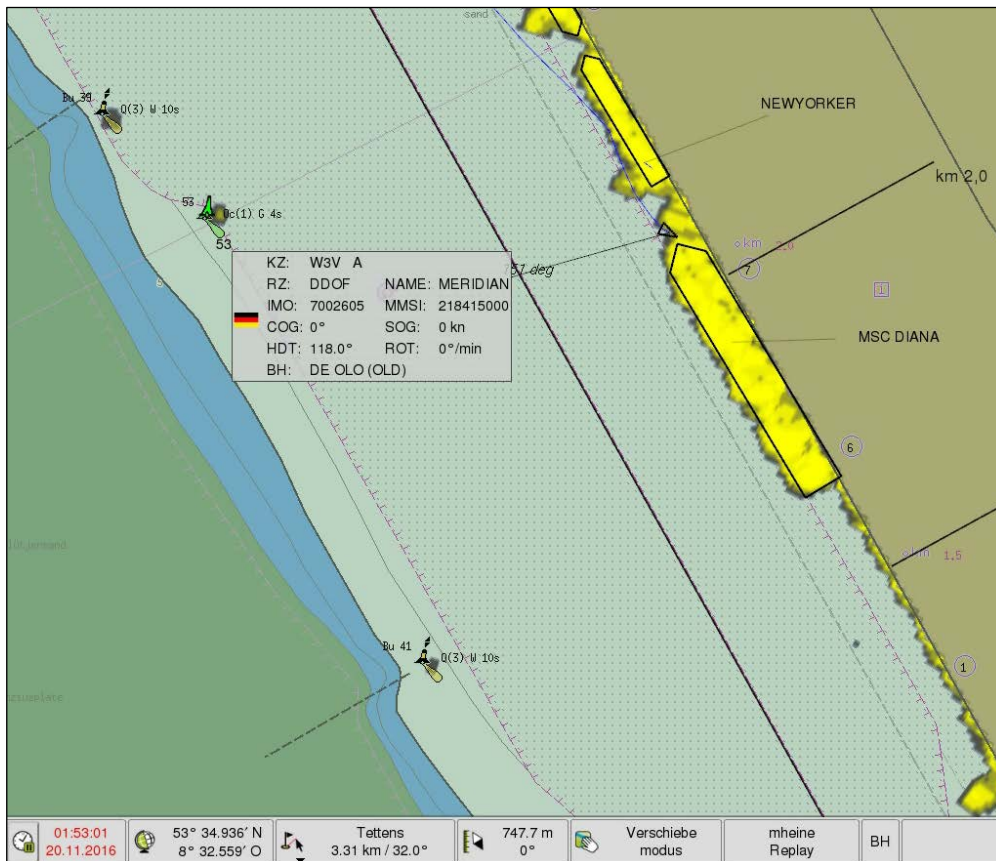


Figure 15: 015301 – STOP at the pier

The master appeared on the bridge at the moment of the collision with the pier so as to take over the watch immediately.

The rising tide immediately started to push the MERIDIAN's starboard side against the bulbous bow of the MSC DIANA. Although this did not cause any damage to the MSC DIANA, the starboard side of the MERIDIAN was dented to such an extent that a small crack formed level with the waterline (with slight water ingress), which the crew was able to seal quickly, however.

The master sounded the general alarm and issued instructions for the two ratings to check inside the ship for damage. He arrived at the conclusion that it was not possible to control the rudder from the bridge and went to the steering gear compartment, where he switched to the backup rudder system, carried out a test, and found that the rudder now moved.

He then started the main engine and began to manoeuvre the ship astern and away from the pier (see Figures 16 and 17).

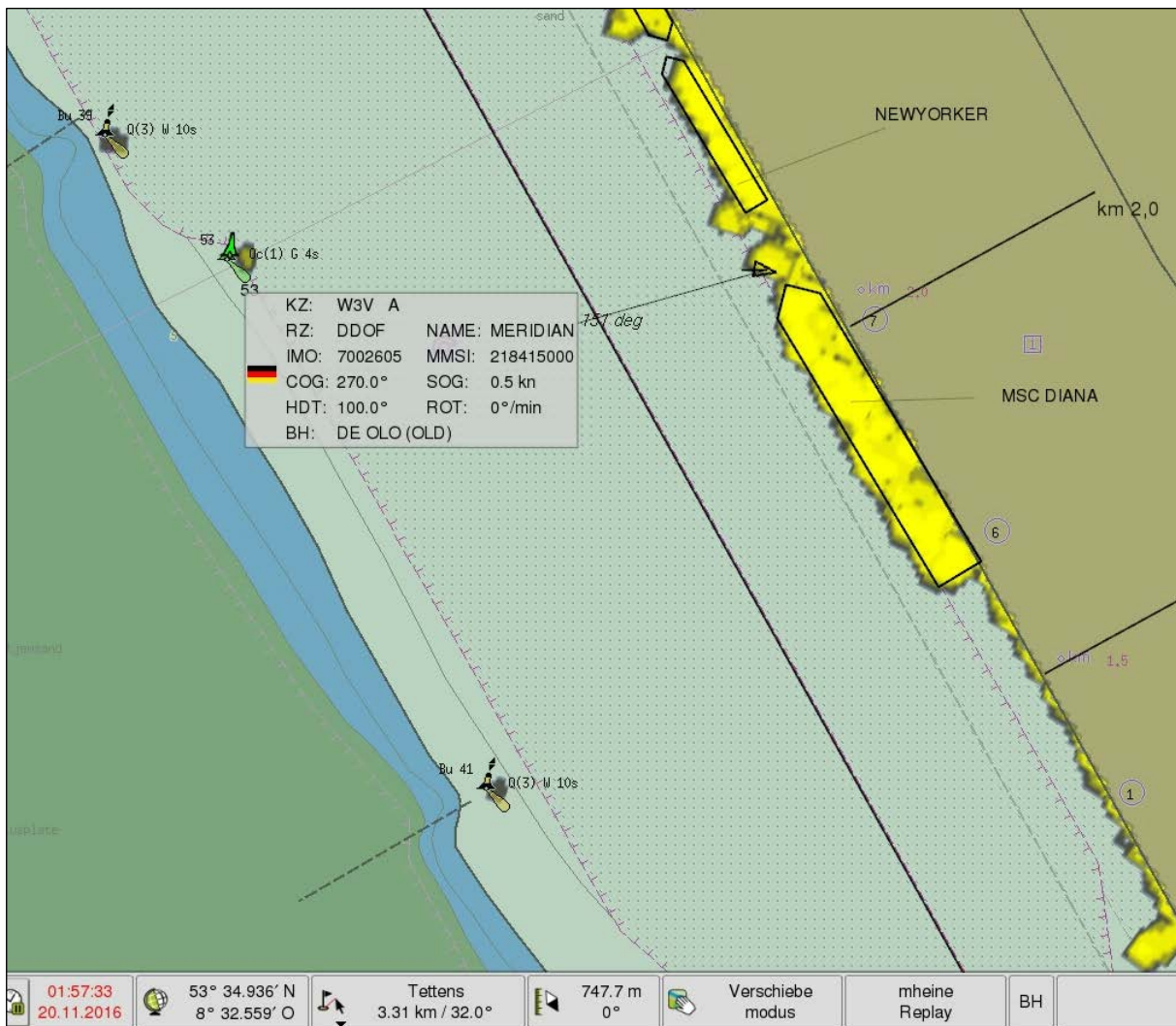


Figure 16: 015733 – start of the astern manoeuvre

The master sailed the MERIDIAN to the Seebäderkaje quay and made fast there. When he tested the steering gear there in normal operating mode again, it failed to respond.

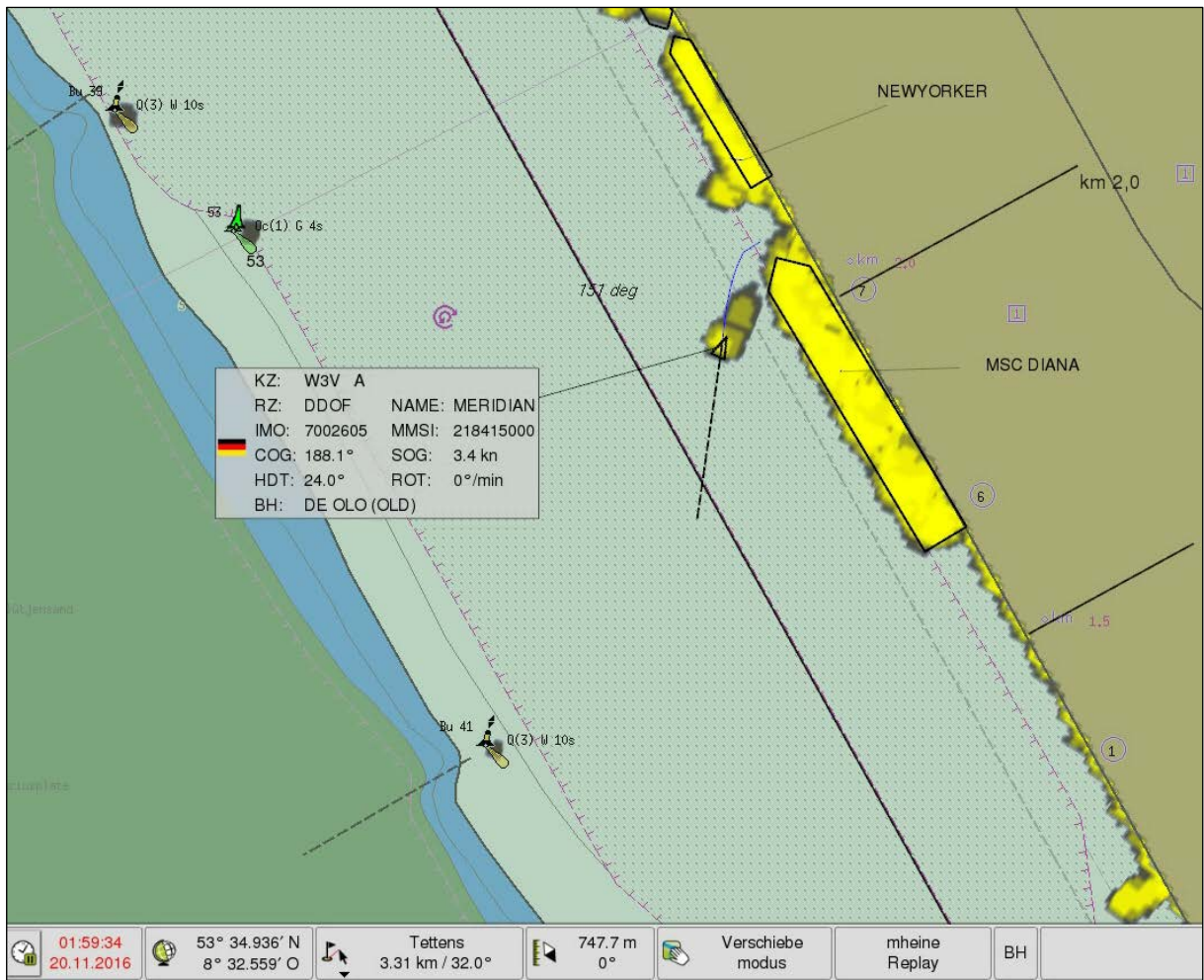


Figure 17: 015934 – the MERIDIAN is clear again

### 3.2 Investigation

Since the MERIDIAN is not required to carry a VDR<sup>6</sup>, such a device was not on board. Accordingly, no technical evidence was available from the MERIDIAN herself for the investigation. No shipboard device recorded the failure of the steering gear, either. The BSU was able to refer to the investigation of the WSP and analyse the technical recordings of VTS Bremerhaven. The ship's AIS data were also used via the Internet portal MarineTraffic.com and AIS-Deutsche Küste.

#### 3.2.1 Course of the voyage

This is a tabular extract from the AIS data:

Timestamp (LT)	Source	Speed (kts)	Course (°)	Latitude (°)	Longitude (°)	
<b>013800</b>	Terr-AIS	<b>11.90</b>	<b>128.00</b>	53.62	8.48	
<b>014313</b>	Terr-AIS	<b>12.10</b>	<b>139.90</b>	53.60	8.50	
<b>014707</b>	Terr-AIS	<b>11.70</b>	<b>138.40</b>	53.60	8.53	
<b>014957</b>	Terr-AIS	<b>11.30</b>	<b>136.70</b>	<b>53.59</b>	<b>8.54</b>	Switch to manual steering
<b>015025</b>	Terr-AIS	<b>11.30</b>	<b>136.70</b>	<b>53.60</b>	<b>8.54</b>	STOP engine
015035	Terr-AIS	11.30	136.70	53.60	8.54	
015045	Terr-AIS	11.30	136.70	53.60	8.54	
<b>015050</b>	Terr-AIS	<b>11.30</b>	<b>136.70</b>	53.60	8.54	
<b>015055</b>	Terr-AIS	<b>11.30</b>	<b>136.70</b>	53.60	8.54	
<b>015100</b>	Terr-AIS	<b>11.30</b>	<b>136.70</b>	53.59	8.54	
<b>015120</b>	Terr-AIS	<b>11.30</b>	<b>133.30</b>	<b>53.58</b>	<b>8.54</b>	
015125	Terr-AIS	11.00	135.00	53.58	8.54	Course deviations due to approaching the NEWYORKER
015135	Terr-AIS	11.00	135.00	53.58	8.54	
<b>015157</b>	Terr-AIS	<b>10.70</b>	<b>136.8</b>	53.58	8.54	
<b>015201</b>	Terr-AIS	<b>10.30</b>	<b>138.8</b>	53.58	8.54	
<b>015205</b>	Terr-AIS	<b>9.80</b>	<b>147.1</b>	53.58	8.54	Collision with the NEWYORKER begins
<b>015213</b>	Terr-AIS	<b>9.30</b>	<b>152.1</b>	53.58	8.54	
<b>015217</b>	Terr-AIS	<b>9.10</b>	<b>154.8</b>	<b>53.58</b>	<b>8.54</b>	
<b>015221</b>	Terr-AIS	<b>8.70</b>	<b>153.7</b>	<b>53.58</b>	<b>8.54</b>	
015229	Terr-AIS	8.40	144.5	53.58	8.54	
015233	Terr-AIS	8.00	142.4	53.58	8.54	
<b>015237</b>	Terr-AIS	<b>7.60</b>	<b>140.20</b>	<b>53.58</b>	8.54	
015301	Terr-AIS	0.00	0.00	53.58	8.54	Collision with the pier
015934	Terr-AIS	3.40	188.10	53.58	8.54	Astern manoeuvre starts

<sup>6</sup> VDR: Voyage data recorder

As discussed above, the ship's speed decreases at 015125. Alterations in course are clearly identifiable as such again and again (see colour change in the column). As of 014957, the course remains at 136° and hardly changes until the collision with the NEWYORKER at 0153.

### 3.2.2 Damage

The damage to two ships and the quay was considerable.



© WSP

Figure 18: Damage to the MERIDIAN's bow



© WSP

Figure 19: Crack on the MERIDIAN's waterline



© WSP

Figure 20: Damage to the MERIDIAN's starboard side...



© WSP

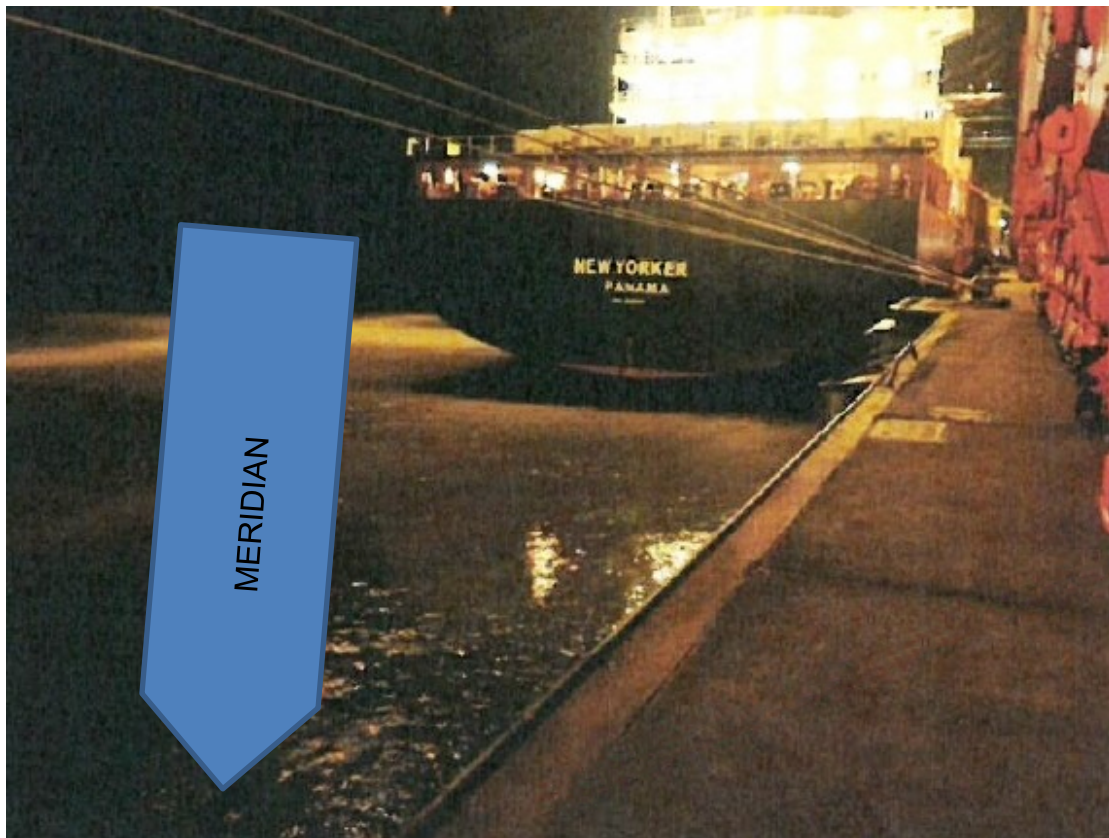
Figure 21: ...with water ingress

The MERIDIAN's shell plating was dented level with the all-weather passageway to such an extent due to the collision with the MSC DIANA's bulbous bow that there was slight water ingress, which the crew managed to contain.



© WSP

Figure 22: Damage to the MERIDIAN's fore section



© WSP

Figure 23: View from the scene of the collision with the pier to the NEWYORKER

For illustration purposes, Figure 23 shows the vacant gap at Pier 2020 between the NEWYORKER and MSC DIANA (not in the image but on the left margin). The blue arrow represents the MERIDIAN. The damage to the pier structure was clearly visible on the following day (see Figure 24). The following heavy damage was found on the pier and documented:

- dolphin torn from the anchorage at the pier;
- access ladder with mounting torn from the pier;
- significant traces on the pier's concrete foundation.



© WSP

Figure 24: Damage to the pier



The blue arrow shows the scene of the collision between the MERIDIAN and pier.

Figure 25: MSC DIANA

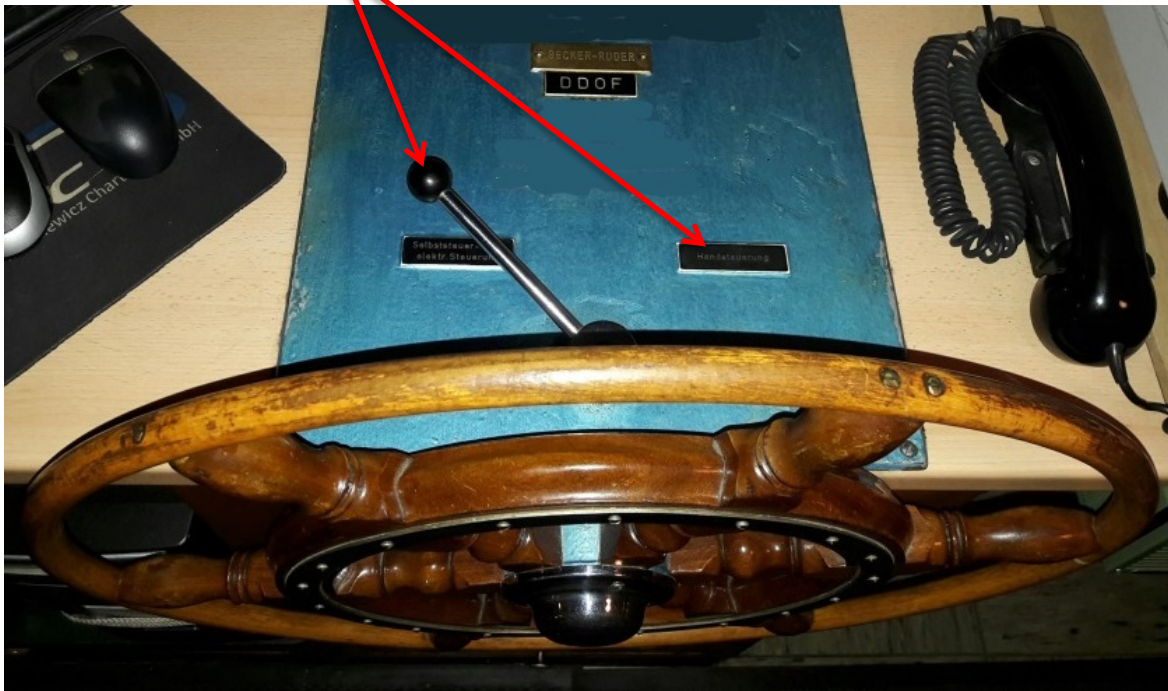
No damage to the MSC DIANA's bulbous bow (red arrow) was visible during daylight, either.



### 3.2.3 Steering gear

The MERIDIAN is controlled by Becker steering gear manufactured in 1969 with traditional manual steering located on the bridge.

To select the steering control, a lever switch is installed in front of the steering wheel. When it points to port, the autopilot or electric steering is switched on, enabling the user to choose between autopilot (including tiller<sup>7</sup>) and riverpilot. When the lever switch is moved to starboard, hand steering is enabled via the large steering wheel. However, two valves first have to be switched in the steering gear compartment for this. Therefore, this manual steering is not normally used.



© WSP

Figure 26: Manual steering and lever switches

The controlling three-stage rotary switch is located on the starboard side of the bridge console (Figure 27). This rotary switch is used to determine how the ship is steered. The autopilot or tiller (sea) is used on '1', '0' means manual steering (where two valves in the steering gear compartment have to be switched – see Figure 30) and '2' switches to riverpilot. The latter is designed to navigate the bends in a river automatically, making track control much easier.

Installation of the SIMRAD AP 50 autopilot on board at the time of the accident was carried out at a later date. This system was manufactured and sold between the years 2000 and 2014. The AP 50 has neither its own data memory nor interfaces for recording and other computer systems.

<sup>7</sup> Tiller: Small lever for steering the ship directly



© WSP

Figure 27: The three-stage rotary switch

The system is connected to the ship's gyrocompass. In operating mode, the desired course is entered by means of a control knob (Figure 28). The autopilot then sends electrical control pulses to the hydraulics of the ship's steering gear. The specified course is achieved through the thus obtained rudder angles. Once the ship has reached a specified course, the system uses the connected gyrocompass to monitor whether the course is maintained and responds with appropriate rudder angles in the event of deviations.

The autopilot of a ship is basically used when constant courses are maintained at least for a certain period of time at sea. Direct manual steering is preferred only during such manoeuvres as berthing or casting off, sailing into or out of locks and possibly also when overtaking.



Figure 28: SIMRAD AP 50

On board the MERIDIAN, the autopilot is switched on using the rotary switch (Figure 27). The switch is set to position 1 and the autopilot is switched on at the unit (AUTO). The current course is shown on the display and can now be changed using the control knob.

If the rotary switch is in position 1 and the autopilot is not engaged, then the steering gear can be controlled using the tiller.

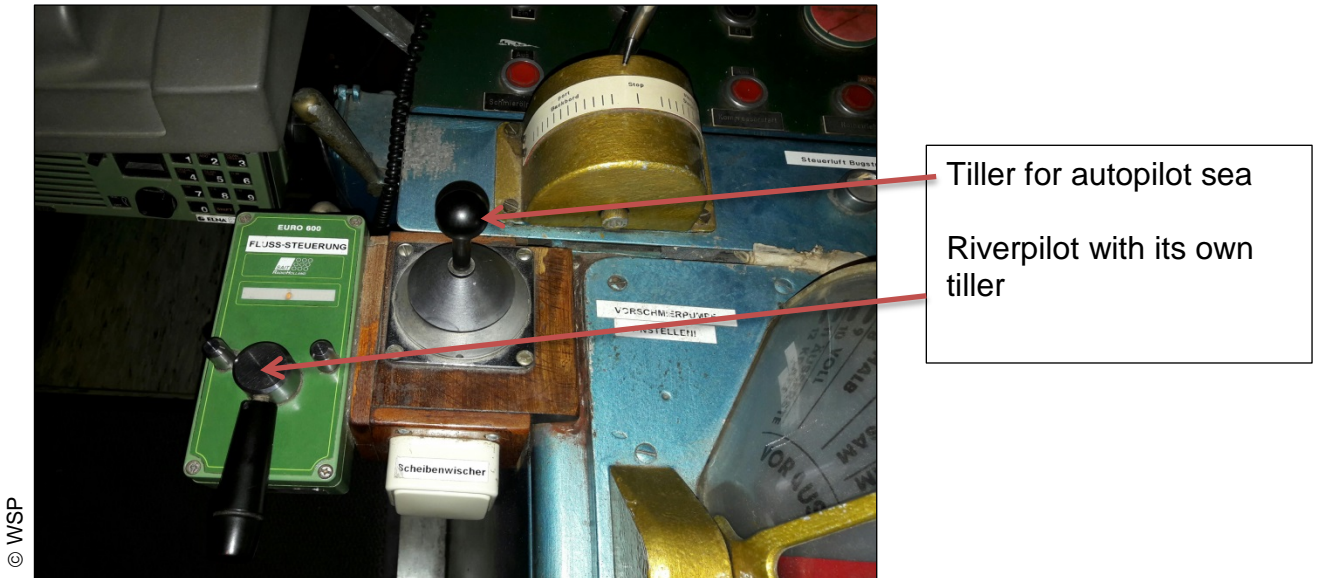


Figure 29: Tiller and riverpilot

The tiller is basically a lever for controlling the hydraulic steering gear manually.

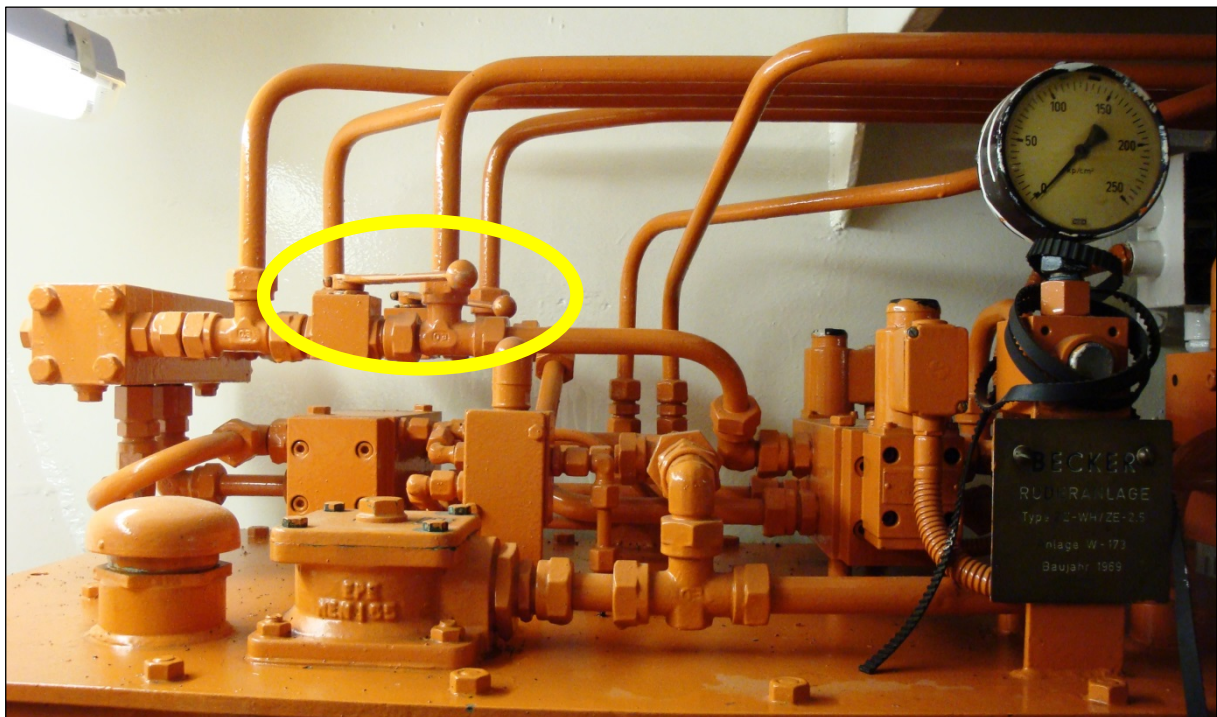
This lever can be operated against a slight resistance to the left for turning to port or to the right for turning to starboard. This manual steering requires constant monitoring of the course steered on the compass. Moreover, it normally leads to more deviations from the desired course and thus requires more manual input and concentration from the helmsman.

When the rotary switch is in position 2, the riverpilot is used, which can also be operated by its own tiller (Figure 29).

Upon reaching buoy 51a for the course alteration to about 151° necessary in this case, the rotary switch should be changed from position 1 to position 2. The course of 151° must be steered by ships sailing upstream on the River Weser for a distance of about 6 km between buoys 51a and 61. This distance takes about 18 minutes at a speed of some 11 kts.

To switch from autopilot to rudder control using the riverpilot tiller, the switch must pass the '0' position. This switching must have rendered the entire electric steering gear inoperative.

After the collision, the master enabled the manual steering by switching the two required valves in the steering gear compartment, among other things (see Figures 26 and 30). This enabled him to manoeuvre the ship away from the scene of the collision and steer her to the berth.



© BSU

Figure 30: Steering gear valves for manual operation

On 21 November 2016, a service company removed the rotary switch. It was found in the process that the cable contact points were corroded and the screws on the terminal strip loose. A new switch was installed and successfully tested in the presence of the WSP. The crew later opened the entire bridge console and found more corrosion, which it removed.

### **3.2.4 Manning**

The crew of the MERIDIAN usually consists of four people, as is also specified in the minimum safe manning certificate. It includes a master, a helmsman and two deckhands. A chief engineer officer can be replaced by an appropriately qualified master, as was the case here.

The master has held his certificate since 1998. He acquired the MERIDIAN in 2007.

The helmsman has held his navigating certificate since 2008. He served as nautical officer on behalf of a different owner up until the end of October 2016. In the meantime, it seems that he regularly stood in as ship mechanic or navigator on the MERIDIAN. He was reportedly familiar with the ship. He had been on board the MERIDIAN since 1 November 2016.

The rating on watch had been on board since 1 November 2016. He held a navigating certificate but sailed as a rating because he had reportedly not been at sea for a long time and first wanted to re-familiarise himself.

The second rating was not on watch but asleep at the time of the accident, meaning he was unable to make any statements regarding the course of the accident.

Officially, a 6/6 watchkeeping system is operated. This means that each navigator goes on watch with a rating for six hours and then has six hours off. The transfer normally takes place at 1200. However, this is difficult to put into practice, as all the crew members are needed for making fast and casting off in port or in a lock.

### **3.2.5 Alcohol/drugs/fatigue**

The WSP arrived at the scene one hour after the collision and tested the skipper responsible and his helmsman for the ingestion of alcohol, drugs or medication. Participation in this test was voluntary.

The alcohol level for each ship's officer was 0.00‰. The consumption of drugs or medication that might impair judgement while sailing the vessel could be ruled out. Both navigators were very calm and collected. It did not leave the impression that they were in a state of shock because of the incident. The eyes of both people appeared overly red, which could be interpreted as an indication of fatigue.

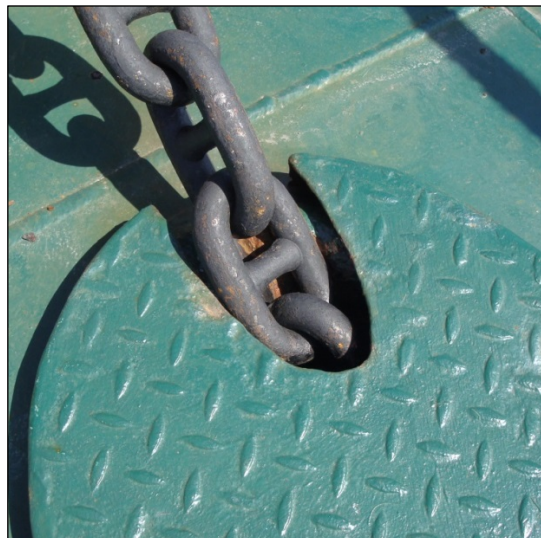
### 3.2.6 Anchor

Among other things, the WSP found immediately after the accident that the anchor chains were covered by the fairlead plates, indicating that the anchors were apparently not ready to drop. The master was able to refute this charge with his explanation by showing the BSU that the plates had been specially cut so that they permanently covered the fairlead while at the same time allowing the anchor chains to run out. Figures 31 and 32 illustrate this.



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Figure 31: Anchor system



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Figure 32: Modified anchor fairlead plate

## **4 ANALYSIS**

The body of evidence for this investigation was not satisfactory. There were no technical recordings on board the MERIDIAN. A VDR was not required and therefore not installed. Other equipment did not store anything that documented the failure of the steering gear, either.

The only indirect item of evidence was the steering gear switch, which was replaced by a service company because it exhibited clear traces of corrosion and loose cable connections.

The statements of the four crew members available were extremely detailed in places. Using recorded data from the Deutsche Küste AIS system, it can be confirmed almost beyond doubt that the MERIDIAN's speed started to drop at 014957.

It was also found that the surrounding shipping was warned neither audibly nor by VHF. An internal general alarm was not sounded on the ship, either.

After the event, the officer on watch was aware that he could have responded better in this critical situation.

## **5 Actions taken**

The master assured and satisfied the BSU that his crew members on watch are always equipped with a mobile VHF device. He justified this by mentioning his small crew, which for that reason alone needs to be in permanent contact. The BSU therefore removed the safety recommendation originally intended for this subject from the draft report.

## 6 CONCLUSIONS

The BSU's legal mandate is to identify the causes of a marine casualty without the apportionment of blame.

Despite the established technical fault in the steering gear's control system, the BSU believes the impact of human error in a crisis situation is far more relevant. However, this poses the ensuing question as to why a person made a mistake?

Only four people regularly work on board the MERIDIAN. Two of them are navigators who have to repeatedly alternate to keep the ship in operation, where the usual watchkeeping schedule of six hours on and six hours off was practised. It has been proven and is generally known that this watchkeeping schedule leads to permanent overtiredness when practised over a longer period of time, resulting in a lack of concentration, exhaustion and slower reactions (fatigue), for example. The helmsman on watch when the accident happened had sufficient rest periods during the previous afternoon. Although it cannot be ruled out that he did not respond in time and appropriately, at least due to the permanent stress, it was not possible to prove this.

The BSU is convinced that the helmsman did not fall asleep during the watch. This is demonstrated by the speed data of the AIS, which decrease at 014957 in spite of the rising tide pushing. The helmsman performed his watch and deliberately reduced the speed of the ship when he realised that the rudder was no longer responding. It is safe to assume that he only did this because he saw no other means of preventing a collision with the ships at the pier. This means that he could not steer his ship.

A service company later found out that the contacts of a switch were loose and corroded. Accordingly, in addition to the primary means of steering, the backup – i.e. the mandatory and basically present second means of steering – also failed.

A third, non-mandatory means of steering also exists so as to operate the rudder in the event of the electronics failing. However, this requires both setting the lever switch to hand steering (see Figure 26) and switching two valves in the steering gear compartment manually, so as to bypass the defective electronics. This would have made it possible to alter the course and avoid the subsequent collisions with the NEWYORKER and the pier. That this did not happen can probably be explained by the lack of time and the anxiety that started to take hold of the helmsman.

The helmsman stated that he set the control lever to STOP when he could no longer steer the ship. It is understandable that a main engine with fixed pitch propeller cannot be set to astern immediately.



Having said that, he failed to do anything to decelerate further, e.g. drop an anchor.

The helmsman on watch was evidently not aware of the options still open to him when the rudder stopped responding. He later attributed this to the uniqueness of the situation and stress associated with it.

Moreover, a general alarm was not sounded, nor was the surrounding shipping warned by audible signals or on VHF.

The BSU concludes that it might be helpful to consider certain emergency scenarios, record the appropriate actions in writing and keep them within reach of the officer on watch.

## **7 SAFETY RECOMMENDATION**

The following safety recommendation does not constitute a presumption of blame or liability in respect of type, number or sequence.

### **Owner**

The Federal Bureau of Maritime Casualty Investigation recommends that the owner of the MERIDIAN consider certain emergency scenarios, such as engine or steering gear failure, record the appropriate actions and keep them visible on the bridge.

## 8 SOURCES

- Enquiries of the WSP
- Written explanations/submissions
  - Ship's command/owner
  - Classification society
- Witness testimony
- Navigational charts and ship particulars, BSH
- Official weather report by Germany's National Meteorological Service
- Radar recordings, ship safety services/VTSS
- Documentation, Ship Safety Division (BG Verkehr)
  - Accident Prevention Regulations (UVV See)
  - Guidelines and codes of practice
  - Ship files