Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation
Federal Higher Authority subordinated to the Ministry of Transport,
Building and Urban Development

Summary
Investigation Report 07/10

Very Serious Marine Casualty

Foundering of the FV ORTEGAL UNO on 13 January 2010 west of Ireland

1 November 2010

www.bsu-bund.de

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.

According to said act, the sole objective of this investigation is to prevent future accidents and malfunctions. This investigation does not serve to ascertain fault, liability or claims.

This report should not be used in court proceedings or proceedings of the Maritime Board. Reference is made to art. 19 para. 4 SUG.

The German text shall prevail in the interpretation of this Investigation Report.

Issued by:
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1 Summary of the marine casualty

On 9 January 2010, the ORTEGAL UNO, a fishing vessel flying the flag of Germany, left her port of fitting out, A Coruña, which is on Spain's Atlantic coast, to fish off the west of Ireland. The weather deteriorated continuously during the voyage to the fishing grounds and a storm of up to 10 Bft prevailed when these were reached on 12 January 2010. Nevertheless, the crew made preparations to lay the nets. Several large waves suddenly entered the fish processing area and caused the vessel to list about 40° to port.

Following that, the ship's command immediately arranged for the life rafts to be made ready and called the ORTEGAL TRES, another of the shipping company's vessels, for assistance. Attempts were also made to ensure the vessel was watertight in order to prevent the ORTEGAL UNO from foundering. At 1030[1], the vessel was abandoned by all personnel, who were picked up by the ORTEGAL TRES.

The two vessels remained together until the ORTEGAL UNO foundered on the evening of the day after, 13 January 2010. Although the weather conditions improved steadily over the course of the day, the ship's commands did not see any possibility for re-boarding the ORTEGAL UNO in order to rescue her.

The ORTEGAL TRES then proceeded to A Coruña and arrived there on 16 January 2010.

[1] Unless otherwise stated, all times are CET = UTC + 1 hour.

2 SHIP PARTICULARS

2.1 Photo

Source: Owner

Figure 1: Photo of the FV ORTEGAL UNO (ex BELEN)

2.2 Vessel particulars

Name of vessel:	ORTEGAL UNO ex BELEN ex INGRID
Type of vessel:	Fishing vessel
Nationality/flag:	Federal Republic of Germany
Port of registry:	Cuxhaven
IMO number:	8836041
Call sign:	DFPH
Owner:	Ortegal Fischerei GmbH
Year built:	1970
Shipyard/yard number:	Julius Diedrich Schiffswerft / 110
Classification society:	Germanischer Lloyd AG
Length overall:	29.36 m
Breadth overall:	6.40 m
Gross tonnage:	179
Deadweight:	101 t
Draught (max.):	4.20 m
Engine rating:	422 kW
Main engine:	DEUTZ SBA 12 M 816 U
(Service) Speed:	9.5 kts
Hull material:	Steel
Hull design:	Fully covered motor vessel
Minimum safe manning:	5

2.3 Voyage particulars

Port of departure:	A Coruña
Port of call:	A Coruña
Type of voyage:	Merchant shipping International
Cargo information:	No cargo
Draught at time of accident:	F: 2.40 m A: 3.80 m
Manning:	17
Pilot on board:	No
Canal helmsman:	No
Number of passengers:	0

2.4 Marine casualty or incident information

Type of marine casualty/incident:	Very serious marine casualty; capsize with foundering of vessel
Date/Time:	12/01/2010/0945
Location:	west of Ireland
Latitude/Longitude:	φ 52°20.4'N λ 014°02.3'W
Ship operation and voyage segment:	High seas Laying the nets
Place on board:	Fore castle
Consequences (for people, vessel, cargo, environment and other):	Total loss of the vessel, no personal injuries

Excerpt from Nautical Chart 379, BSH

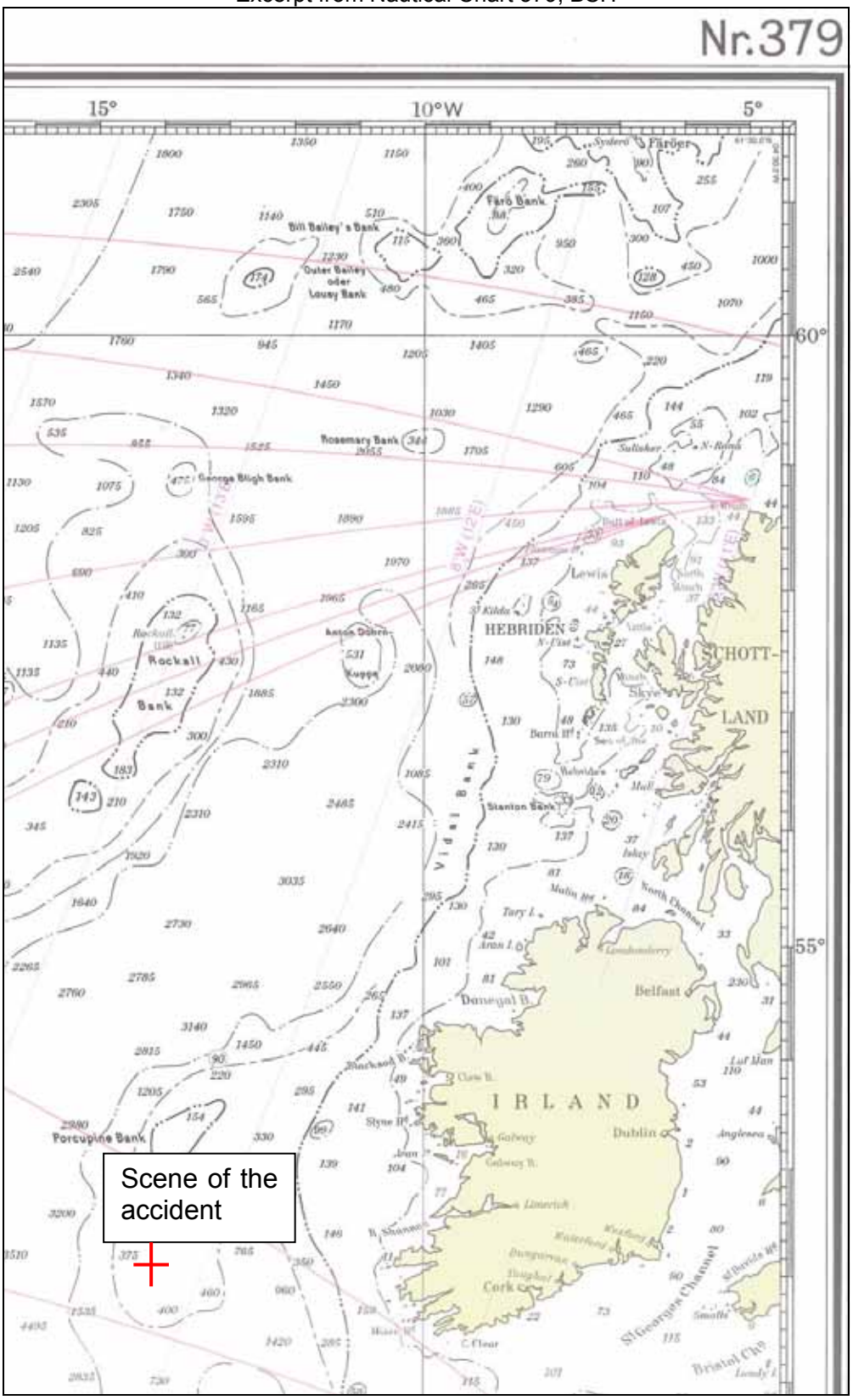

Figure 2: Scene of the accident

2.5 Shore authority involvement and emergency response

Agencies involved:	Irish Coast Guard
Resources used:	Observation helicopter
Actions taken:	None
Results achieved:	None

3 COURSE OF THE ACCIDENT AND INVESTIGATION

3.1 Course of the accident

On 9 January 2010, the fishing vessel ORTEGAL UNO left the port of A Coruña[2] in order to fish off the west of Ireland in line with usual practise.
The destination was reached on 12 January 2010 and the crew made preparations to lay the nets. In spite of rough seas, the crew was surprised when several large waves suddenly flooded the whole of the deck and superstructure of the vessel at 0945. This abruptly led to a heel of about 40°. The vessel was subsequently hit by additional waves. According to statements given, these caused the heel to increase to up to 60°. With this list, the meteorological conditions at sea (squalls from the south-east of 9 to 10 Bft) were assessed by the skipper as "very critical." In view of the risk of the vessel foundering, orders were given to make the life-rafts ready and prepare to abandon the vessel. In the process, one of the rafts was lost due to the strong wind. The skipper made contact with the ORTEGAL TRES. This fishing vessel operated for the same shipping company and was in the vicinity. The ship's command of the ORTEGAL TRES was informed of the situation and requested to assist. At the same time, in an attempt to prevent water ingress the skipper of the ORTEGAL UNO reportedly gave instructions for the engine room door to be blocked. The idea was to maintain the vessel's power supply for as long as possible; reportedly, this was to enable operation of the bilge pumps. Hence, he reportedly took steps to prevent the vessel from foundering. The ORTEGAL UNO was abandoned at 1030. The fishing vessel ORTEGAL TRES picked up the crew at the position 52°21'N and 014°41'W. They remained in the vicinity of the fishing vessel ORTEGAL UNO, hoped for better weather and monitored the ORTEGAL UNO's situation.
In the prevailing weather conditions it was not possible to approach the ORTEGAL UNO throughout the whole of 12 January. At 0900 on 13 January, the ORTEGAL TRES approached the ORTEGAL UNO and found that the vessel was heeling severely and that it was impossible to board her. The wind conditions had improved to a south-westerly force 4 wind. Given this situation, Valencia Radio was informed about the emergency. Prior to that, fishermen in the area were informed. The ORTEGAL TRES stayed in the vicinity of the ORTEGAL UNO throughout 13 January. This was reportedly in order to ascertain whether an improved heel would permit boarding, which ultimately was not possible. The radar echo of the ORTEGAL UNO was reportedly lost at 2215 on 13 January 2010. A visual inspection of the sea area by the crews revealed that the ORTEGAL UNO had foundered. The ORTEGAL TRES then proceeded to the port of A Coruña and arrived there at 2000 on 16 January 2010.

[2] Officially and in Galician 'A Coruña' – unofficially in Spanish and formerly officially 'La Coruña'

3.2 Investigation

The fishing vessel ORTEGAL UNO was hit by heavy seas in the Gran Sol fishing zone on the morning of 12 January 2010 at about 0930. In the process, the vessel was flooded several times and then listed to approx. 40°. Following that, the crew abandoned the vessel and was picked up by the fishing vessel ORTEGAL TRES, which was operating in the vicinity.
The ORTEGAL UNO remained afloat until she foundered on 13 January at about 2215. The accident did not lead to any personal injuries.

In the skipper's report, the accident position is specified as 52°21'N 014°41'W. This is the position at 0930 on 12 January 2010, when the vessel was hit by large waves and took on a significant amount of water. According to this report, the vessel foundered on 13 January 2010 at the position 52°20'40N 14°02'30W.
When the skipper made his emergency call to MRCC Valencia on 13 January 2010 at about 0900, the current position of the two vessels was recorded: 52°19'N 014°18'W. This position was also passed on to the BSU and therefore the weather report was requested on that basis. The difference with the skipper's report was only noticed in the later stages of the investigation.
The MRCC Valencia immediately informed the MRCC Dublin about the emergency. The position of the report was again transmitted as that of the accident.
The Bundesanstalt für Landwirtschaft (Federal Agency for Agriculture and Nutrition/BLE) is responsible for implementation of the common market policy for fishery products, the management of national fishing quotas and the preparation of a list of trade descriptions for fish species. As part of its role, it also monitors the position of fishing vessels flying the German flag. The positions of the automatic vessel monitoring system delivered values which brought the information in the skipper's report and the MRCC in line.

The Institute of Ship Design and Ship Safety of the Hamburg-Harburg University of Technology (TUHH) was commissioned by the Federal Bureau of Maritime Casualty Investigation to establish the circumstances that led to the foundering of the ORTEGAL UNO.

A weather report by Germany's National Meteorological Service (DWD) and a photometric analysis of images of the capsized ORTEGAL UNO were incorporated in the TU Hamburg-Harburg's investigation.

3.2.1 Weather conditions

3.2.1.1 Weather situation on 12-13 January 2010

At 0000 UTC on 12 January, a small-scale but very intense low pressure system with core pressure of 973 hPa, which slowly moved north and later north-west, prevailed at the position 48°N 017°W.
At 0000 UTC on 13 January, the low pressure system was positioned at about 56°N 018°W to the north-west of Ireland with core pressure of 969 hPa. It moved slowly further to the north-west. However, since a secondary depression of 989 hPa was positioned to the west of Cape Finisterre at the same time and a high wedge formed to the south-west of Ireland, the wind dropped in the area under investigation during the course of 13 January.

3.2.1.2 Weather conditions on 12 January 2010 at position 52°19'N 014°18'W

A force 8 to 9 Bft south-easterly wind prevailed in the early morning hours. This turned briefly to the east and increased to a mean wind force 9 to 10 Bft. Gale-force winds were very likely during that period. The wind dropped to 6 Bft during the course of the morning and turned slowly as the core of the depression moved closer. At midday it still blew from the south-east, but by the afternoon it was already blowing from the south-west. During the course of the afternoon, the south-west wind reached force 7 Bft because the core of the depression passed in a northerly direction just west of the position. The wind direction and force changed only slightly during the first half of the night of 12/13 January.
According to the calculations of the wave model of the European Centre for Medium Range Weather Forecasts (ECMWF), the wind sea increased rapidly from 3 to 4-5 m and changed only a little during the day. The direction was initially from the south-east, the turn to south-west followed in the afternoon.
Using the ECMWF wave model, the swell is initially calculated as 3 m, 6 m at midday and 5 m during the early evening. It initially came from south-east to south and later from south-west.
This relates to the significant wave heights. Rare individual waves could have been 70 to 100 per cent higher.
With the different wind sea and swell directions, the probability of a crossing sea can be assessed as particularly high, especially during the morning and midday.
Air temperature was between 6 and 8° C and water temperature 11° C; therefore, spray ice is unlikely.
There were no measurements or estimates with regard to visibility.
However, after analysis of the satellite images it can be assumed that rain contributed to occasional reduced visibility.

3.2.1.3 Weather conditions on 13 January 2010 at position 52°19'N 014°18'W

The wind blew initially from the west at 6 to 7 Bft with gusts of 8. It then turned to the south-west and dropped to 5 to 6 Bft with gusts of 7 by 1200 UTC. By the end of the period under investigation (2400 UTC), the wind turned back to south and dropped to 3 to 4 Bft.

According to the calculations of the wave model of the European Centre for Medium Range Weather Forecasts (ECMWF), the wind sea continued to drop during the course of the day from 4 m to 1 m and less by the end of the period under observation.
Using the ECMWF wave model, the swell is calculated as 5 m initially and 3 to 4 m later. This relates to the significant wave heights. Rare individual waves could have been 70 to 100 per cent higher.
Air temperature was between 7 and 9° C and water temperature 11° C; therefore, spray ice is unlikely.

3.2.1.4 Wavelengths on 12 and 13 January 2010

The wavelengths can be calculated from the period of swell (1.56 x period in sec.). Information about the wave periods in the accident area is provided by the model data from the wave model of the ECMWF or the DWD; the vessel reports are in the range of the model calculations.

The wavelengths were as follows:

	12/01/ 0000	**12/01/ 0600**	**12/01/ 1200**	**12/01/ 1800**	**13/01/ 0000**	**13/01/ 0600**	**13/01/ 1200**	**13/01/ 1800**	**2010 UTC**
Windsea	100	120	150	150	120	120	40	40	**m**
Swell	190	180	220	300	220	220	220	220	**m**

3.2.2 Photometry for calculating the list

3.2.2.1 Fundamentals

The 'optical metrology' is based on the measurement of labelled identical object points in two or more situation pictures that were taken from different angles. Object dimensions can be reconstructed from the survey photographs using known camera and lens data and at least one known reference line on the object.

3.2.2.2 Data

7 digital images taken by the Irish Coast Guard helicopter from different angles were available for analysing the situation of the foundered fishing vessel. Furthermore, the general arrangement plan of the ORTEGAL UNO was used to establish the reference lines.

3.2.2.3 Analysis

The necessary data of the camera and lens used could be derived from the additional information on the digital images.
An appropriate number of identical points on the hull were measured to reconstruct the fishing vessel's position in the water (see Figure 3).

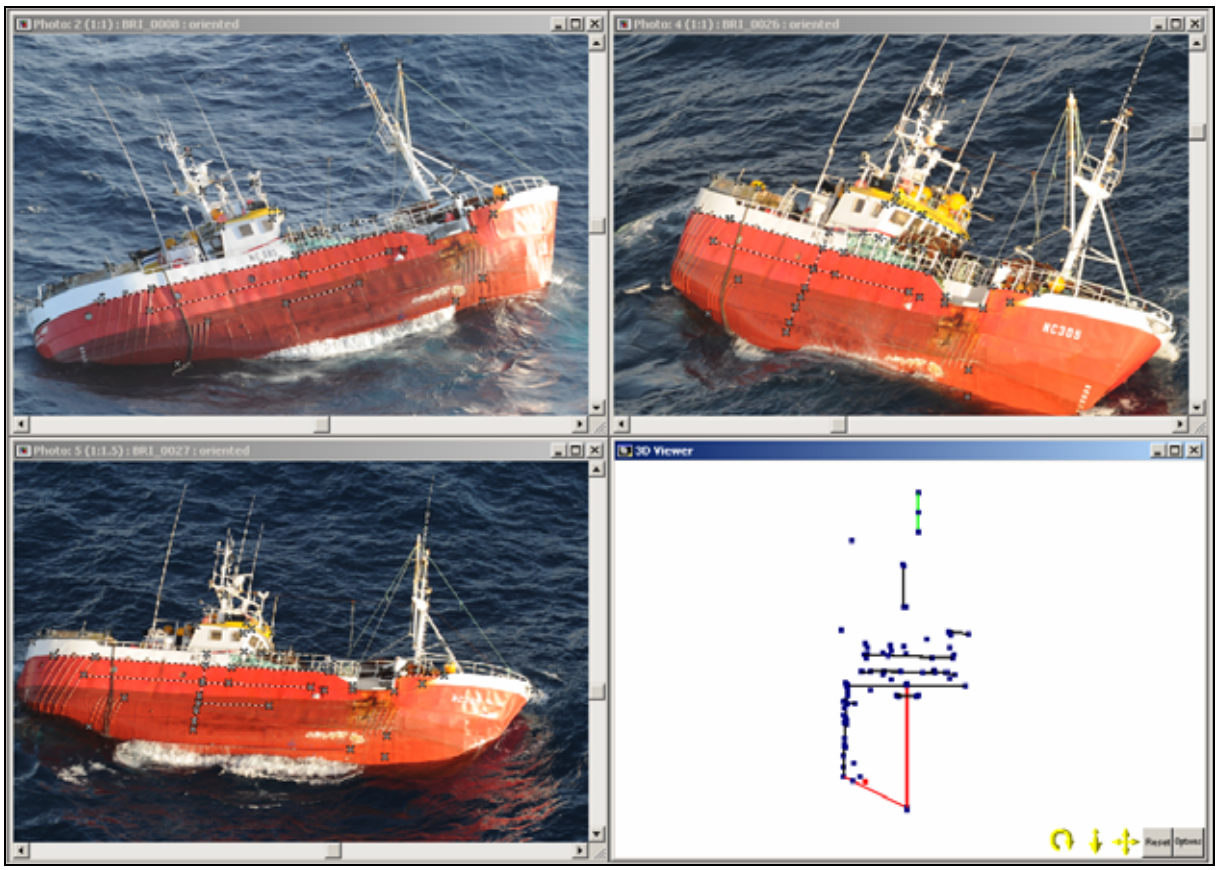

Figure 3: Measurement points on the hull

It was possible to determine the shape and position of the fishing vessel in relation to the water surface from the three-dimensional calculation of the visible side of the vessel and additional points on the port side (see Figure 4).

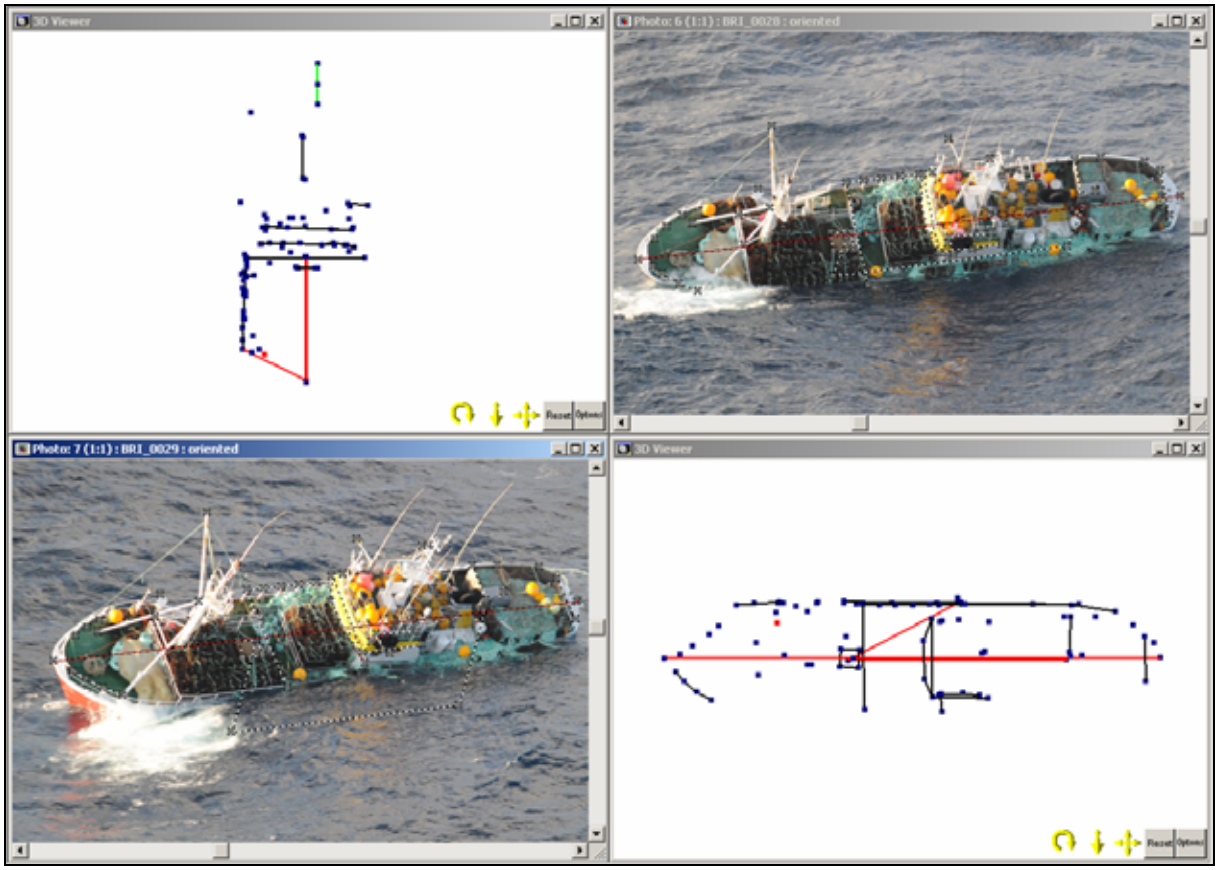

Figure 4: Shape and position of the hull

Necessary reference lines were taken from the general arrangement plan and used to scale the three-dimensional hull form (see Figure 5).

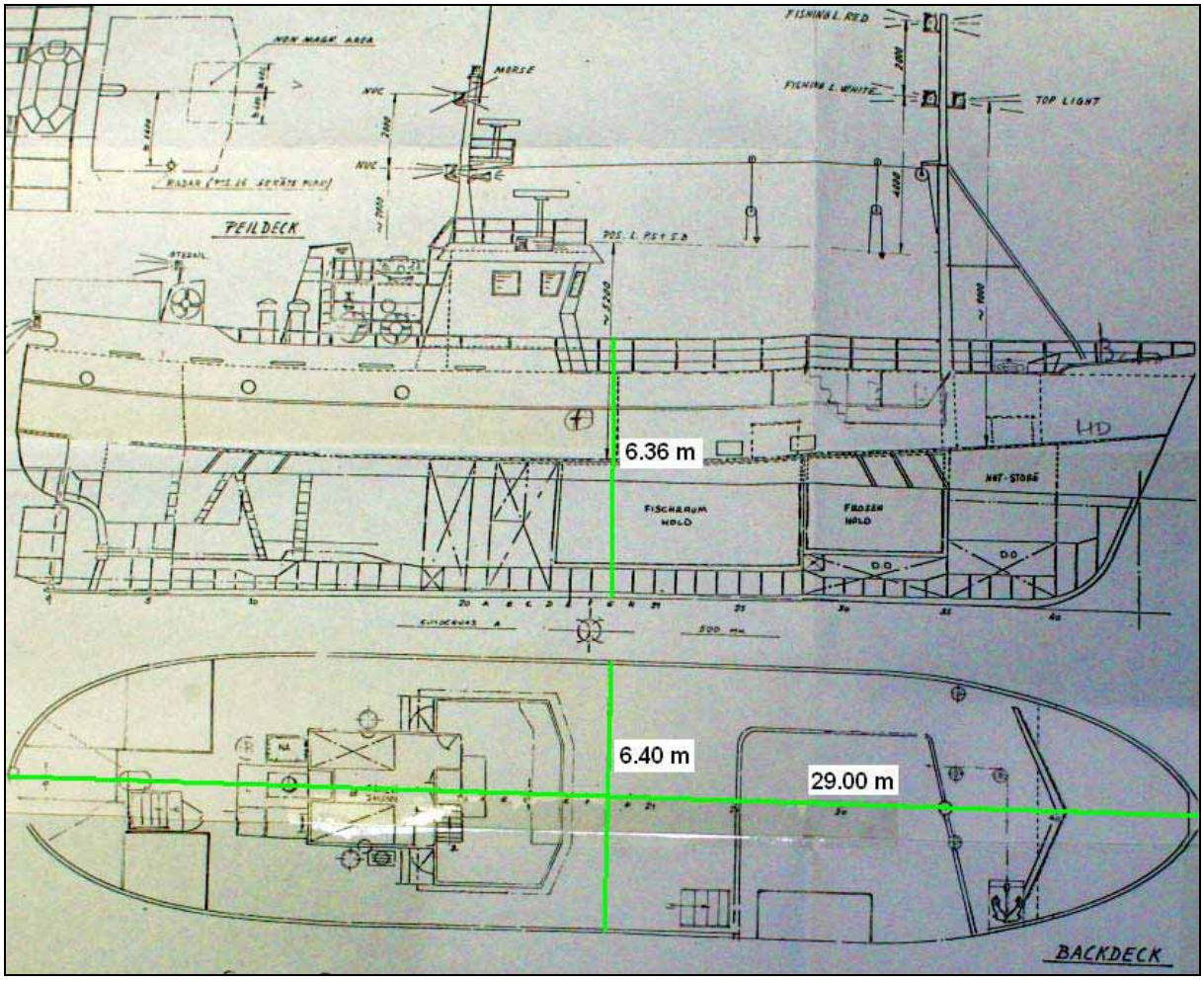

Figure 5: Reference lines used

Since the port side of the ORTEGAL UNO was almost completely below the water line, the hull was reconstructed by mirroring the starboard side at the centre line (see Figure 6).

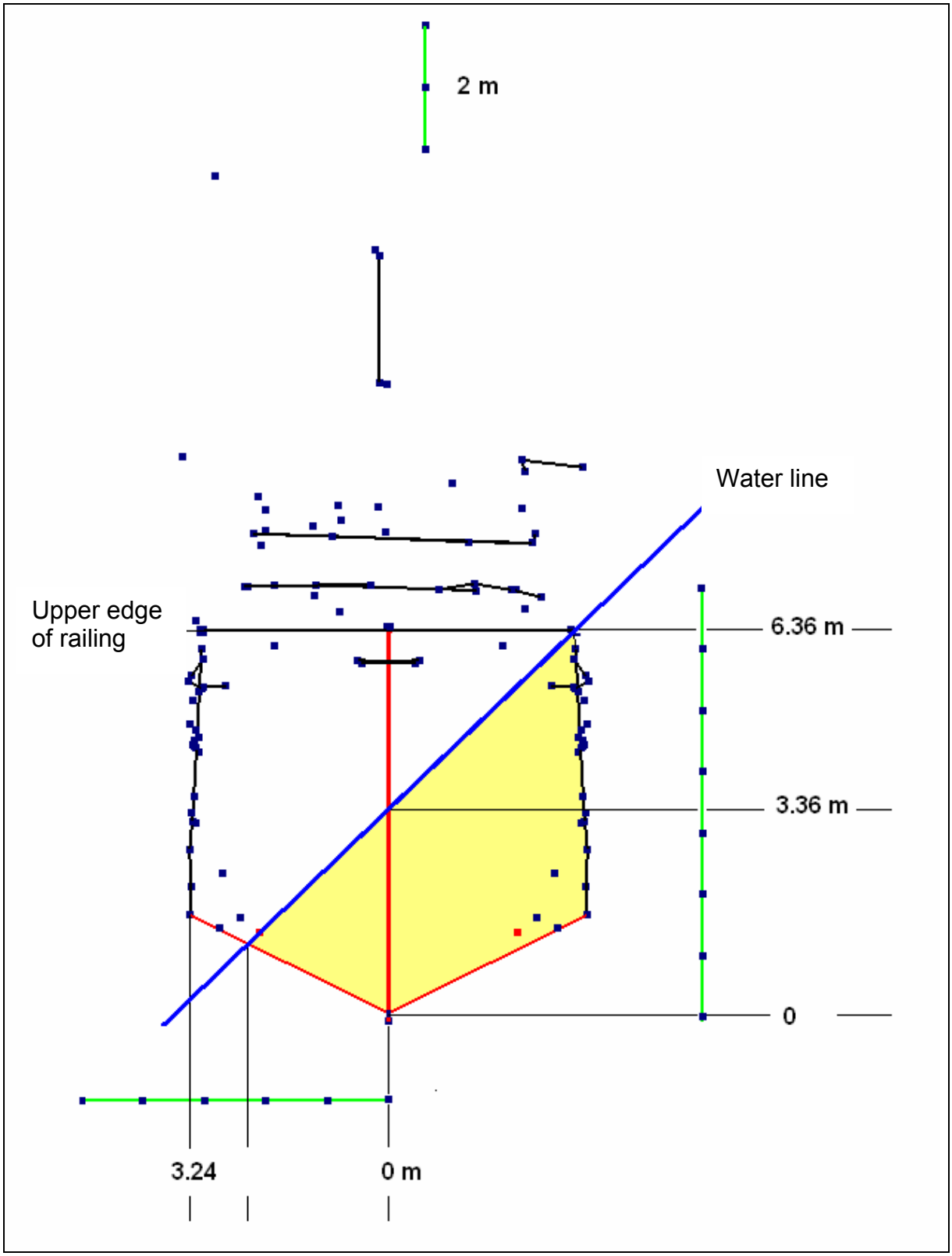

Figure 6: Front view (from bow to stern) with reconstructed port side

It is also possible to establish the depths to be determined from this figure.

3.2.2.4 Summary of the marine casualty

Evaluation of the digital images of the accident shows that the water reached the ORTEGAL UNO's port railing at the time they were taken. The water level was 3.36 m in midships at the time. Due to the swell and measurement uncertainty, this value may vary by +/- 0.20 m. The yellow area in Figure 6 shows the immersed part of the fishing vessel.
The water line runs 3 m below the upper edge of the railing through the centre of the vessel. A half beam of 3.24 m results in an angle = atan (3.24/3) = 47.2°. The angle of the deck in relation to the waterline is therefore 42.8°.

3.2.3 Stability report

Based on the submitted documentation and calculations of TU Hamburg-Harburg, it is possible to explain the accident in physical terms with absolute certainty. The accident was caused by a sequence of factors, which, in general, reveal an insufficient culture of safety in terms of the modification, monitoring and operation of the vessel.[3]
The intact stability of the vessel was significantly impaired as compared to the case documented in the vessel's stability manual; notably, to the extent that the valid and according to the stability manual inspected stability rules were no longer observed. Therefore, the vessel entered poor weather with insufficient intact stability.

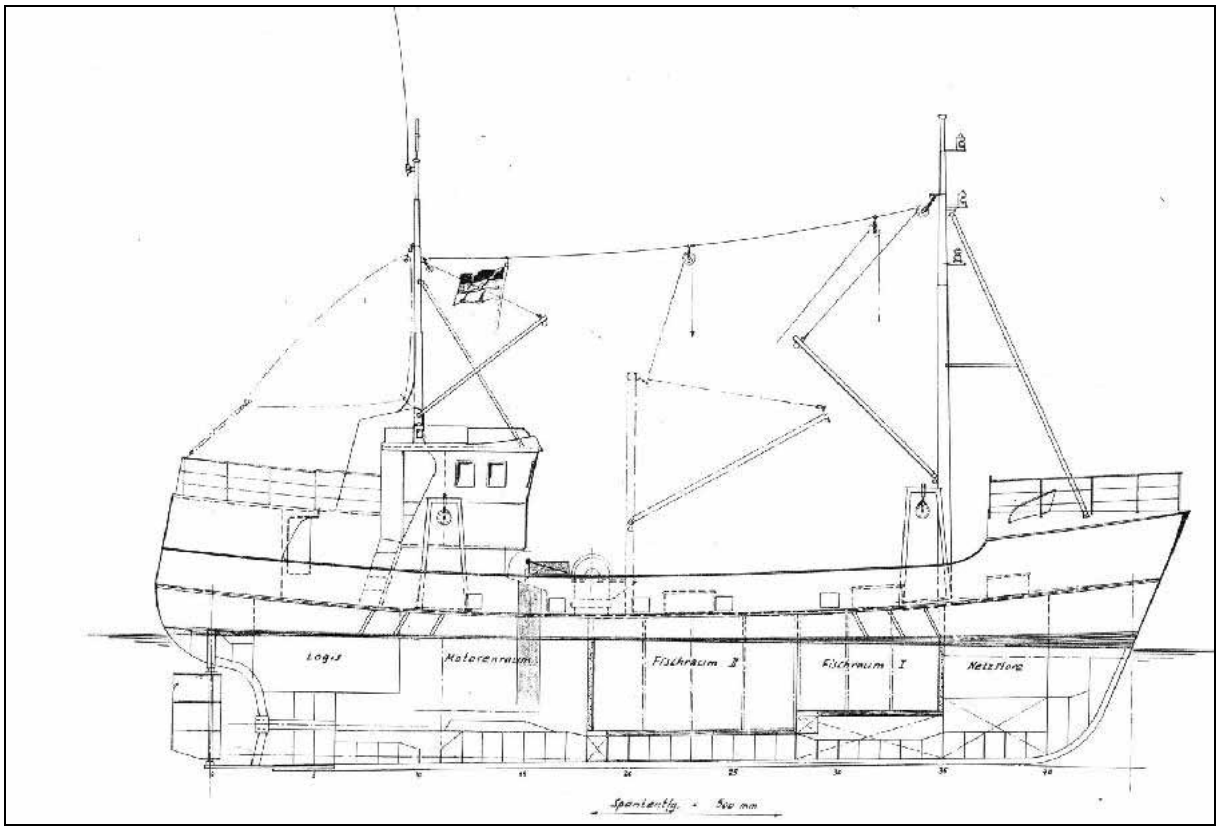

Figure 7: Side view of the vessel in her original state as FV INGRID in 1970

[3] The extensive expertise and this report can be reviewed at www.bsu-bund.de.

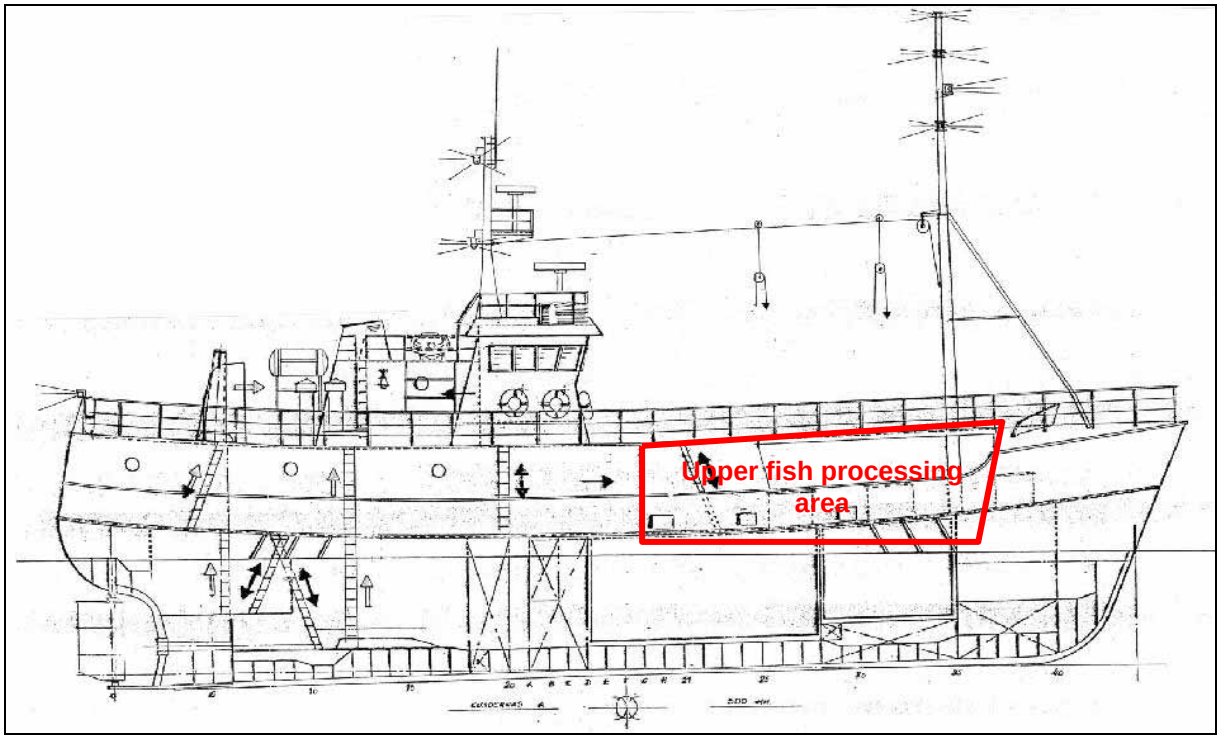

Figure 8: Side view of the vessel in her accident state as FV ORTEGAL UNO in 2010

Due to the insufficient stability of the vessel in heavy weather, the vessel was already rolling continuously with roll angles of up to about 30° when in an intact state and sailing in stern seas.
While deploying the fishing gear in heavy weather, the crew had the opening in the upper fish processing area on the starboard side open. This coupled with the rolling motion enabled water to enter the upper fish processing area.
Since the upper fish processing area was not equipped with wash ports, the water that entered the area could not clear, especially not after the vessel listed to port. The bilge pumps, which the skipper states are in this area, are not shown on the plans. Even if they were operational, it is likely that the intakes would be clogged by drifting working material and thus water could not be pumped out of the area.
However, the calculations have shown that the vessel would not have capsized with the amount of water in this area alone. The crew must have had the inner weathertight door (see Figure 9) between the upper fish processing area and superstructure open so that water entered the superstructure as the vessel rolled back to starboard in swell. In the process, the water that first entered the fish processing area ran into the superstructure. This must have occurred several times.

In this phase, it is also quite possible that the vessel could have continued to list to starboard. According to the calculations, it would have then flooded immediately and foundered. In that case, it would have no longer been possible for the crew to abandon the vessel.

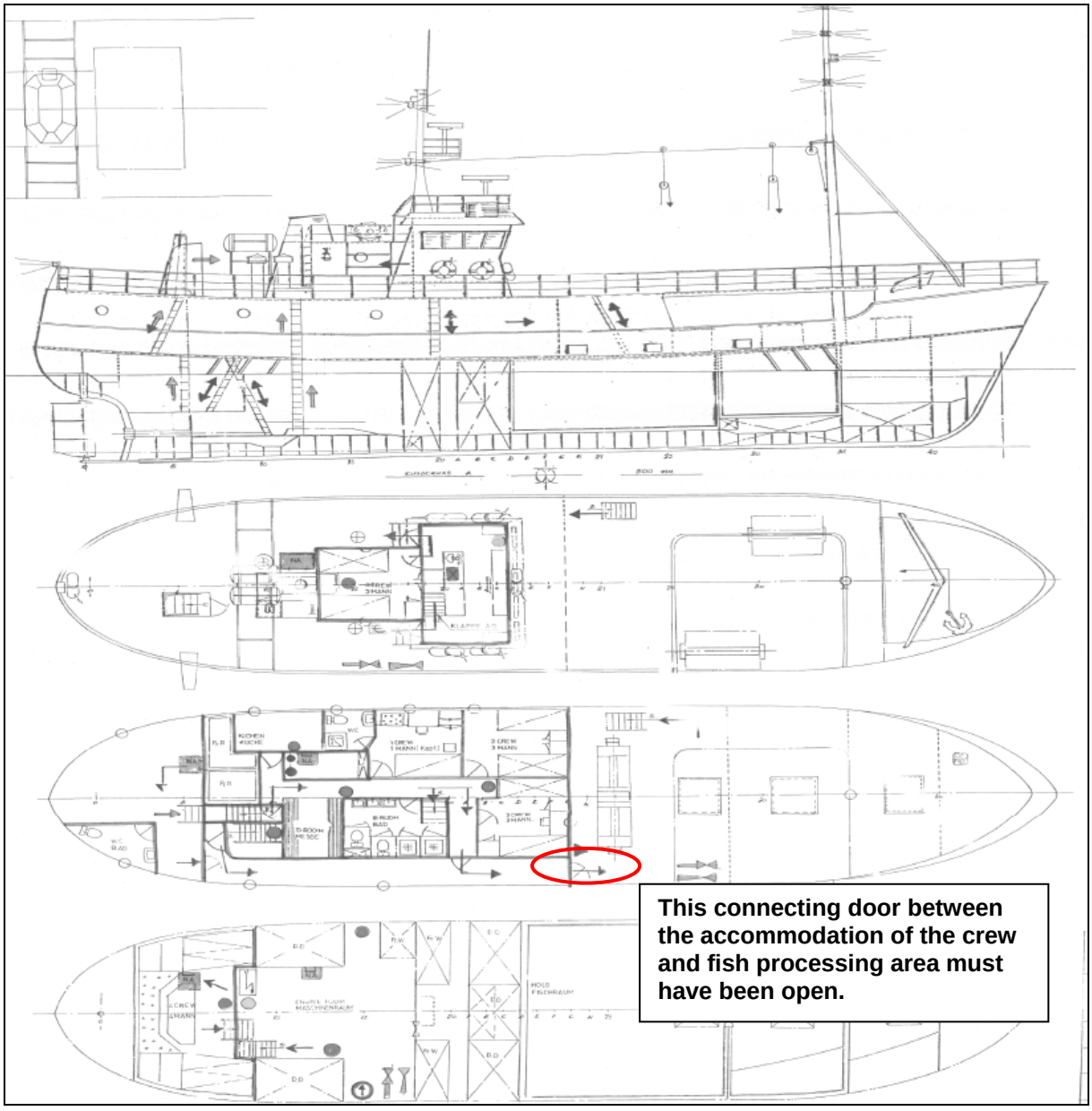

Figure 9: Excerpt of the general arrangement plan

Fortunately, the vessel remained on her port side and only took on quite small amounts of water in the swell. Since the portholes and closures were largely watertight and permitted only minor water ingress, the vessel remained afloat for a very long time before she finally foundered.

4 ANALYSIS

It was found that the cause of the accident stems directly from the various structural modifications on the vessel, which are improperly documented. During her last modification, the ORTEGAL UNO was fitted with an ice machine in order to be able to produce the amount of ice required to cool the catch. This also involved the preparation and approval of a new stability manual. Although, according to the statement of the skipper, the vessel did not have ice in the lower fish hold on departure as the ice machine was now available, in the corresponding stability case 25 tons of ice is scheduled for the cargo hold. Furthermore, in the accident situation the fishing gear was carried on the forecastle; however, in the loading condition of the stability manual this is scheduled for the main deck, which is lower. Although the vessel had consumed about a third of her bunker upon arriving at the fishing grounds, the loading condition in the stability manual prescribes a bunker filling of 100%. Therefore, based on the stability documents the vessel's centre of gravity was much higher than indicated, which led to the stability no longer complying with the applicable rules.

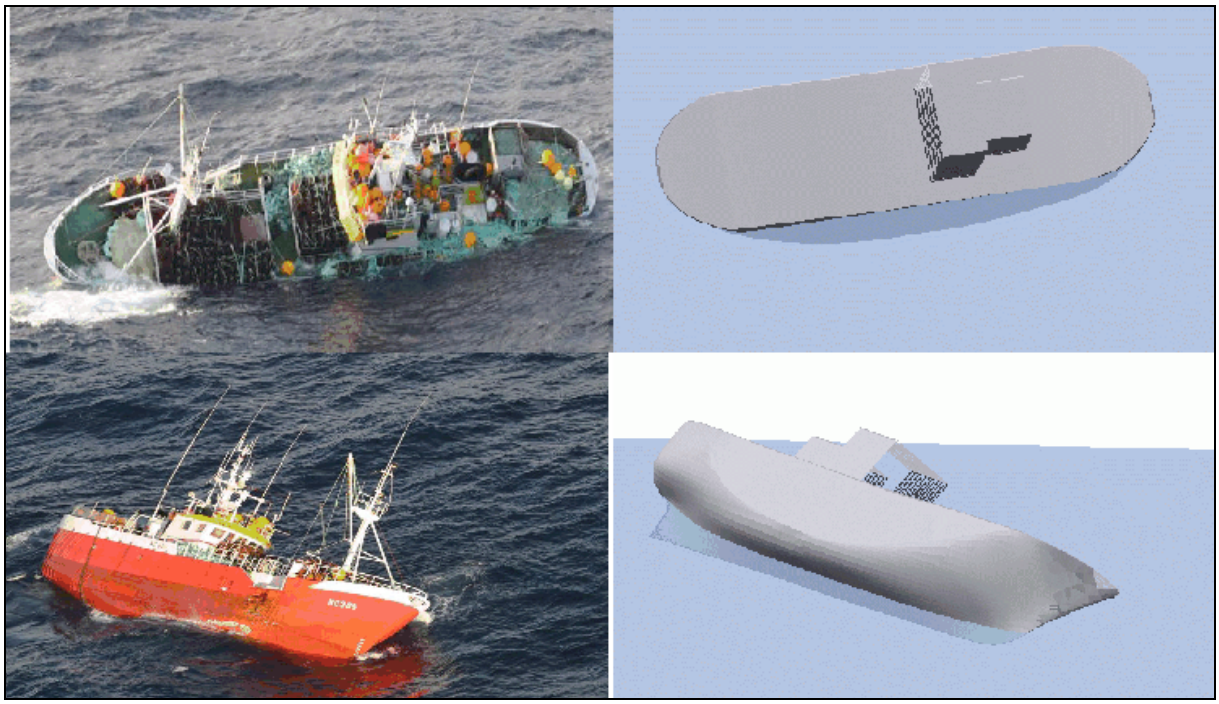

Figure 10: Comparison of the calculated and photographed equilibrium position for the presumed accident state of the ORTEGAL UNO

That the upper fish processing area was not equipped with any water ports had a particularly catastrophic effect. This meant that water which entered this area was unable to clear. This ultimately triggered the accident. Wash ports are present on the approved plans of the vessel; however, they are not visible on various photos. This is a violation of the applicable safety rules according to EU Directive 97/70/EC; for if the upper fish processing area would have been regarded as closed, flooding of the area would have had to be considered when assessing stability. If it was regarded as open, it should have been equipped with wash ports.

Therefore, we are unable to understand how the vessel was certified as being in compliance with EU Directive 97/70/EC when the sailing permit was reissued.

Figure 11: Access to the upper fish processing area on the starboard side. The opening is behind the bulwark. The net is deployed through the smaller opening; the larger one is used to enter the fish hold.

Moreover, the rules of good seamanship were not observed by the crew. After the flooding of just the upper fish processing area, it would have been possible to refloat the vessel had a functioning draining system been available in accordance with Directive 97/70/EC. Since, basically, it is otherwise not possible to explain the course of the accident, the door from the fish processing area to the superstructure must have been open.

It is difficult to understand why the ship's command did not request external assistance until 24 hours after the vessel capsized. The likelihood of salvaging the ORTEGAL UNO with external assistance was probably very high given that she stayed afloat for more than 30 hours and the weather was becoming increasingly calm.

5 CONCLUSIONS

It is now possible to calculate heeling angles using only the photos of a capsized vessel. Based on that, the vessel's stability in this situation can be calculated, and, in turn, conclusions as to the cause of the list made. In this case, that led the following results:

Structural modifications to the vessel must be properly documented and their influence on the stability of the vessel tested accordingly. In particular, it must be ensured that the structural condition of the vessel is consistent with the approved stability cases.

In the case of fishing vessels, a loading condition 'arrival in the fishing grounds with 70% bunkers and stores' must be shown.

It must be shown in accordance with Directive 97/70/EC that water can flow out of only partially enclosed areas through suitable wash ports or that the vessel can withstand flooding of the area.

A watertight closure condition must be ensured in sea operation, i.e. corresponding openings on board are to be closed.

In the reports on the foundering of the fishing vessel HOHEWEG[4] and the capsizing accident of the fishing vessel NEPTUN[5], the BSU also found that the stability of a vessel changed, without this being sufficiently accounted for, following a modification.

Ultimately, the investigation of this accident did not result in new lessons of any significance for improving maritime safety but important findings already made were vividly and very clearly confirmed.

Due to significant modifications on the ORTEGAL UNO, one can say that she is unique, i.e. no other vessel exists that has similar characteristics.

For these reasons, the Federal Bureau of Maritime Casualty Investigation is concluding the investigation of this marine casualty with a summary report.[6]

[4] See www.bsu-bund.de Ref.: 564/06 'Foundering of the Fishing Vessel HOHEWEG'
[5] See Investigation Report 'Foundering of the FC NEPTUN', Ref.: 226/03.
[6] See art. 15 para. 1 SUG in conjunction with art. 18 para. 4 FIUUG.

6 SOURCES

- Investigations by Waterway Police (WSP) Hamburg
- Investigations by the Federal Police Sea, Maritime Investigation and Detection Group
- Investigations by the Irish Coast Guard
- Investigations by the Spanish maritime accident investigation authority C.I.A.M.
- Written statements by the ship's command
- Witness accounts
- Documents from MRCC Dublin and MRCC Bremen
- Opinion on stability by Professor Krüger, TUHH
- Opinion on photometry by Dr.-Ing. Wiggenhagen
- Nautical charts and vessel particulars, Federal Maritime and Hydrographic Agency (BSH)
- Official weather report by Germany's National Meteorological Service (DWD)
- Position data from the Bundesanstalt für Landwirtschaft (Federal Agency for Agriculture and Nutrition/BLE)
- Documentation, Ship Safety Division (BG Verkehr)

7 APPENDICES

Expert opinion on the foundering of the fishing vessel ORTEGAL UNO in the Gran Sol fishing zone on 12/01/2010

Professor S. Krüger
Head of the Institute of Ship Design and Ship Safety

Available as a PDF file on the Internet at:

www.bsu-bund.de