



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

Summary
Investigation Report 43/14

Serious Marine Casualty

**Collision between the MV BIMI and
MV BARENT ZANEN
in the Medem roadstead
on 1 March 2014**

19 January 2015

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) of 16 June 2002, amended most recently by Article 1 of 22 November 2011, BGBl. (Federal Law Gazette) I p. 2279.

According to said Law, the sole objective of this investigation is to prevent future accidents and malfunctions. 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.

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1 Summary

At 0636¹ on 1 March 2014, the general cargo ship BIMI, flying the flag of the Bahamas, collided with the anchored Cypriot suction dredger BARENT ZANEN in the Medem roadstead to the north-east of Cuxhaven. The collision occurred after the BIMI's anchor lost its grip. Fog prevailed, visibility was less than 200 m and there were easterly winds of 3 Bft. The BIMI drifted with the outgoing current at a maximum speed of 3.8 kts according to the VTS's radar recordings. The collision resulted in damage to the BIMI's superstructure, deck and screw, and the BARENT ZANEN's shell plating and a drain pipe. No pollutants escaped.

¹ All times shown in this report are Central European Time (CET) = Universal Time Coordinated (UTC) + 1

2 FACTUAL INFORMATION

2.1 Photo



Figure 1: Photo of ship

2.2 Ship particulars

Name of ship:	BIMI
Type of ship:	General cargo vessel
Nationality/Flag:	Bahamas
Port of registry:	Nassau
IMO number:	8914295
Call sign:	C6UJ9
Owner:	Misje Bulk AG
Year built:	1991
Shipyard/Yard number:	Scheepswerf Ferus Smit B.V./283
Classification society:	Germanischer Lloyd
Length overall:	88.25 m
Breadth overall:	13.17 m
Gross tonnage:	2,373
Deadweight:	4,245 t
Draught (max.):	7.02 m
Engine rating:	1,499 kW
Main engine:	Caterpillar 3606 DITA
(Service) Speed:	12 kts
Hull material:	Steel
Hull design:	Double hull
Minimum safe manning:	6

2.3 Voyage particulars

Port of departure:	Klaipėda, Lithuania
Port of call:	New Ross, Ireland
Type of voyage:	Merchant shipping/Other shipping National/International
Cargo information:	3,972 t of potash
Draught at time of accident:	5.5 m
Manning:	6
Pilot on board:	Yes

2.4 Photo



Figure 2: Photo of ship

2.5 Ship particulars

Name of ship:	BARENT ZANEN
Type of ship:	Suction dredger
Nationality/Flag:	Cyprus
Port of registry:	Limassol
IMO number:	8315504
Call sign:	5BFJ2
Owner:	Boskalis Baggermaatschappij
Year built:	1985
Shipyard/Yard number:	ICH Smit BV/CO1171
Classification society:	Bureau Veritas
Length overall:	133.58 m
Breadth overall:	23.5 m
Gross tonnage:	9,773
Deadweight:	14,355 t
Draught (max.):	8.81 m
Engine rating:	Unknown
Main engine:	Unknown
(Service) Speed:	15.3 kts
Hull material:	Steel
Hull design:	Single hull

2.6 Voyage particulars

Port of departure:	Elbe
Port of call:	Elbe
Type of voyage:	Merchant shipping, international
Cargo information:	Dredged material
Draught at time of accident:	6.30 m
Manning:	26
Pilot on board:	No

2.7 Marine casualty or incident information

Type of marine casualty/incident:	Serious marine casualty, collision
Date/Time:	01/03/2014 0636
Location:	Medem roadstead, Cuxhaven
Latitude/Longitude:	ϕ 53°52.7'N λ 008°43.7'E
Ship operation and voyage segment:	At anchor
Place on board:	BIMI: Starboard guard rail, superstructure, BARENT ZANEN: Drain pipe
Human factors:	Technical fault, anchor lost its grip
Consequences (for people, vessel, cargo, environment, and other):	Superficial damage and dents, BIMI's engine and screw damaged

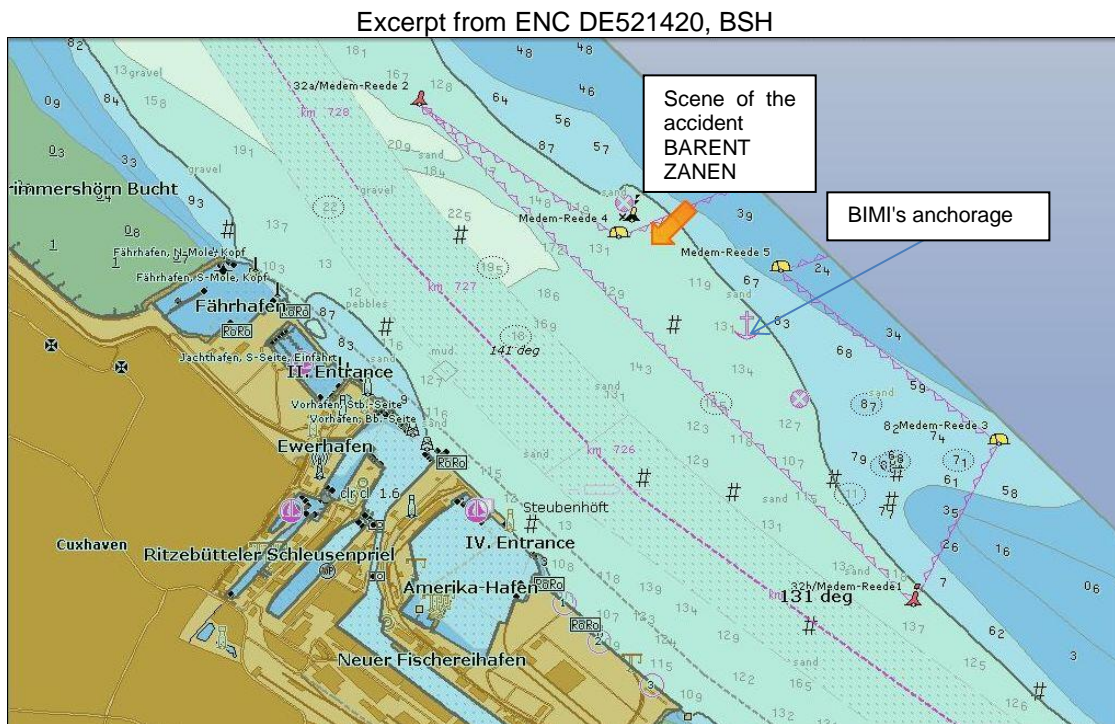


Figure 3: Scene of the accident

Shore authority involvement and emergency response

Agencies involved:	Vessel Traffic Service (VTS) and Waterway Police (WSP) Cuxhaven
Resources used:	Two tugs
Actions taken:	BIMI: Towed to Seebäderbrücke in Cuxhaven, BARENT ZANEN: Steubenhöft Berth in Cuxhaven
Results achieved:	Survey of damage by WSP Cuxhaven

3 COURSE OF THE ACCIDENT AND INVESTIGATION

At 0240 on 1 March, the BIMI left the old Nordschleuse under pilotage. She was headed for the Medem roadstead and fog prevailed. The BIMI is equipped with a left-hand controllable pitch propeller, a single rudder, and a bow thruster. Of the two radar systems, only the X-band system was switched on. This was set to a range of 1.5 nm, north-up and off-centre. Inter alia, two ECDIS and two VHF systems, as well as a gyrocompass were installed on the bridge. The VHF systems (first on channel 68, later on channel 71) and the respective radar channels were set to listen. The anchor was ready to drop. The chief officer relieved the master after the outer port had been passed. Notification was given on VHF that the suction dredger BARENT ZANEN would cease her work and anchor on the western side of the Medem roadstead.

The master was woken and requested to go to the bridge half an hour before arrival at the Medem roadstead. The BIMI turned from the fairway into the anchorage area at about 0405. The BIMI was set against the ebb current and anchored to the south of Medem roadstead buoy 5. The water depth was 6.1 m beneath the keel and four shackles of chain length were deployed. The BIMI reportedly came to a standstill immediately after the anchor was dropped. The radar system's electronic bearing line was reportedly set at 006° on Medem roadstead buoy 5. The distance was reportedly 3 cbl. The distance marker was reportedly set at 2.5 cbl on the BARENT ZANEN. The BIMI's position at 0420 was 53° 52.49' N 008° 44.03' E. The anchor ground consisted of firm sand and shells. Visibility stood at 1 cbl. The engine's notice (standby time) was ten minutes. The chief officer and the pilot were on anchor watch until 0600. The master then relieved the chief officer. It was then noticed that the BIMI started to sway between the headings of 175° and 115°. The displacement to the original anchor position stood at about 100 m. This was reportedly unusual given the calm weather. The pilot requested that the main engine be started immediately and did not want to deploy additional chain length in response to the master's suggestion. The BIMI began to drift, initially at 0.5 kts, then increasing to 3-4 kts. The rudder and engine were still not made ready. The plan was to move the BIMI towards the fairway using the ebb current and her response to the helm. It was not possible to start the engine until 0634 after the master went to the engine room and then back to the bridge. During this period, the BIMI drifted further westwards. The pilot notified the radar advisers and BARENT ZANEN about the situation on the BIMI. About a ship's length ahead of the BARENT ZANEN, the bearing reportedly stood at 5° to starboard abaft the beam.

At 0634, the control lever was reportedly set to full ahead and the rudder to amidships. The master reduced power again to prevent overloading the engine. At reduced power, the BIMI was then reportedly brought to a standstill immediately in front of the BARENT ZANEN's stem post. At 0635, the BIMI's starboard side amidships collided with the port side of the BARENT ZANEN's fore section. The BIMI then came to a standstill athwart the bow of the BARENT ZANEN. A tug was requested and the anchor was reportedly hoisted at dead slow ahead.

An order was reportedly issued to set the bow thruster to full power to port so as to protect the rudder and screw, to turn against the tide, as well as to bring the BIMI alongside. The anchor was weighed at 0642. The bow thruster proved too weak to turn against the current to port. As a consequence, the two vessels drifted. The VTS warned of a risk of grounding. Following that, an order was reportedly issued to set the engine to full ahead and they counteracted with a hard to port rudder angle. The BIMI moved slow ahead and came almost parallel to the BARENT ZANEN. The BARENT ZANEN had deployed her port anchor chain. When about $\frac{3}{4}$ of the length of the ship overran the chain, the rudder was reportedly set hard to starboard to turn the BIMI across the bow of the BARENT ZANEN towards the west and keep the screw and rudder away from the anchor chain. The engine failed at 0645.

The BIMI continued to turn due to the current and eventually separated from the BARENT ZANEN. It was no longer possible to start the engine. At 0648, the anchor (four shackles) was let go again at a water depth of 9.2 m. As the BIMI swayed on the anchor chain, she touched buoy 32A/Medem roadstead 2. The tug TAUCHER O. WULF 3 was made fast fore through the central hawsehole at 0708 and pulled the BIMI away from the buoy. At 0712, the anchor was hoisted and a second tug requested. At 0737, the port pilot for Cuxhaven boarded. The second tug, TAUCHER O. WULF 5, was made fast aft through the central hawsehole at 0740. The anchor was weighed at 0745. The BIMI was then taken to Seebäderbrücke in a towed convoy, where she arrived at 0840 and made fast. Both tugs were stood down at 0845.

It was found during the classification society's survey that 15 m of the starboard guard rail was buckled, ballast water tanks and fan cowls were dented, and all the propeller blades were torn. No pollutants escaped.



Figure 4: Guard rail damage (BIMI)



Figure 5: Radar antenna (BIMI)

The dredging master on the BARENT ZANEN observed the course of the accident from the forecabin. Reportedly, he was initially alerted by an unusual engine noise (probably the BIM I's bow thruster). Due to fog, the BARENT ZANEN was anchored about 2 cbl south-east of Medem roadstead buoy 2 at the position 53° 52.766' N 008° 43.631' E with four chain lengths deployed. The BIM I drifted athwartships towards the bow of the BARENT ZANEN. Reportedly, nobody was initially visible on the BIM I's deck or bridge after loud calls. Only during the collision did a person in the bridge wing show himself without communicating. The BIM I's starboard side reportedly scraped along the port side of the BARENT ZANEN due to the ebb current. Only at this point was the BIM I's main engine reportedly started. The BIM I's stern reportedly turned to port in the process and two people attempted to hoist the anchor. While attempting to move ahead, the BIM I's fore section reportedly collided again with the drain pipe. At the same time, pipes and a platform were reportedly buckled because the radar mast's retention device struck them. Reportedly, the BIM I's screw presumably struck the BARENT ZANEN's anchor chain while separating because a loud noise was heard and black smoke rose from the funnel. The BIM I then disappeared in the fog and a short time later her anchor could reportedly be heard dropping.

On the bridge of the BARENT ZANEN, the officer on watch (OOW) monitored the course of the accident. At about 0625, the echo of the BIM I, which was about 3 cbl ahead, moved on radar screen 1. The BIM I approached the BARENT ZANEN, initially at about 1.5 kts. It was assumed that the BIM I was leaving her anchor position.

Following that, the second radar system was switched from a range of 6 to 3 nm to obtain a better overall view. At the same time, the building supervisor of Waterways and Shipping Authority (WSA) Cuxhaven alerted the OOW vis-à-vis the risk of collision. Meanwhile, the BIMI was moving at a speed of 3.5 kts according to the radar data and the closest point of approach (CPA) reportedly stood at 0.0 nm. The BIMI was then called on VHF channel 71, but did not respond. After that, VTS Cuxhaven Elbe Traffic called the BARENT ZANEN on VHF channel 71. She was advised that is the BIMI was reportedly on a collision course. The VTS then called the BIMI on VHF channel 71, as well as the BARENT ZANEN on VHF channel 16. There was no response from the BIMI. The master of the BARENT ZANEN was then requested to go to the bridge and informed about the situation by the OOW. He also tried to call the BIMI. The BIMI, athwart the bow, collided with the BARENT ZANEN half a minute later.

At 0635, the building supervisor of the WSA noted on the bridge of the BARENT ZANEN (on his positioning computer with depth and AIS displays) that the BIMI reportedly approached them at 3.5 kts and informed the OOW of this, who had already registered the situation, called the BIMI and the VTS, and woke the master. In the dense fog, the BIMI's bridge spotlights reportedly first came into view. The stern of the BIMI first collided with the bow of the BARENT ZANEN at an obtuse angle and then veered athwartships off the stem post. Loud calls were made on the forecastle and nobody was visible on the BIMI. The BIMI moved back and forth off the bow and the master reportedly said she was rubbing firmly on the anchor chain. Some time after, the BIMI made contact by radio. Attempts were reportedly made on the BIMI to haul in the anchor. After that, the BIMI scraped sternwards along the port side of the BARENT ZANEN.

The BARENT ZANEN weighed anchor at 0800. At 0843, she made fast at Steubenhöft in Cuxhaven, where the damage was assessed. Only light paint abrasions were found on the ship's side and in the area of the stem. A larger paint abrasion and a dent was found on the port shoulder. The platform with drain pipe on the port side of the main deck was also damaged.



Figure 6: Bow damage (BARENT ZANEN)



Figure 7: Drain pipe (BARENT ZANEN)

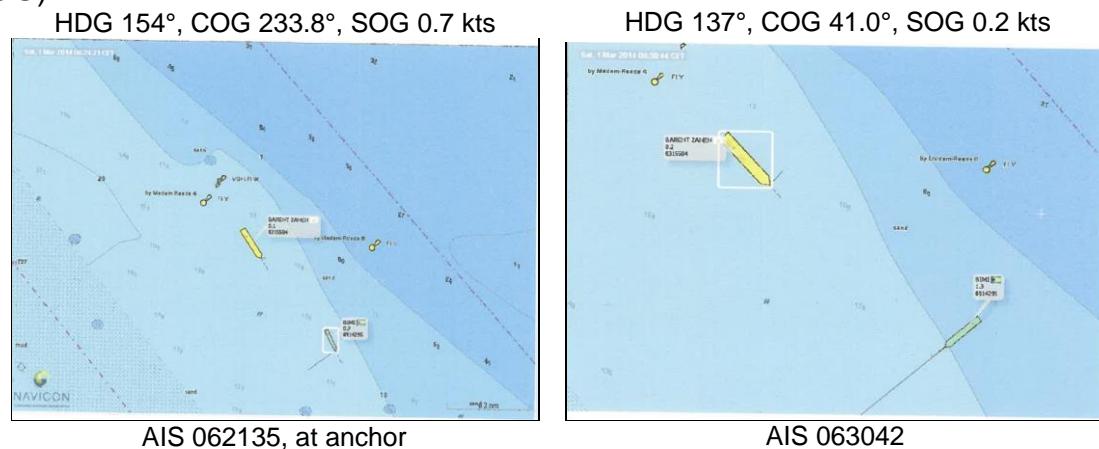
4 ANALYSIS

The BSU had the AIS analysis of the Gemeinsame Leitstelle der Wasserschutzpolizeien der Küstenländer (Joint Control Centre of the Waterway Police of the Coastal States) in Cuxhaven, as well as the radar recordings of VTS Cuxhaven at its disposal for the data analysis and assessment of the BIMI's anchorage. Furthermore, the Federal Waterways Engineering and Research Institute in Hamburg and the Federal Maritime and Hydrographic Agency (operational models) produced expert opinions on the current patterns. Moreover, WSA Cuxhaven provided sounding charts for the Medem roadstead. According to statements given by the pilot brotherhood, the anchor ground consists of firm sand with scouring, fine sand follows, and sludge is further towards the middle. Medem roadstead is reportedly known for its unsafe anchor ground.

AIS data (automatic identification system)

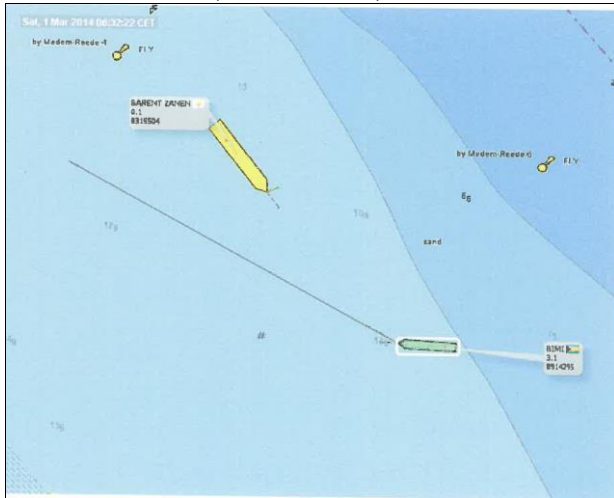
A time lag of +54 seconds exists compared to the radar recordings made at one-minute intervals by VTS Cuxhaven (see Fig. 9), i.e. approximately one minute must be added to the times displayed. The BSU advised the WSP's joint control centre of the time lag issue on 10 September 2014 during another investigation (373/13).

The BIMI's heading (HDG), course over ground (COG), and speed over ground (SOG)



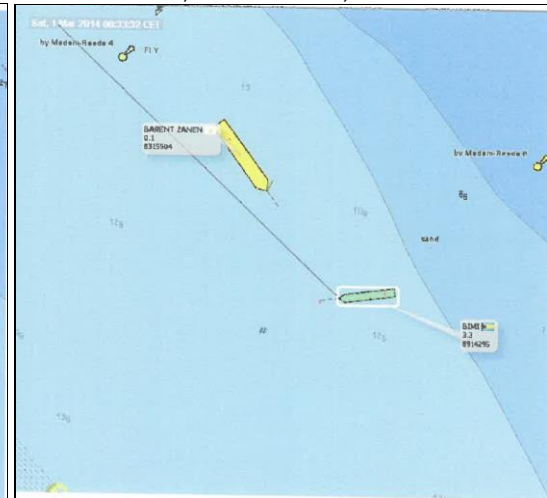
According to the AIS recordings, the BIM I starts to drift at 0.7 kts at about 062135. At 063042, only 0.2 kts is measured. It is possible that the effect was caused by the use of engine and bow thruster or the anchor still on the ground. However, according to statements given, the engine did not start until 0634. At 063214, the drift had already reached 3.1 kts. At 063434, the drift peaked at 3.4 kts. The collision occurs at 3.1 kts speed over ground at 063534 and the bow's turn to port is clearly visible. Evidently, there is contact with the BARENT ZANEN's anchor chain. After several attempts, the BIM I tried to separate and scraped along the anchor chain and port side of the BARENT ZANEN. It was not possible to start the main engine from 0645 onwards. According to statements given, the anchor was let go again at 0648. Nevertheless, the AIS recordings indicate that the BIM I's drift had reached 4.3 kts at 070022. The anchor gripped at 070022. The drift is measured at 0.3 kts.

HDG 273°, COG 298.6°, SOG 3.1 kts



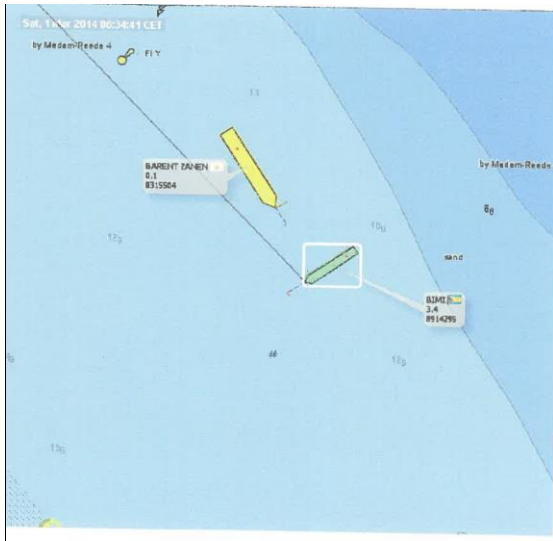
AIS 063214

HDG 263°, COG 313.6°, SOG 3.3 kts



AIS 063324

HDG 236°, COG 315.6°, SOG 3.4 kts



AIS 063434

HDG 206°, COG 309.9°, SOG 3.1 kts

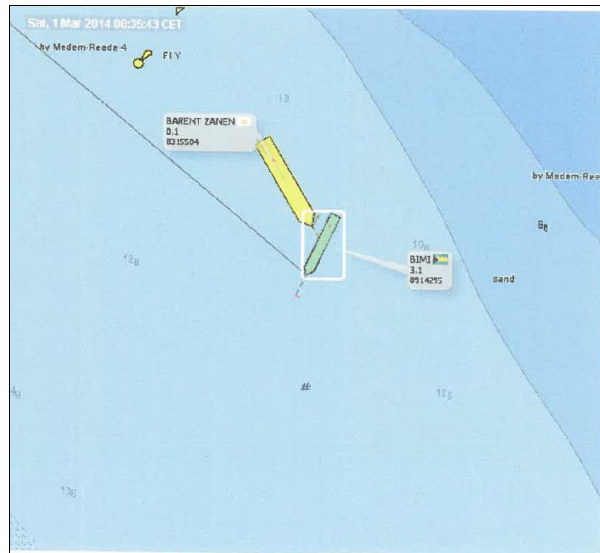
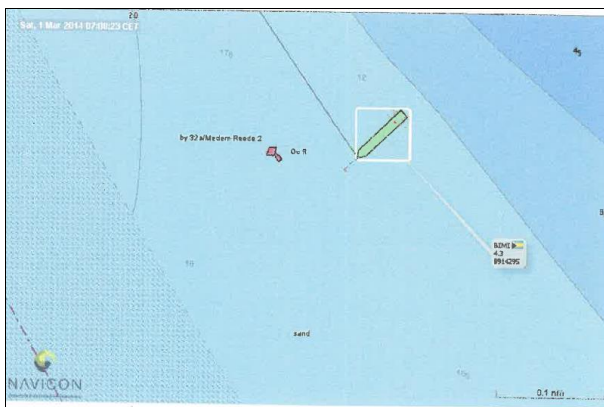


Figure 8: AIS 063534, collision

HDG 226°, COG 325.9°, SOG 4.3 kts



AIS 070022

HDG 165°, COG 282.1°, SOG 0.3 kts



AIS 070222, BIMBI at anchor

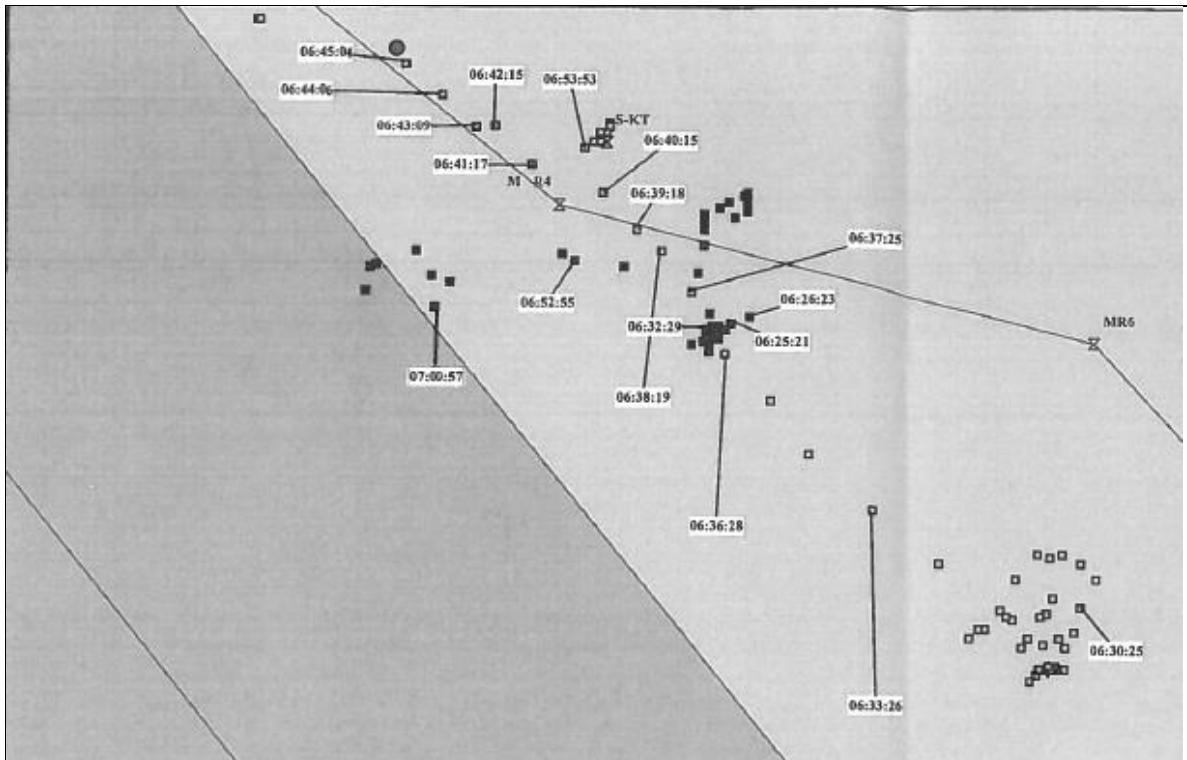


Figure 9: VTS radar plot, collision 063628, COG = 322°, SOG = 2.6 kts, maximum drift = 3.8 kts

The radar measurements show significant movements at the BIMI's anchorage.

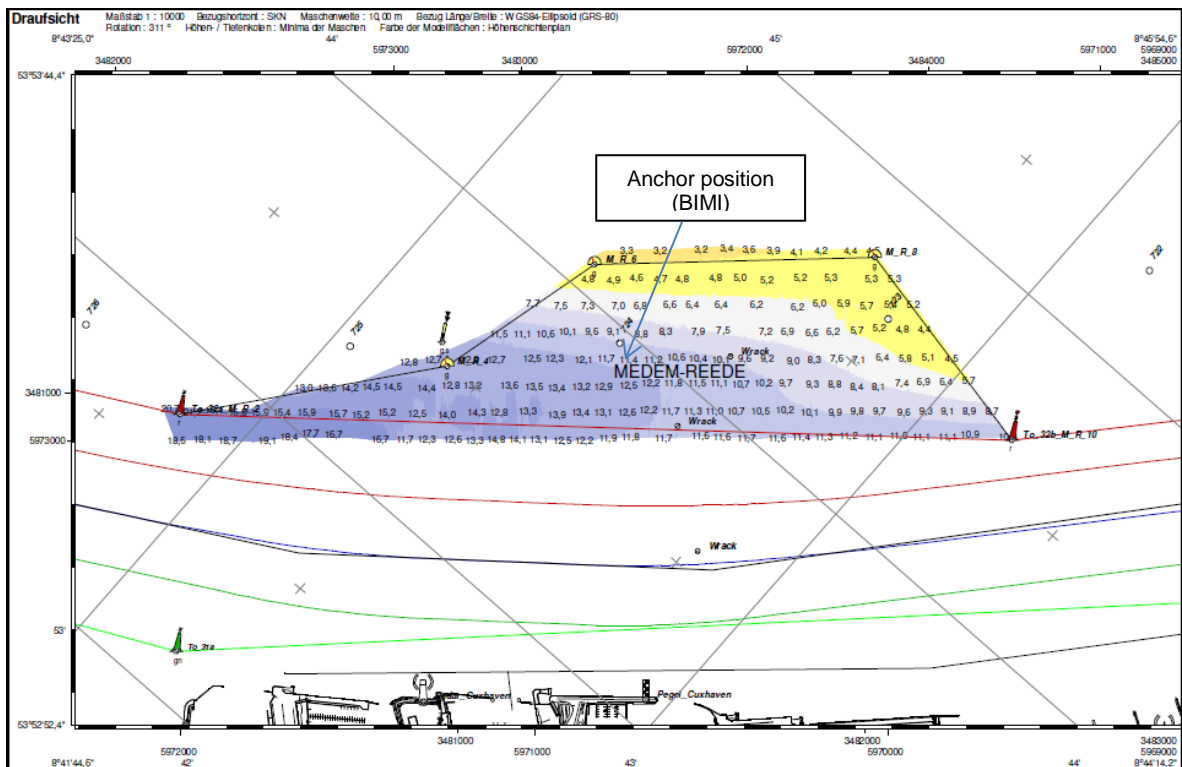


Figure 10: Sounding chart of WSA Cuxhaven dated 14 February 2014

The BIMl is located at a water depth of 11.6 m (echo sounder measurement of 6.1 m plus draught of 5.5 m). The measurement is consistent with the sounding chart.

Expert opinion by the BAW

Since measurements of the current patterns for the time of the accident in the section of the Medem roadstead were not available to the BAW, research on earlier measurements, as well as existing computations from hydrodynamic numerical modelling techniques were necessary. An initial assessment of the local tidal stream based on ADCP² transverse profile measurements made by the BAW off Cuxhaven (profile GK 3482195/5970063 to 3485102/5973243) on 14 May 2002 throughout an entire tide revealed a near-surface ebb current velocity (at about -3 m AMSL) of roughly 1.3 m/s (approximately 2.5 kts) at approximately one hour before LWL in the Medem roadstead. However, this initial assessment for conditions on 1 March 2014 could not be confirmed based on hydrodynamic numerical computations of the BSH and the BAW.

The analysis of three dimensional computations by the BSH (OPTTEL modelling technique) for the time of the accident on 1 March 2014 revealed near-surface current velocities of roughly $v_e \gg 0.95$ m/s (approximately 1.9 kts), depth-averaged of $v_{em} \gg 0.85$ m/s (approximately 1.7 kts) in the corresponding section of the Medem roadstead. The Internet presentation of the BSH is referenced for illustration of the tidal current patterns in the Medem roadstead. An up-to-date summary of the information provided for this by the operational model of the Elbe can be viewed each day at <http://www.bsh.de/aktdat/modell/stroemungen/elbe1/elbe1.htm>.

Hydrodynamic numerical computations using the latest model of the BAW (2010) reveal depth-averaged current velocities of approximately $v_{em} \gg 0.91$ m/s (approximately 1.8 kts) for similar water level conditions at Cuxhaven-Steubenhöft as on 1 March 2014 in the Medem roadstead about one hour before LWL. The wide-ranging current patterns computed for the drifting vessel BIMl (red circle) are illustrated in the following figure.

² ADCP (acoustic Doppler current profiler): acoustic measurement of water flow using the Doppler effect.

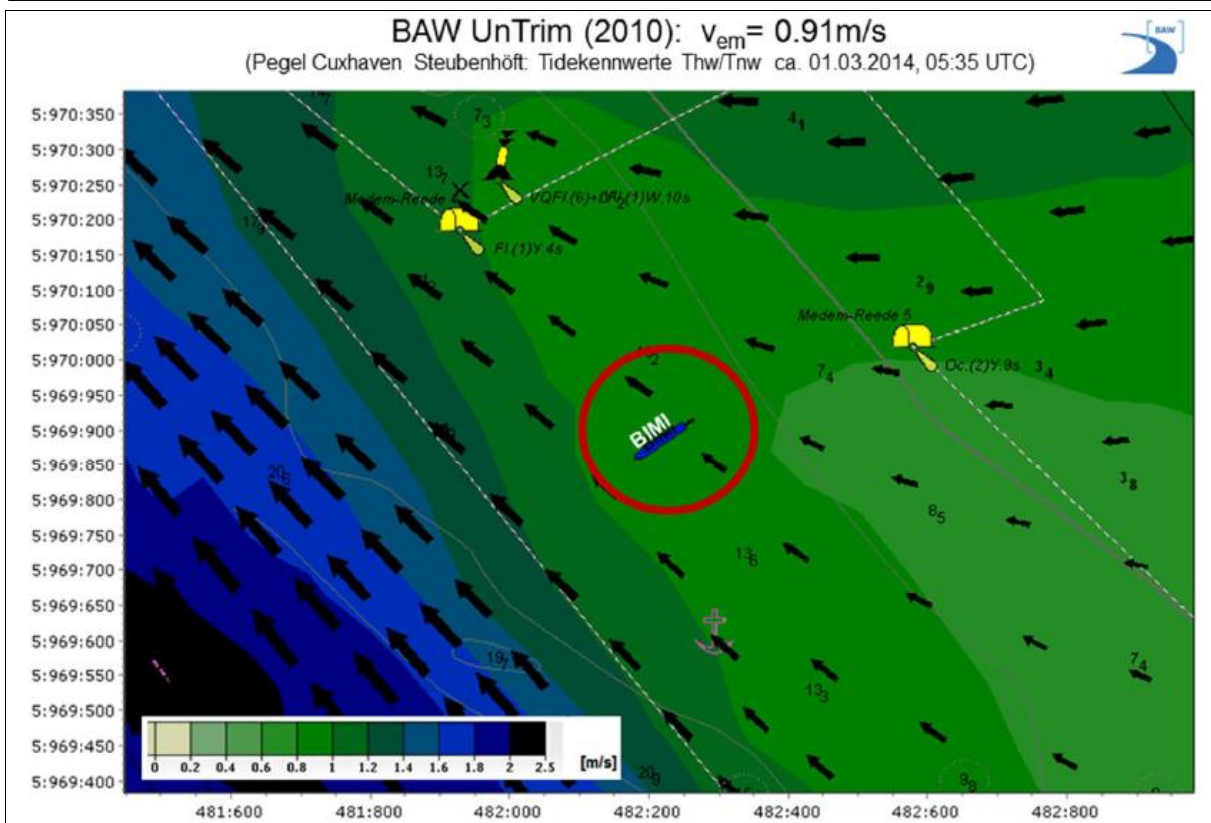


Figure 11: Current computation by the BAW

Since by the nature of things no measurements are available for 1 March 2014 and due to the natural morphological development of the Outer Elbe in the area of Klotzenloch – Kratzsand – Medem Channel, it is not possible to make far-reaching conclusive statements about the current patterns in the Medem roadstead at the time of the accident.

Expert opinion by the BSH

Since it is not possible to read the current velocities in the chart accurately, the simulated current is extracted at two positions and displayed in a time series in tabular form. The positions selected relate to the anchor position of the BIMBI and the collision with the BARENT ZANEN's anchor chain. The near-surface current corresponds to the column 1.8 m dep. The velocities are in knots and the direction data are the direction of the water's flow. Accordingly, the current is setting to NW if 315° is specified.

If we consider the current at 0515 UTC, for example, it is 2.66 kts at the position of the BIMBI and 3.52 kts at the position of the BARENT ZANEN. As is already evident from the chart, strong current gradients are simulated in the area. Since the bathymetric data in the current model are not up-to-date (from 2006) and it can be assumed the model also contains other inconclusive data, the current velocities of > 3 kts, as derived from the drift velocity of the BIMBI on the morning of 1 March 2014 in the Medem roadstead, can be regarded as completely realistic.

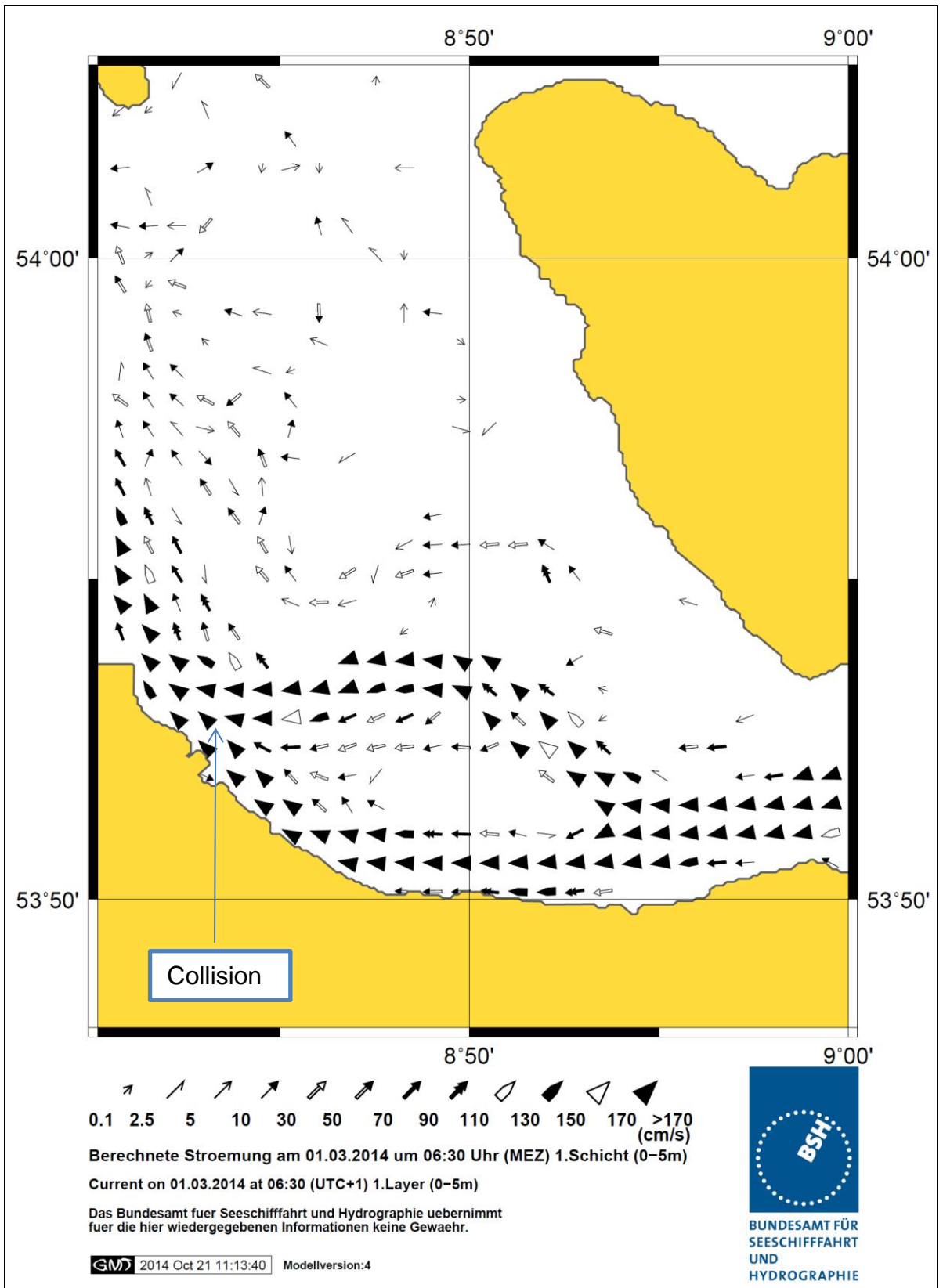


Figure 12: Current computation by the BSH

Tables: BSH current model at various positions and depth layers

Latitude 53°52'34" N		Longitude 008°44'00" E						Depth: 18.770 m, BIMBI's anchor position					
Wind		1.8m dep.		5.4m dep.		9.0m dep.		12.7m dep.		16.6m dep.			
Date	Time (UTC)	kts	deg	kts	deg	kts	deg	kts	deg	kts	deg		
2014/03/01	020000	2.7	100	1.79	295	1.11	307	1.15	301	0.79	314	0.49	360
2014/03/01	021500	3.0	102	1.95	302	1.55	304	1.35	302	0.89	317	0.61	360
2014/03/01	023000	3.2	101	2.17	308	1.93	302	1.47	302	1.01	319	0.71	360
2014/03/01	024500	3.4	102	2.51	311	2.10	301	1.54	303	1.08	319	0.73	360
2014/03/01	030000	3.6	101	2.87	315	2.13	300	1.60	304	1.14	319	0.75	360
2014/03/01	031500	3.7	101	3.04	315	2.09	301	1.65	304	1.22	319	0.77	360
2014/03/01	033000	3.7	99	2.95	310	2.08	303	1.66	307	1.29	319	0.81	360
2014/03/01	034500	3.7	99	2.96	304	2.08	304	1.71	309	1.34	321	0.85	360
2014/03/01	040000	3.8	97	2.93	306	2.09	304	1.72	311	1.33	321	0.82	360
2014/03/01	041500	3.8	99	2.88	307	2.07	304	1.73	311	1.32	322	0.82	360
2014/03/01	043000	4.0	100	2.78	307	2.00	305	1.68	312	1.28	323	0.76	360
2014/03/01	044500	4.0	102	2.72	307	1.95	306	1.65	313	1.26	323	0.75	360
2014/03/01	050000	4.0	103	2.68	311	1.89	307	1.61	313	1.22	322	0.72	360
2014/03/01	051500	4.1	103	2.66	313	1.82	309	1.56	313	1.17	322	0.68	360
2014/03/01	053000	4.2	101	2.65	316	1.72	312	1.47	314	1.10	322	0.63	360
2014/03/01	054500	4.4	101	2.55	317	1.60	315	1.34	315	1.01	323	0.58	360
2014/03/01	060000	4.5	99	2.38	317	1.48	321	1.19	317	0.90	323	0.50	360
2014/03/01	061500	4.5	104	2.19	319	1.39	328	1.04	320	0.77	324	0.40	360
2014/03/01	063000	4.6	108	2.02	322	1.34	335	0.90	326	0.62	324	0.28	360
2014/03/01	064500	4.8	112	1.86	328	1.34	342	0.77	335	0.45	324	0.12	360
2014/03/01	070000	5.0	115	1.77	336	1.39	345	0.66	346	0.24	322	0.07	180
2014/03/01	071500	5.0	115	1.71	344	1.39	347	0.56	358	0.02	220	0.24	180
2014/03/01	073000	4.9	114	1.64	348	1.21	350	0.42	17	0.27	145	0.46	180
2014/03/01	074500	4.9	113	1.55	345	0.82	2	0.34	68	0.56	143	0.65	180
2014/03/01	080000	5.0	112	1.36	342	0.48	48	0.63	117	0.87	143	0.78	180
2014/03/01	081500	4.9	111	1.07	353	0.76	104	1.12	128	1.20	141	0.87	180
2014/03/01	083000	5.0	110	0.85	19	1.34	123	1.68	132	1.54	143	0.95	180
2014/03/01	084500	5.0	109	0.91	46	2.17	129	2.27	133	1.66	144	0.92	180
2014/03/01	090000	5.0	107	1.12	59	2.64	129	2.65	134	1.77	145	0.84	180
2014/03/01	091500	4.9	108	1.33	88	2.89	135	2.62	136	1.81	145	0.86	180
2014/03/01	093000	4.8	108	1.84	107	2.91	140	2.53	140	1.84	147	1.01	180
2014/03/01	094500	4.7	108	2.44	118	2.99	136	2.83	139	2.16	143	1.15	180
2014/03/01	100000	4.6	109	3.05	135	3.02	131	2.81	128	2.02	134	1.29	180

Latitude 53°52'41" N		Longitude 008°43'37" E						Depth 19.680 m, Collision BARENT ZANEN					
Wind		1.8m dep.		5.4m dep.		9.0m dep.		12.7m dep.		17.0m dep.			
Date	Time	kts	deg	kts	deg	kts	deg	kts	deg	kts	deg		
2014/03/01	020000	2.7	100	1.85	297	1.22	321	1.19	305	1.11	307	0.87	315
2014/03/01	021500	3.0	102	2.00	303	1.52	312	1.55	305	1.32	311	1.09	321
2014/03/01	023000	3.2	101	2.22	312	1.98	308	1.76	306	1.51	314	1.30	324
2014/03/01	024500	3.4	102	2.61	316	2.28	306	1.89	307	1.64	316	1.40	324
2014/03/01	030000	3.6	103	3.16	319	2.39	306	1.97	308	1.70	315	1.43	323
2014/03/01	031500	3.7	101	3.71	321	2.45	308	2.03	309	1.75	315	1.44	322
2014/03/01	033000	3.7	99	3.69	320	2.50	313	2.08	312	1.81	314	1.44	321
2014/03/01	034500	3.7	99	3.41	315	2.53	315	2.18	317	1.90	317	1.44	321
2014/03/01	040000	3.8	97	3.40	314	2.51	314	2.26	320	2.02	322	1.49	323
2014/03/01	041500	3.8	99	3.42	315	2.50	314	2.28	321	2.10	324	1.59	326
2014/03/01	043000	4.0	100	3.36	315	2.49	317	2.28	322	2.11	325	1.67	329
2014/03/01	044500	4.0	102	3.30	315	2.48	319	2.29	324	2.10	325	1.63	329
2014/03/01	050000	4.0	103	3.42	318	2.46	320	2.25	324	2.03	325	1.58	329
2014/03/01	051500	4.1	103	3.52	320	2.48	323	2.20	324	1.96	325	1.51	328
2014/03/01	053000	4.2	101	3.61	322	2.53	327	2.13	325	1.84	325	1.39	327
2014/03/01	054500	4.4	101	3.54	323	2.55	330	2.04	327	1.71	325	1.25	326
2014/03/01	060000	4.5	99	3.35	323	2.55	332	1.92	329	1.54	326	1.08	326
2014/03/01	061500	4.5	104	3.14	324	2.52	333	1.80	330	1.35	326	0.89	324
2014/03/01	063000	4.6	108	2.94	326	2.45	333	1.68	332	1.15	327	0.69	321
2014/03/01	064500	4.8	112	2.77	327	2.33	334	1.53	334	0.93	328	0.45	315
2014/03/01	070000	5.0	115	2.65	328	2.12	335	1.36	335	0.71	330	0.20	286
2014/03/01	071500	5.0	115	2.55	328	1.80	337	1.10	336	0.47	334	0.19	189
2014/03/01	073000	4.9	114	2.38	327	1.35	340	0.69	338	0.20	351	0.39	161
2014/03/01	074500	5.0	113	2.05	328	0.82	351	0.18	9	0.26	124	0.54	149
2014/03/01	080000	5.0	112	1.62	333	0.37	36	0.46	127	0.72	133	0.82	142
2014/03/01	081500	4.9	111	1.20	343	0.64	117	1.02	134	1.27	136	1.19	142
2014/03/01	083000	5.0	110	0.85	360	1.46	135	1.69	136	1.79	137	1.46	140
2014/03/01	084500	5.0	109	0.80	28	2.30	133	2.35	135	2.10	140	1.52	143
2014/03/01	090000	5.0	107	0.87	70	2.63	132	2.80	136	2.40	140	1.60	148
2014/03/01	091500	4.9	108	1.47	103	3.14	140	2.91	141	2.51	143	1.77	147
2014/03/01	093000	4.8	108	1.92	109	3.30	143	3.08	144	2.66	143	1.96	145
2014/03/01	094500	4.7	108	2.77	127	3.21	139	3.35	137	2.65	132	2.02	139
2014/03/01	100000	4.6	109	3.34	141	3.19	136	2.82	128	2.58	128	2.14	136

5 CONCLUSION

The BIMI collided with the suction dredger BARENT ZANEN in the Medem roadstead in dense fog because her anchor lost its grip, the main engine was not ready on time and later failed, as well as because of the strong maximum drift of 3.8 kts, as measured by the VTS radar system. No attempt was made to stop the drift by letting go the second anchor or deploying additional chain length. Instead, attempts to start the engine as quickly as possible were made in vain. It was reportedly not ready to start until two minutes before the collision at 0634 and because of its late use was ineffective in terms of preventing the vessel from scraping along the anchor chain and port side of the BARENT ZANEN, however. The advising Elbe pilot responded with a "No" when the master suggested the deployment of additional anchor chain when the vessel was drifting. He relied on information that the engine would reportedly be ready for use in ten minutes. Unusual for the weather conditions, the swaying was observed shortly after the change of watch at 0600. The BIMI was damaged on the superstructure, deck, and screw during the collision. The BARENT ZANEN had abrasions on the shell plating and a drain pipe was damaged. No pollutants escaped.

A total of two vessels were located in the anchorage area and there would still have been room in the south-eastern area of the roadstead on the 10 m line (see Fig. 10, sounding chart). Inasmuch, a greater and in relation to the direction of the current more offset distance to the BARENT ZANEN could have been selected to reduce the risk of collision in the event of drifting. However, the BIMI's only anchor manoeuvre was carried out properly. The distance to the BARENT ZANEN was originally 3 cbl and four shackles of chain length were deployed. At a chain length of 25 m/shackle, about 100 m of chain length were deployed. The water depth at the BIMI's anchor position was about 11.5 m and as a rule of thumb the chain length deployed should be 5-6 times the water depth, i.e. about 60-70 m. However, the anchor will hold only if both flukes of a stockless anchor are well embedded and the forces can spread over the anchor chain parallel to the anchor ground. It is likely that did not happened in the present case, possibly due to scouring (see sounding chart). Once the flukes twist in the anchor ground and the stockless anchor embeds itself at an angle instead of parallel, a vertical direction of pull occurs, which may cause the anchor to spin. The radar plot (see Fig. 9) indicates that the BIMI's anchor position was changing by the minute, until it started to drift with the current at 0631. This unusual swaying was observed on the bridge and attempts were made to start the engine.

The Medem roadstead is known among pilots as an unsafe anchor ground. Towards the fairway, the anchor ground reportedly consists of firmly compacted sand, fine sand and finally sludge then follow further towards the middle. As can be seen from the sounding chart, the bottom is uneven and the current can set at up to 5 kts. This local knowledge of the pilots is not shown in the official nautical publications. Moreover, the current forces in the 'Der Küstennahe Gezeitenstrom in der Deutschen Bucht' (inshore tidal streams in the German Bight) atlas issued by the BSH (No 2348; see Fig. 13), for example, are not specified accurately enough if the grid resolution is too coarse.

The current arrows finish here at current forces of greater than 3.4 kts. This atlas is referenced in the sailing directions of the BSH (No 20061). Also indicated is that the incoming current occurs one hour and 40 minutes after the occurrence of local low tide and the outgoing current one hour and 30 minutes after the occurrence of local high tide. Here, the ebb current velocity is greater than the flood current velocity. It is stated that the Medem roadstead can be used for vessels up to 140 m in length, cargo handling, bunkering, and vessels carrying dangerous cargo. A note under 'Characteristics' contains a warning that swaying can occur in the fairway. There is no information about the anchor ground. The values of 1.8 and 2.7 kts calculated in the computational models of the BAW and BSH at the BIMI's anchor position are too low and do not reflect the values of up to 3.8 kts actually measured using VTS radar and AIS chain or the drifting BIMI with anchor deployed. Merely at the position of the BARENT ZANEN, the BSH model only calculated 3.52 kts at 0615. It should be noted here that, as indicated, no up-to-date data or measuring instruments were available in either model. Depth-averaged data were calculated at the BAW. They do not reflect the BIMI's draught of 5.5 m.

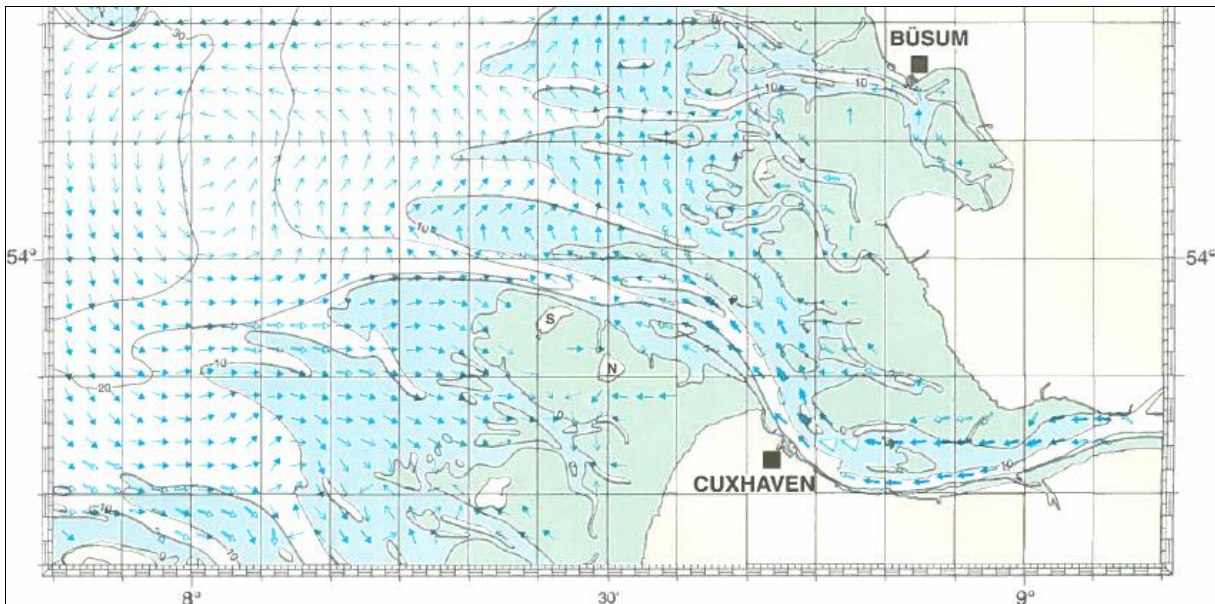


Figure 13: Excerpt from Tidal Atlas 2348

Medem roadstead is a challenging anchorage area with unsafe anchor ground. Even with VTS monitoring, pilotage and local knowledge, as well as constant observation of the anchor position using radar and AIS, it was not possible to prevent a collision with another vessel laid up at anchor in dense fog and darkness. Contributory factors here were that the vessels anchored on the same track in the direction of the current at a distance of only 3 cbl and the BIMI's engine, with a notice (standby time) of ten minutes, could not be started.

6 SOURCES

- Enquiries by WSP Cuxhaven (WSPK4)
- Written statements
 - Ship's commands
 - Owner
 - The classification society Germanischer Lloyd (GL)

- Witness accounts

- Reports and technical paper

Dr.-Ing. Klemens Uliczka, Dr. rer.-nat. Frank Kösters
Federal Waterways Engineering and Research Institute – Coastal Department –
Bundesanstalt für Wasserbau – Dienststelle Hamburg

Federal Maritime and Hydrographic Agency (BSH); operational models
Dr. Frank Janssen

Brotherhood of Elbe Pilots

WSA Cuxhaven, VTS Cuxhaven, hydrology, shipping

- Nautical charts, sailing directions and ship particulars, BSH
- AIS recordings, Joint Control Centre of the Waterway Police of the Coastal States in Cuxhaven
- Photos by WSP Cuxhaven and Hasenpusch