



Bundesstelle für Seeunfalluntersuchung
Federal Bureau of Maritime Casualty Investigation



Annual Report

June 2023

Before we begin

Dear Reader,

Anyone who thinks about seafaring often conjures up stereotypical images of the surly skipper with a pipe at the corner of his mouth who mumbles his orders, the weary helmsman who holds on to the big wooden steering wheel with both hands in a storm while the rain whips the spray into his face, the stout, good-natured cook in his no-longer-spotless apron... Often taken from the cinema, some of these images may still be true today in a few exceptional cases – but shipping has changed a lot. Ships are getting bigger and more complex, many different technical aids are in use, crews are becoming increasingly multi-national and the environmental conditions are no longer the same, either. Compared to 100 years ago, officers now also need completely different skills – from understanding and operating the latest digital technology to cross-cultural understanding – and yet must always be up to speed. After all, the human being – with all his abilities and errors – has been the central part of maritime shipping for centuries.

Some of these errors and their consequences are discussed in this annual report. For where errors are made, accidents also happen, which in turn call for the BSU to step into action. But this report has much more to offer. I would particularly like to draw your attention to the concluding statistics section, which aims to illustrate developments and causes.

Allow yourself to be taken on what I hope will be an entertaining and interesting excursion into the world of marine casualties.

Warm regards,

Ulf Kaspera

Table of Amendments

Page	Amendment	Date

Table of Contents

Marine casualty investigation.....	9
1.1 Fundamentals.....	9
1.2 The investigation procedure.....	11
1.3 Investigation reports and safety recommendations	11
1.4 Reports of foreign investigating authorities	13
1.5 Lessons learned	14
Main investigations.....	15
2.1 MUMBAI MAERSK	15
2.2 PAIVI and BJOERKOE	17
2.3 PETER OLDENDORFF	20
2.4 FAIRPLAY 82	21
2.5 STEN ARNOLD	24
2.6 MERI	25
What was happening in the Administration?	29
3.1 Personnel and organisational matters.....	29
3.2 Finances.....	30
Public relations.....	30
4.1 The BSU's website	30
4.2 Lectures and events	34
4.3 Social media.....	34
International	35
5.1 EMAIIF and MAIIF	35
5.2 Permanent Cooperation Framework (PCF).....	36
5.3 International Maritime Organization	37
5.3.1 IMO audit.....	37
5.3.2 Implementation of mandatory IMO instruments (III-9)	38
Statistics.....	39
6.1 General information and explanatory notes.....	39
6.2 Notifications received.....	40
6.3 Ships flying the German flag.....	43
6.4 Distribution by kind of accident and type of ship	45
6.5 Causes of a marine casualty.....	47
6.6 Incidents	53
6.7 Distribution of marine casualties and incidents by sea area	56
6.8 Consequences of an accident.....	62
6.9 Investigation reports published and lessons learned	64

Table of Figures

Cover picture: The BJOERKOE	1
Figure 1: Headquarters of the BSU.....	9
Figure 2: The MUMBAI MAERSK.....	15
Figure 3: Scene of the accident (outlined in red), Neue Weser entrance	16
Figure 4: The Cyprus-flagged PAIVI	17
Figure 5: The Cyprus-flagged BJOERKOE.....	17
Figure 6: The deformed bow of the PAIVI.....	18
Figure 7: View from the BJOERKOE's forepeak	19
Figure 8: View into the BJOERKOE's flooded bow thruster compartment.....	19
Figure 9: The PAIVI, secured in the Kiel Canal.....	19
Figure 10: The sailing PETER OLDENDORFF	20
Figure 11: The scene of the accident in the steering gear room marked with a red circle	21
Figure 12: The accident is re-enacted with a dummy.....	21
Figure 13: The FAIRPLAY 82 in operation before the accident.....	22
Figure 14: The Kattwyk bridge, which was also lowered at the time of the accident.	23
Figure 15: The heavily damaged FAIRPLAY 82 after the allision.....	24
Figure 16: The chemicals and product tanker STEN ARNOLD	25
Figure 17: Scene of the accident outlined in red; sounding data from April 2022	25
Figure 18: The MERI loaded with two cranes	26
Figure 19: The damaged crane	27
Figure 20: Hole in the MERI's deck together with a helmet for size comparison	28
Figure 21: Organisational chart of the BSU	29

Table of Graphs

Graph 1: Allocation of the BSU's budgetary resources	30
Graph 2: Web statistics for 2022 by month.....	31
Graph 3: Global reporting 2022	41
Graph 4: Marine casualties according to the IMO Code in 2022	41
Graph 5: Comparison of marine casualties from 2018 to 2022	42
Graph 6: Development of ships flying the German flag.....	44
Graph 7: Marine casualties on merchant ships flying the German flag	44
Graph 8: Marine casualties involving German seagoing fishing vessels	45
Graph 9: Distribution by the various kinds of accident	46
Graph 10: Distribution of accidents between the different types of ship	47
Graph 11: Causes and categorisation of incidents.....	49

Graph 12: Technical causes	50
Graph 13: Human causes	51
Graph 14: Other agent or vessel	52
Graph 15: Cause unknown	52
Graph 16: Distribution of incidents by kind of event	53
Graph 17: Human cause in incidents	54
Graph 18: Technical cause in incidents	55
Graph 19: Caused by hazardous material	55
Graph 20: Other agent or vessel	55
Graph 21: Unknown cause	56
Graph 22: Distribution of marine casualties and incidents by location.....	57
Graph 23: Distribution on the River Elbe.....	58
Graph 24: Distribution on the River Weser	58
Graph 25: Distribution on the NOK	59
Graph 26: Locations and accident category (marine casualties).....	60
Graph 27: Locations and accident category (incidents)	61
Graph 28: The consequences of a loss of control event by scene of accident	63

Table of Spreadsheets

Spreadsheet 1: Number of views over the last seven years.....	31
Spreadsheet 2: Number of deceased and injured people from 2016 to 2022.....	43
Spreadsheet 3: Technical causes.....	47
Spreadsheet 4: Human causes	48
Spreadsheet 5: Caused by hazardous material	48
Spreadsheet 6: Cause other agents	48
Spreadsheet 7: Cause unknown.....	48
Spreadsheet 8: Causes involving fatalities and injuries	52
Spreadsheet 9: BSU investigation reports published in 2022.....	64
Spreadsheet 10: Lessons learned	65

Table of Acronyms Used

'000	Thousand
BG Verkehr	German Social Accident Insurance Institution for Commercial Transport, Postal Logistics and Telecommunication
BMDV	Federal Ministry for Digital and Transport
BSH	Federal Maritime and Hydrographic Agency
BSU	Federal Bureau of Maritime Casualty Investigation
CCME	German Central Command for Maritime Emergencies
cont.	Continuous
DGzRS	German Maritime Search and Rescue Service
DMAIB	Danish Maritime Accident Investigation Bureau
DSB	Dutch Safety Board
EEZ	Exclusive Economic Zone
EMAIF	European Marine Accident Investigators' International Forum
EMCIP	European Marine Casualty Information Platform
EU/EC	European Union/Community
IMO	International Maritime Organization
ISM	International safety management
kts	Knots
LL	Lessons learned
LSMC	Less serious marine casualty
m	Metre
MAIIF	Marine Accident Investigators' International Forum
MSC	Maritime Safety Committee
nm	Nautical mile
No	Number
NOK	Kiel Canal
OCI	Other casualty or incident
PCF	Permanent Cooperation Framework
SMC	Serious marine casualty
SOLAS 1974	International Convention for the Safety of Life at Sea, 1974
SUG	German Maritime Safety Investigation Law

TEU	Twenty-foot equivalent unit
UK	United Kingdom
ULCS	Ultra-large container ship
VSMC	Very serious marine casualty

Marine casualty investigation¹

The Federal Bureau of Maritime Casualty Investigation ([BSU](#)) is a federal higher authority based in Hamburg. It has 13 full-time and part-time staff members, making it Germany's smallest federal higher authority, and a single-stage administrative structure. The BSU is subordinated to the Federal Ministry for Digital and Transport ([BMDV](#)) and operates under the supervisory control of Division WS 26 (Maritime Shipping Law, BSU).



Figure 1: Headquarters of the BSU²

1.1 Fundamentals

Both national and international legislation defines the work of a marine safety investigating authority as 'marine safety investigation'. This clearly demonstrates that a marine casualty investigation is not intended to clarify issues of fault or liability but is solely for the purpose of improving maritime safety. A marine casualty investigation aims to deliver a comprehensive account and analysis of the course of events leading up to and during an accident to prevent future accidents. It should consider any direct and indirect causes, facilitating factors, as well as the overall circumstances including possible rescue operations and safety systems. The law provides that the BSU be guided by a no blame approach within the framework of a safety partnership. The BSU does not make findings on culpability, claims or liability. Investigation reports and the findings therein are not for use in judicial proceedings.

¹ The cover picture shows the BJOERKOE heavily damaged during the collision in the Kiel Canal (NOK); see Section 2.2 of this annual report. Source: BSU.

² Source: Fotolia.

The German Maritime Safety Investigation Law (SUG) constitutes the primary legal framework for the work of the BSU. The SUG transposes international rules and regulations, such as the Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code), IMO³-Resolution MSC.255(84), and the European Directive 2009/18/EC into the German judicial system. Other provisions that apply under German law include Regulation (EU) No 1286/2011 and IMO Resolution A.1075(28), which harmonise the methodology and implementation of the investigation of accidents internationally.

The BSU is thus responsible for investigating incidents and marine casualties involving seagoing ships of any flag

- within German territorial waters;
- on German navigable maritime waterways, as well as to, from, and in ports connected to them;
- outside territorial waters but within the German Exclusive Economic Zone (EEZ) only in the event of very serious marine casualties, provided that the special rights assigned to Germany there are affected.

Outside the areas referred to above, the BSU only investigates marine casualties on or involving seagoing ships flying the German flag or if the Federal Republic of Germany has a substantial interest in the investigation of a marine casualty abroad (if German nationals are killed or seriously injured, for example).

The SUG also addresses those cases in which the BSU does not take action. The BSU is not responsible for marine casualties involving only

- ships of war, troop ships and other ships owned or operated by Germany's federal or state governments and used only on government non-commercial service;
- ships not propelled by mechanical means, wooden ships of primitive build, pleasure yachts and pleasure craft not engaged in trade, unless they have prescribed manning and carry more than 12 passengers;
- fishing vessels of less than 15 m in length;
- fixed offshore drilling units.

This has practical relevance in the recreational boating sector, in particular. The SUG does not cover privately used recreational craft (unlike those used commercially), meaning the BSU's statutory mandate does not extend to investigating accidents involving recreational craft. This applies regardless of damage. However, in (rare) exceptional cases, it is still possible for the BSU to investigate such accidents, but only if they occur in German territorial waters and concern recreational craft that are built, suitable and used for seafaring. Open rowing or sailing boats and personal watercraft, etc. do not belong to this category.

³ International Maritime Organization, London, UK.

The SUG distinguishes between four categories of marine casualty: incident, less serious marine casualty, serious marine casualty and very serious marine casualty and in the case of the latter requires that the BSU always conduct an investigation.⁴

1.2 The investigation procedure

After an accident notification is received, the BSU's director (or the deputy director in his absence) decides on the initiation of an investigation and usually assigns the subsequent processing of the accident to a team of two to three people. The BSU is free from instructions in this decision and in all other aspects of the investigation through to the preparation of the investigation report.⁵ If an accident does not have to be investigated by law, then the BSU has discretionary powers. Various factors such as the consequences, potential gaps in safety or an increased public interest play a role when deciding whether to investigate an accident.

The BSU has extensive rights and powers of intervention when investigating the course of events leading up to and during an accident, including in respect of access to the scene of the accident, preservation and analysis of evidence, questioning witnesses and the engagement of experts. These rights are not limited to the parties directly involved in the accident (the ship, her crew and possibly pilots), but can also be exercised in respect of third parties (e.g. shipping companies, shipyards or classification societies) or public authorities (e.g. the Federal Waterways and Shipping Administration or the German Social Accident Insurance Institution for Commercial Transport, Postal Logistics and Telecommunication (BG Verkehr)).

An important cornerstone of the work of the BSU is cooperation with European and non-European investigating bodies. Based on European and international principles, the BSU conducts investigations in international cooperation. These can be limited to merely supporting the other investigating body or may extend to a full joint investigation and joint final report.

1.3 Investigation reports and safety recommendations

The investigation report is the product of a marine safety investigation and made available to the public. An investigation concludes with the publication of the report. The BSU's investigation reports follow a certain pattern, which is provided by Directive 2009/18/EC. In addition to the required indication of the purpose of the marine safety investigation, notably, the prevention of future accidents and malfunctions, but not the determination of blame, liability or claims, each report contains

⁴ On the subject of marine casualties, see in particular the explanatory notes in Chapter 6.1.

⁵ See also Section 12(3) SUG.

- a summary of the accident;
- factual information, including but not limited to ship and voyage particulars;
- a detailed account of the course of the accident and investigation;
- an analysis of the investigation;
- ensuing conclusions;
- action already taken, and
- safety recommendations (if necessary).

Safety recommendations constitute the key element and conclusion of an investigation report. A safety recommendation is directed at a specific addressee and points to an identified gap in safety. It is intended to help to avoid or at least reduce the impact of future situations similar to the one that led to the accident. A marine safety investigation by the BSU focuses not only on events on board, but also looks at organisation ashore or the safety system where appropriate, which also includes the post-accident emergency management. In short, any factors that may have facilitated the accident are investigated and evaluated. Consequently, in addition to the crew, addressees of safety recommendations could include pilots, shipping companies, shipyards, manufacturers of equipment, the Maritime Administration, the legislator or other parties and institutions. Safety recommendations can also be directed at several addressees, but their wording should be sufficiently specific. Addressees should be able to clearly discern what is being recommended to them. Accordingly, recommendations of a general nature should be avoided.

The BSU may also issue an early alert in the form of preliminary safety recommendations before the publication of an investigation report. This is to prevent accidents if it has been found that a safety risk exists for which notification must be given as quickly as possible, i.e. before publication of the final report.

However, safety recommendations are not issued with every investigation report. This can be for a variety of reasons, e.g. that no specific deficiencies were apparent or that the potential addressees had already closed a gap in safety identified by the BSU through their own action while the investigation was ongoing ('Action taken').

If no safety recommendations are published, the law grants the BSU the option to produce a **summary (or simplified) investigation report** when it investigates incidents or less marine serious casualties.⁶ The summary report is intended to facilitate the work of investigating bodies and to reduce the time needed for preparation. Strict procedural rules such as the statutory period of 30 days for parties involved to submit comments do not apply, for example. The summary investigation report is still a fully-fledged investigation report, however.

⁶ A summary report is not available for serious or very serious marine casualties, however (see Section 27(5) SUG in conjunction with Article 14 Directive 2009/18/EC).

The publication of **interim investigation reports** is also required for serious or very serious marine casualties if it is not possible to prepare a final report within one year of the date of an accident. Cases not investigated further after the BSU has conducted a preliminary investigation, e.g. due to a lack of sufficient data, are usually closed with an internal note.

The BSU published a total of 12 investigation reports in 2022, including four interim reports and one summary report. Furthermore, for the first time and together with Holland's investigating body, the DSB⁷, the BSU published the responses of the parties involved to an investigation report prepared jointly with the flag State of Panama and the safety recommendations contained therein.

The BSU issued a total of 34 safety recommendations in six reports. Safety recommendation addressees included (number of recommendations in brackets):

- Federal Ministry for Digital and Transport⁸ (7)
- Federal Waterways and Shipping Agency (6)
- Shipping companies/owners (6)
- Federal Maritime and Hydrographic Agency (3)
- International organisations/classification societies (3)
- Pilots (2)
- Manufacturers (2)
- German Maritime Search and Rescue Service (2)
- BG Verkehr – Ship Safety Division (1)
- BG Verkehr – Prevention Department (1)
- Other (1)

1.4 Reports of foreign investigating authorities

In addition to carrying out its own investigations, the BSU often cooperates with foreign counterparts. In particular, this applies to marine casualties on German territory involving only vessels flying a foreign flag. Under international law, the flag State has the first right of access. If it is agreed that the flag State will lead the investigation of an accident, then the BSU will support the foreign investigating authority with expertise and/or human resources. Such support ranges from the simple establishment of contacts to the independent assumption of entire focal points of an investigation and can demand the same amount of work as one of the BSU's own investigations. For investigations in which support was especially exhaustive, the BSU arranges for the translation of the foreign investigating authority's investigation report into German and then – as with its own reports – publishes it on its website.

⁷ Dutch Safety Board.

⁸ Prior to being renamed, the 'Federal Ministry of Transport and Digital Infrastructure'.

1.5 Lessons learned

Unlike safety recommendations, lessons learned are directed at a broader group of addressees, e.g. ship crews, shipping companies or water sports enthusiasts. Lessons learned generalise the findings of an investigation and draw attention to existing gaps in general safety or hazards of particular relevance. However, not all investigations lend themselves to the translation of findings into general lessons learned. Lessons learned were published on the basis of five investigation reports in 2022.

Main investigations

This section deals with several accidents that occurred in 2022 and are currently the subject of main investigations. In principle, investigations should be completed after one year. Unfortunately, this is not possible in many cases. The reasons for this are as varied as the actual accidents. However, the rule is that the length of the investigation rises with the degree of complexity of the events surrounding the accident and number of parties involved. The BSU obviously makes every effort to analyse accidents quickly and publish the final report within one year. I would like to briefly outline some of the accidents from the previous year on the pages below. A general overview of the accidents currently under investigation by the BSU can be found on our website under '[Current investigations](#)'.

2.1 MUMBAI MAERSK



Figure 2: The MUMBAI MAERSK⁹

The first accident concerns an ultra-large container ship (ULCS¹⁰). On 2 February 2022, the 400 m long MUMBAI MAERSK was en route from Rotterdam to Bremerhaven. The ship had chosen the offshore deep water route. During the approach to the narrow fairway section of the Neue Weser, the MUMBAI MAERSK, which had a draught of 12.80 m and was dependent on the tide, was advised by radio that her berth would reportedly remain occupied for longer than planned but that it would soon be vacant. To begin with, the vessel traffic service permitted the ship, which was approaching at 6-7 kts, to cross the boundary of the area. However, she was informed shortly after that it was reportedly still not possible to enter the part of the fairway in which neither a turn nor an encounter between two large vessels is possible without any problems. Shortly before entering this section of the fairway, the ship therefore sailed on a reciprocal course.

⁹ Source: Hasenpusch Photo-Productions.

¹⁰ ULCS (also ULCV, ultra-large container vessel): Very large container ships with a deadweight of more than 12,000 TEU (twenty-foot equivalent units = twenty-foot standard container).

The MUMBAI MAERSK was informed less than half an hour later that she could now begin to sail for Bremerhaven. Since the tidal window was about to close, she immediately turned back on a reciprocal course, i.e. on her original course. The planned manoeuvre failed and the MUMBAI MAERSK ran aground directly south of the fairway on a disposal site for dredged waste.

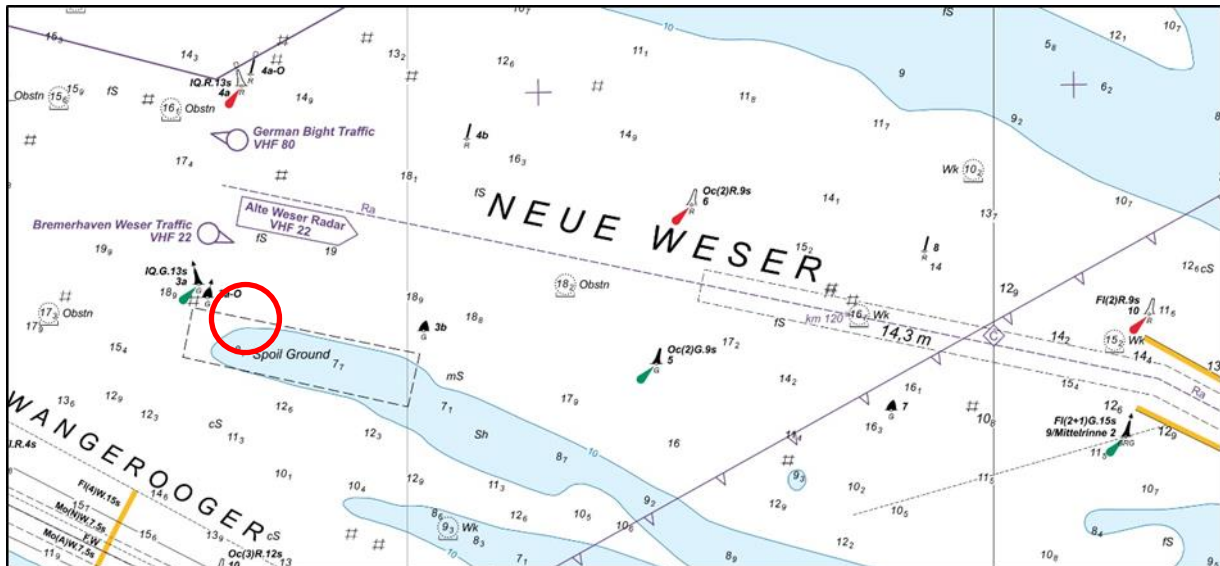


Figure 3: Scene of the accident (outlined in red), Neue Weser entrance¹¹

Due to the sudden deceleration of the forecastle, which had run aground first at a speed of almost 10 kts during a port turn, the stern started to yaw and pivoted around a longitudinal axis on the grounded stem. When the MUMBAI MAERSK had finally stopped moving after about 20 minutes, she was lying more than 180° offset from the direction in which she had run aground on the disposal site. The ground contact was immediately reported to the vessel traffic service when she grounded for the first time at 2306.

The notified German Central Command for Maritime Emergencies (CCME) assumed overall command of the operation just over an hour later. The first attempt to refloat the vessel at the next high tide failed.

The Dutch salvage company SMIT Salvage, which was commissioned by the shipping company, drew up a salvage plan in consultation with the CCME. The second attempt to refloat the ship was made at the next but one high tide (during the night of 3-4 February 2022). Prior to that, the exact water depths around the MUMBAI MAERSK had been gauged and 7,000 t of ballast water was discharged from the ship. A report stating that she had been refloated was made at 0114 on 4 February 2022.

¹¹ Source: Extract from Navigational Chart DE2, BSH (INT 1456).

Before the MUMBAI MAERSK entered Bremerhaven under her own steam, she was towed into the German Bight to test her two main engines there.

Due to the shallow water depth in Bremerhaven and poor visibility under water, the inspection of the underwater hull by divers, which was required for maintenance of class, and all class surveys were carried out at the ship's next scheduled port of call (Århus in Denmark). After an inspection of all tanks by the classification society, BG Verkehr and the insurer, a temporary permit to proceed was issued in Bremerhaven. The dive revealed that the ship had not sustained any damage other than paint abrasion during the accident. The BSU has published an [interim report](#) on this accident, which is available on its website.

2.2 PAIVI and BJOERKOE

There was another 'big bang' on the Kiel Canal (NOK), too. On the morning of 29 March 2022, the westbound cargo ship PAIVI collided almost head-on with the eastbound cargo ship BJOERKOE on the eastern stretch level with the bridge at Levensau.



Figure 4: The Cyprus-flagged PAIVI¹²



Figure 5: The Cyprus-flagged BJOERKOE¹³

The collision took place in the area of the bridges at Levensau. The collision occurred because the PAIVI had suddenly left her intended course and turned towards the oncoming BJOERKOE. Due to the close proximity of the vessels, an evasion manoeuvre or effective reduction in speed was no longer possible. Each vessel suffered considerable damage to her fore section during the collision. The bow of the PAIVI was completely deformed. The BJOERKOE's hull was holed above and below the waterline, causing water ingress in the forepeak and bow thruster compartment. Due to the unexpected impact, three of the PAIVI's crew members were injured such that deployed fireboats and ambulances had to transport them to a hospital for the treatment of lacerations and bruises. One of the BJOERKOE's crew members also suffered bruises.

¹² Source: Jörn Kallauch.

¹³ Source: Hasenpusch Photo-Productions.



Figure 6: The deformed bow of the PAIVI¹⁴

The PAIVI broached to due to the impact, blocking the entire width of the Kiel Canal in the process. This made it necessary to close the NOK for the salvage operation. After the collision, tugs towed or escorted the two vessels to their berths in Kiel designated by the vessel traffic service. Due to the severity of the accident, the BSU decided to investigate it. The investigation is still ongoing and an [interim report](#) is available on the BSU's website.

¹⁴ Source: BSU.

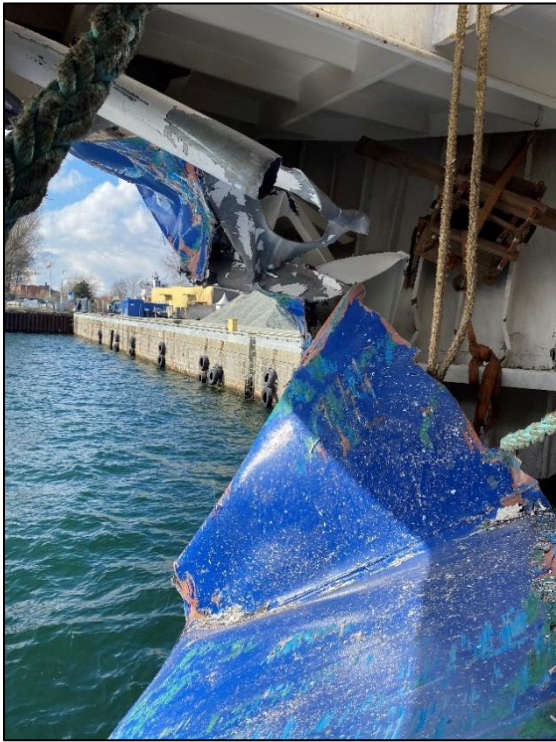


Figure 7: View from the BJOERKOE's forepeak¹⁵

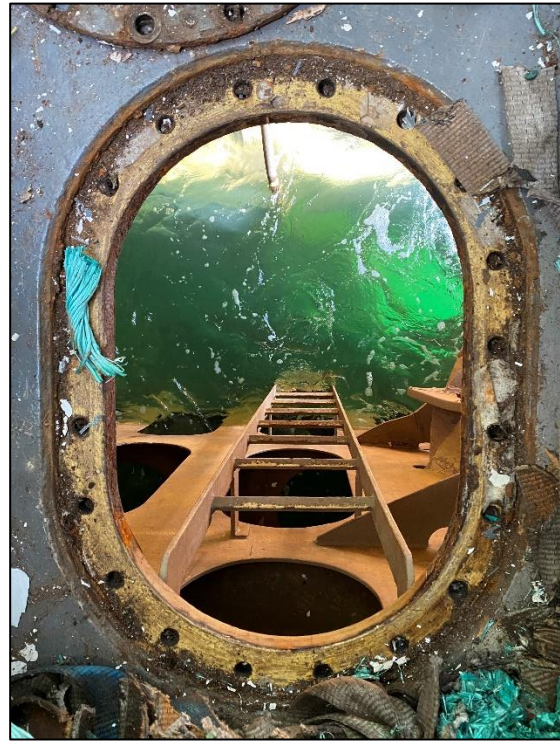


Figure 8: View into the BJOERKOE's flooded bow thruster compartment¹⁶



Figure 9: The PAIVI, secured in the Kiel Canal¹⁷

2.3 PETER OLDENDORFF

A fatal work accident occurred on August 3 aboard the bulk carrier PETER OLDENDORFF in the ferry port of Mukran while removing a steel plate from a vertically stowed pile. The stack was located in the aft part of the ship's steering gear room. The very heavy plates¹⁸, which cannot be moved by one person, are stored there in order to be able to access raw material for on-board repair work and cut it to size as required.



Figure 10: The sailing PETER OLDENDORFF¹⁹

The crew member involved in the accident, who was working alone in the steering gear room at the time of the accident, had apparently loosened the cross strut that secured the stack to a railing and thus prevented it from tipping over. The stack then tipped to the side. The accident victim was caught by the stack and crushed between it and a shelf mounted on the ship's side at waist level. When the victim was found later, he was already unresponsive. Immediate first aid measures were unsuccessful. The emergency doctor who was called to the scene was only able to diagnose the death of the crew member.

¹⁵ Source: BSU.

¹⁶ Source: BSU.

¹⁷ Source: Waterways police.

¹⁸ 300 up to 500 kg per plate.

¹⁹ Source: FleetMon.



Figure 11: The scene of the accident in the steering gear room marked with a red circle²⁰

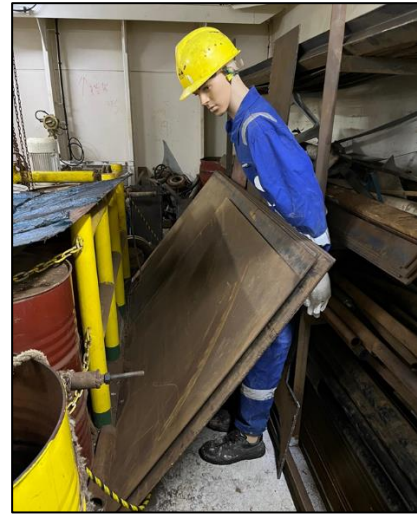


Figure 12: The accident is re-enacted with a dummy²¹

As this accident is categorised as a very serious marine accident, the BSU immediately launched an investigation as a matter of law.

2.4 FAIRPLAY 82

Another accident for which the BSU decided to conduct a main investigation occurred on the Hamburg port tug FAIRPLAY 82 on 21 July.

²⁰ Source: BSU.

²¹ Source: BSU.



Figure 13: The FAIRPLAY 82 in operation before the accident²²

On the day in question, the seagoing vessel TANG LAND was shifting in the port of Hamburg from the Norderelbpfähle [northern Elbe pilerow] to the Moorburg power station. The tug FAIRPLAY 82 as well as the FAIRPLAY 9 and BUGSIER 9 provided assistance. At about 1730, the towed convoy passed the two open Kattwyk bridges in a south-easterly direction. After this passage, the lift bridges were lowered again to enable rail and road traffic to pass.

After the TANG LAND had made fast at the Moorburg power station, the FAIRPLAY 82 was the first tug to be stood down. She then set off for her return voyage, accelerated to 6.5 kts, and shortly afterwards sailed into the lowered southern Kattwyk bridge without any reduction in speed.

²² Source: Vessel operator.



Figure 14: The Kattwyk bridge, which was also lowered at the time of the accident.²³

The ship struck the bridge centrally level with the wheelhouse and was pushed underneath. The wheelhouse was literally torn off at waist height and completely destroyed. The people there – the master and his chief engineer – were able to protect themselves by kneeling just low enough to be only slightly injured. The third crew member, a ship mechanic, was in the superstructure and fell down a stairway due to the sudden jolt that went through the ship. During the fall, he also suffered minor injuries.

²³ Source: Waterway Police Hamburg.



Figure 15: The heavily damaged FAIRPLAY 82 after the collision²⁴

The BSU assessed the considerable damage on the following day and immediately launched an investigation. It can already be noted that since nobody was seriously harmed, the ship's crew was extremely fortunate, however.

2.5 STEN ARNOLD

The next accident I would like to present caused quite an uproar among the general public, as it touches on an extremely sensitive subject: the deepening of the River Elbe and its consequences. It concerns the ground contact and grounding of the STEN ARNOLD on 21 August in the Elbe fairway about 4 nm east of the entrance to the NOK.

²⁴ Source: BSU.



Figure 16: The chemicals and product tanker STEN ARNOLD²⁵

On the day of the accident, the 144 m long tanker, flying the UK-Gibraltar flag and manned by a pilot, was sailing upstream on the River Elbe towards Hamburg in receding water with a draught of 8.5 m. The vessel was sailing on the right-hand side of the fairway in accordance with regulations when she suddenly ran aground level with buoy 63 at a disposal site there. According to the chart and most recent sounding, the water depth at this point should have been more than 12 m. Information about a shoal was neither plotted on the navigational chart, nor was it known about beforehand.

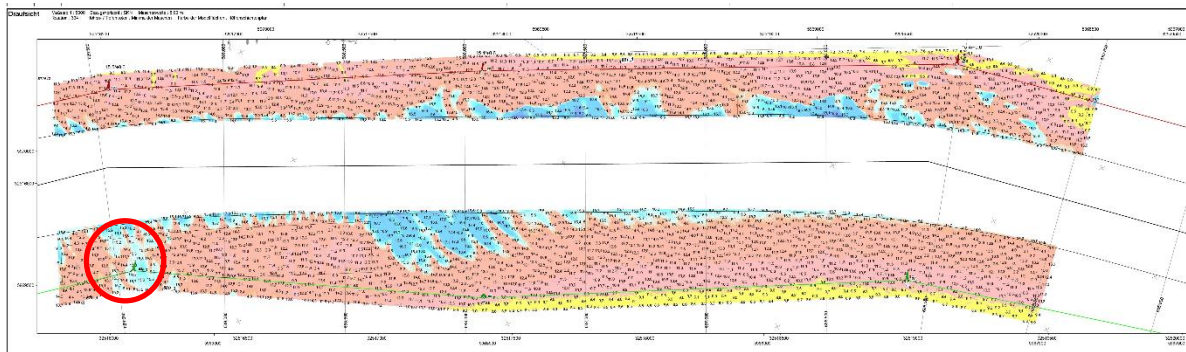


Figure 17: Scene of the accident outlined in red; sounding data from April 2022²⁶

A few hours later, the STEN ARNOLD refloated with the tide and was able to continue her voyage. There was no damage to the ship or environment. Due to the exceptional nature of the incident, the BSU decided to conduct a main investigation.

2.6 MERI

A final case taken from the current investigations for presentation here is the MERI's allision with a bridge in the NOK. This accident, too, has triggered a huge public response because of its improbability.

²⁵ Source: Hasenpusch Photo-Productions.

²⁶ Source: Federal Waterways and Shipping Agency.



Figure 18: The MERI loaded with two cranes²⁷

The MERI, a heavy-lift vessel flying the flag of Finland, set off from Rostock on 29 November for Esbjerg on the Danish North Sea coast. The cargo was a mobile harbour crane from a crane builder in Rostock, which was destined for the port there. According to the documents available, the height of the ship and cargo was such that she could have transited the NOK safely.

While passing the bridges at Holtenau, the top of the tower struck the hollow boxes of both lanes of the bridges. The crane was torn out of its lashing and moved due to the force of the impact. The running gear was destroyed in the process. Also damaged, the MERI's deck was deformed and torn open in places. Three counterweights, each weighing 25 t, went overboard and fell into the NOK. The bridge also sustained considerable damage. The bridge and the NOK were closed temporarily.

²⁷ Source: The MERIAURA OY shipping company (in contrast to the photograph, the MERI was carrying only one crane lashed at the stern with jib set down on the deck and pointing towards the bow on the day of the accident).



Figure 19: The damaged crane²⁸

The BSU decided to investigate the accident immediately after it happened. Although the primary cause appears to be clear, and even trite, i.e. the ship and loaded crane were higher than stated, the BSU is faced with the question as to how this could have happened and, more importantly, why it was not noticed at any point earlier. The investigation is still ongoing.

²⁸ Source: BSU.



Figure 20: Hole in the MERI's deck together with a helmet for size comparison²⁹

²⁹ Source: BSU.

What was happening in the Administration?

3.1 Personnel and organisational matters

2022 was a relatively quiet year for the Administration. After extensive preparatory work for the introduction of the 'E-Akte-Bund' federal electronic file system in 2020 and 2021, the introduction could be successfully completed for the Administration division on 1 January 2022. All staff members from the other divisions were then given comprehensive training on how to use E-Akte-Bund by 31 March 2022 and it has been used throughout the BSU since 1 April 2022. E-Akte is more than just a document management system for the BSU. In particular, the Investigation division makes use of the E-Akte-Bund workflow together with the director – from receipt of initial notifications to decision on an investigation – very successfully. This makes a significant contribution to digitisation within the BSU.

As a logical consequence of this, the opportunities and scope for teleworking and mobile working were expanded accordingly and made more flexible in 2022; they are now an integral part of the BSU's work culture.

In terms of personnel and organisation, there were no changes at the BSU, as can also be seen from the below organisational chart when compared with that of the previous year.

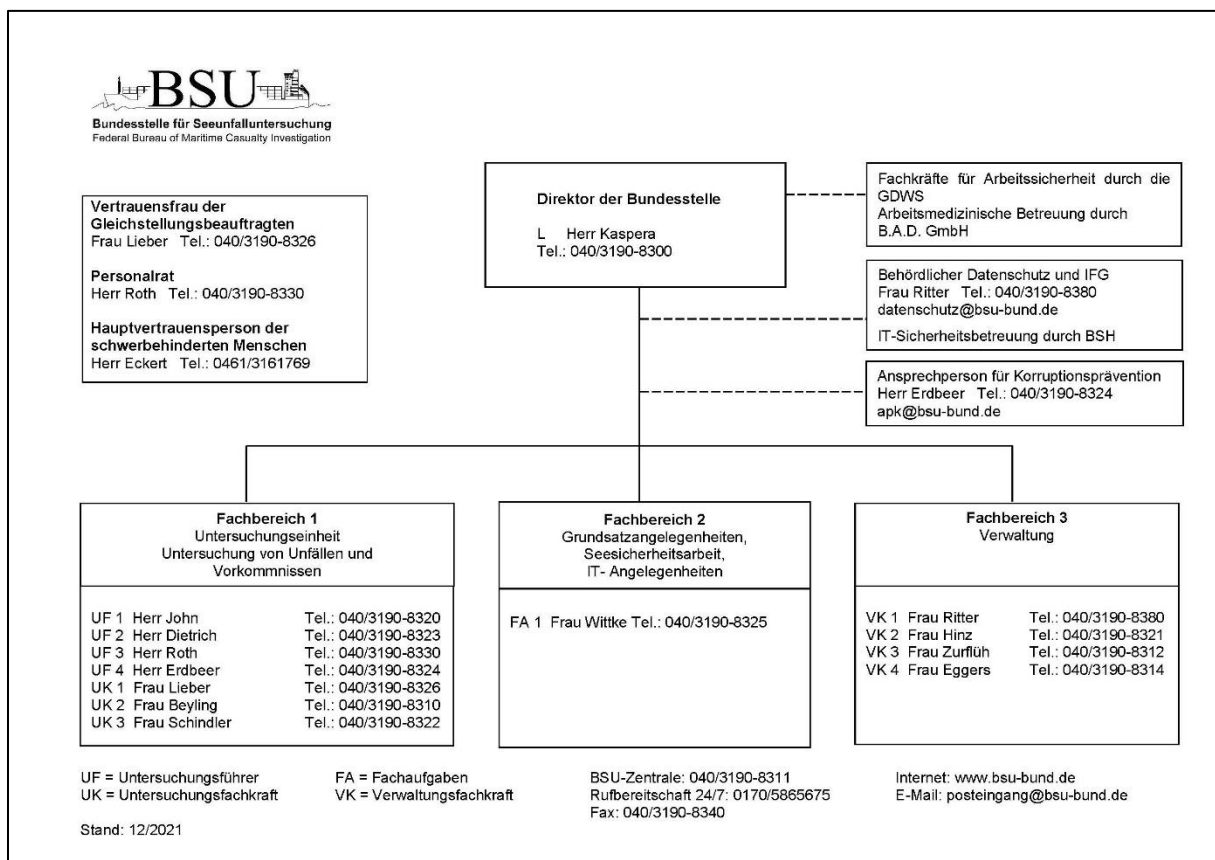


Figure 21: Organisational chart of the BSU

It is easy to see that the BSU is a very small authority. Nevertheless, the major social issues like demographics and shortage of skilled labour concern it in the same way as

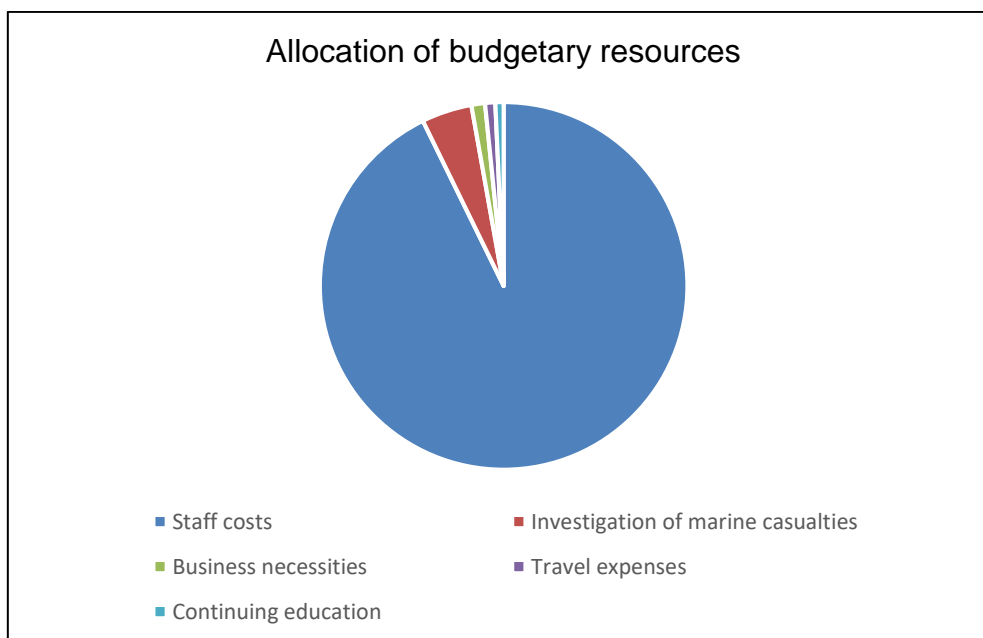
they do other employers. Due to the low staffing level, the BSU cannot allow positions to remain unfilled for an extended period. Accordingly, it strives to do everything in its power to fill vacancies with good, qualified staff as quickly as possible, while ensuring the equal participation of women and men at all times. For this reason and within the framework of the BSU's gender equality plan, a corresponding qualification scheme has been financially supported since 2022.

3.2 Finances

The budgetary resources available to the BSU were at their usual level. The largest item was once more the staffing budget. Expenditure on investigations and related official journeys remained within limits in 2022, which is still due to the coronavirus to a certain degree. In 2022, it was still a case of avoiding official journeys wherever possible for the investigation team, but also for the administration team and director of the BSU. Numerous official meetings were still held virtually.

The BSU's total budget remained unchanged at EUR 1,266,000 in 2022. Expenditure relating to staffing accounted for about EUR 985,000 and to investigations EUR 47,000. Expenditure for business necessities and personal protective equipment, as well as for digitisation and accessibility amounted to EUR 12,700. On the other hand, only EUR 9,500 was needed for travel expenses. Expenditure for in-service training of all the BSU's staff members amounted to about EUR 7,700 in 2022, together with the individual support.

Graph 1: Allocation of the BSU's budgetary resources



Public relations

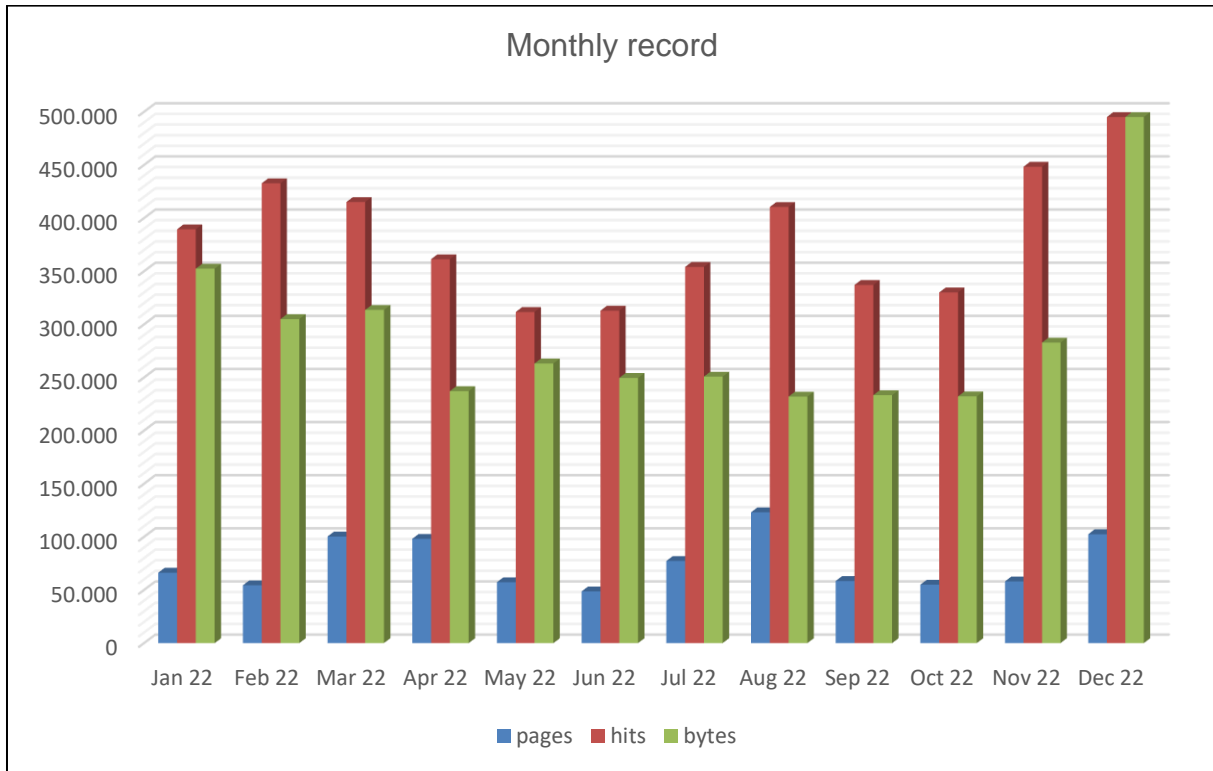
4.1 The BSU's website

The [BSU's website](#) offers information on the duties and structure, the historical development of marine casualty investigation, as well as the statutory framework. You will also find [all the reports published](#) by the BSU – from 2002 to the present day.

Accordingly, you are warmly invited to take a brief foray into the world of marine casualty investigation.

The graph below shows the web statistics for the previous year.

Graph 2: Web statistics for 2022 by month



Most of the page views occurred at the end of the year in November and December and most of the downloads (bytes) were in December. This is easily explained by the fact that three investigation reports were published at the end of the year. In particular, they included the report and the lessons learned about the accident involving the sailing yacht SILJA, which attracted considerable public interest and were covered in several subsequent news items. After quite some time, the BSU once more had to deal with a – sadly tragic – sailing accident and issued several safety recommendations and general lessons learned.³⁰

A comparison of the number of views on the BSU's website with those of previous years reveals that they are generally relatively stable. This is shown by a comparison of the last seven years:

Spreadsheet 1: Number of views over the last seven years

Year	2016	2017	2018	2019	2020	2021	2022

³⁰ See Investigation Report 276/21, published on 8 December 2022, as well as LL 13 published on the same day.

Views ('000)	4,048	4,343	4,098	4,496	5,235	4,496	4,598
---------------------	-------	-------	-------	-------	-------	-------	-------

The page views provide information on where public interest in the BSU's accident reports predominantly lies, as this varies greatly. Not every accident receives the same amount of attention. In principle, reports concerning an accident that has been met with broad public interest are at the top, while reports on other, less prominent accidents tend to be favoured by a purely specialist audience – at least that is what one might think. That this is not always the case can be seen in the following table, which summarises the ten most frequently downloaded investigation reports – and has a few surprises in store.

Pos.	Title	Type	Ref.	Views
1	Untergang des Segelbootes SILJA und Tod eines Crewmitglieds im Seegat Accumer Ee am 26. August 2021	Untersuchungsbericht	276/21	7,363
2	Fire and explosion on board the MSC FLAMINIA on 14 July 2012 in the Atlantic and the ensuing events	Investigation Report	255/12	5,478
3	Collision between MV SVEN and MV COMET on 18 November 2005 in the port of Hamburg	Investigation Report	476/06	3,972
4	Kollision des Küstenmotorschiffes SCHELDEBANK mit der NOK-Fähre HOCHDONN am 8. Mai 2020	Untersuchungsbericht	117/20	3,887
5	Fatal casualty in the scavenge air receiver of the main engine of the CMS LONDON EXPRESS in the night of 24 to 25 October 2003 on the voyage from Savannah/USA to Norfolk/USA	Investigation Report	329/03	3,471
6	Personenunfall mit Todesfolge an Bord des Containerschiffes SEOUL EXPRESS auf See zwischen Manzanillo und Long Beach am 27. März 2021	Untersuchungszwischenbericht	103/21	3,314
7	Bericht über die Umsetzung der Sicherheitsempfehlungen aus dem gemeinsamen Untersuchungsbericht vom 25. Juni 2020 (Überbordgehen von Containern von der MSC ZOE im Januar 2019)	Reaktionen auf den Untersuchungsbericht zur MSC ZOE		3,291

8	Abschleppen des Kleinfahrzeuges TÖWI VI nach Ausfall des Außenbordmotors auf der Fahrt von Juist nach Norddeich am 20. Juli 2021	Summarischer Untersuchungsbericht	218/21	3,289
9	Auflaufen der RUBINA nach Versagen der Ruderanlage auf der Weser am 27. August 2020	Untersuchungsbericht	282/20	3,265
10	Ladungsunfall (Verlust zweier Mobilkrane) auf der JUMBO VISION am Liegeplatz im Hafen Rostock am 31. Januar 2020	Untersuchungsbericht	23/20	3,255

As already discussed, the 'front-runner' is the investigation report on the SILJA. Number 2 is no surprise, either. The accident involving the MSC FLAMINIA is still attracting above-average public interest, even after ten years. However, the third and fifth positions leave us somewhat perplexed. That these two accidents, which occurred almost 20 years ago, attracted such interest last year of all years is difficult to understand, especially as it concerns the English version of the reports. Neither accident report could be found among the top positions in previous years. Of course, it is pleasing to see that older BSU reports continue to attract interest and are perhaps also used as illustrative material to draw lessons from.

The remaining positions relate to current reports, meaning there is still a pronounced interest in the work of the BSU. Finally, the seventh position is worth noting, as this does not concern a report but rather the published responses of the parties addressed in the safety recommendations in the MSC ZOE report. Accordingly, there is evidently a great deal of interest among readers in the aftermath, i.e. in what actually happens after an investigation has been completed. The BSU would like to continue with further publications at this point but unfortunately there is currently no legal basis for this.

There is room for improvement with regard to the hits on the BSU's lessons learned. These are still in the upper three-digit range. Since these are general lessons learned from accidents, which should be of interest and importance to a wider group of addressees, the BSU will make every effort to raise awareness of them.

4.2 Lectures and events

The BSU was actively involved in various fora and events again in 2022. For example, staff gave presentations at technical colleges, such as Münster or Rostock, at the Waterway Police training school in Hamburg, at the Maritime Cluster, at the Centre for Human Factors in Hamburg, as well as to students at the World Maritime University. Physical attendance was possible at some of the events, while – as has become almost customary in recent years – others took place in a virtual environment. There was one special occurrence at the beginning of the year. The BSU was invited to the [HANSA](#) podcast in the spring. Incidentally, this series can be recommended to anyone interested in maritime topics.

4.3 Social media

The BSU has decided to set up a profile on [LinkedIn](#) so as to inform interested parties about newly launched or completed investigations more efficiently. Whenever the BSU decides to investigate an accident, this is posted on LinkedIn with brief background information. The same applies when an interim report is published or an investigation is concluded with a report. The comments function has been consciously enabled and the BSU welcomes objective feedback. However, making contact or holding discussions via this function is not possible, as the BSU lacks the staff necessary for this. Accordingly, anyone who wishes to contact the BSU is advised to do so in the usual way by [email](#).

International

5.1 EMAIF and MAIF³¹

EMAIF

The European meeting of marine safety investigating authorities (EMAIF) fell victim to the coronavirus for the second time in a row and is now scheduled to take place in May 2023. It will be hosted by our Danish colleagues from the DMAIB³² at the venue in Copenhagen.

MAIF

The 29th annual global meeting of investigating authorities was held in Lima, Peru in September. Due to both the unusual date and the travel restrictions still in place, especially in Asian countries, the number of people attending this year's meeting was much smaller than usual. Representation of the European investigating authorities was also lower than usual. Some were forced to cancel at very short notice, which posed a number of challenges in relation to the sequence of events and agenda. MAIF therefore took place in hybrid form for the first time – at least some of the sessions did³³. The meeting was chaired by Lianne van der Veen from the Netherlands. Two sessions should be highlighted here.

Accidents involving Pilot Boarding Arrangements

This session dealt with accidents involving pilots when boarding. Numerous examples illustrate a continuing and quite significant potential danger. The condition of defective pilot ladders was seen as particularly dangerous. It is reported that the ladders are often rolled up or stowed, meaning the actual condition is reportedly not visible during a 'normal' port State control inspection. A closer inspection of the ladders when laid out would be more appropriate. The pilots would also report defective ladders too rarely. Greater awareness would be desirable here, especially out of responsibility to subsequent pilots.

Seabed Investigation of Wrecks

This session dealt with the investigation of submerged shipwrecks and centred on a presentation given by Estonia on the investigation of the ESTONIA during various dive operations. These have now been completed. All the information on this can be viewed by the public, as the three investigating authorities, Estonia, Sweden and Finland, are aiming for maximum transparency. The wreck is in a very poor condition and her position has changed significantly (turn by 180° to the other side). Furthermore, escaping oil has been detected. A preliminary report is available at <https://estonia1994.ee/en>.

³¹ (European) Marine Accident Investigators' International Forum.

³² Danish Maritime Accident Investigation Board.

³³ A session is a thematically defined section of the meeting, usually limited to 120 minutes.

MAIIF Business

MAIIF now has 53 members from 51 countries³⁴. New members are Mexico and South Africa. Vanuatu and Bulgaria have left. The election of mandate holders was postponed until 2023 due to the low number of participants. The next meeting will take place in October 2023 in London, UK.

5.2 Permanent Cooperation Framework (PCF)

The meeting of the investigating authorities in the European Union within the framework of the PCF took place last year in September. The following topics were covered more extensively:

Revision of the European Directive on accident investigation

One important item on the agenda was the EU Commission's planned revision of Directive 2009/18/EC. This Directive establishes rules for marine casualty investigation for EU Member States, making it one of the most important legal frameworks for the BSU. It was reported at the meeting that changes would mainly concentrate on the

- updating of definitions;
- consideration of the amendments to the IMO Casualty Investigation Code and related requirements;
- issue of more support or simplifications for Member States with fewer resources;
- consideration of recent technical developments (new fuels, autonomous shipping);
- broadening of investigation requirements to include small fishing vessels.

Overall, the legal form is also questionable. For example, it remains unclear whether the Directive will remain in force or whether key parts of it will be transposed into a yet-to-be-created regulation that will be directly applicable.

Misuse of the findings of an accident investigation

This agenda item dealt with a general problem in marine casualty investigation. In some cases, legal advisers of shipping companies would be very reluctant to provide information on the course of events leading up to and during an accident because they believed there was a risk that the findings of the investigation could jeopardise these same shipping companies in other proceedings. However, this is a well-known and systemic problem that is extremely difficult to resolve on the basis of existing international, European and national legal frameworks for accident investigation. Under German law, the courts are each obliged in their proceedings to form their own views on an accident event and to arrive at their own judgement. They cannot make a blanket reference to a BSU investigation report. Although the findings may ultimately be the same, they may also differ, too.

Further education and training offered by EMSA

³⁴ Members are the official investigating authorities of the flag States, not countries under international law. There are countries under international law that can be represented more than once at MAIIF (or also at the IMO), e.g. China (with mainland China and Hong Kong) or the United Kingdom (with the UK and UK-Gibraltar). There are also countries that have several investigating authorities, such as the United States.

EMSA has advised that the range of courses on accident investigation is to be expanded further. Irrespective of the coronavirus, there will still be courses for attendance physically and/or online in the future. EMSA's courses are important for investigating authorities, as training in marine casualty investigation is virtually unavailable on the open market. Moreover, when it is, the prices are barely affordable. Accordingly, the BSU also makes use of the courses of EMSA and contributes to them itself.

Election of the PCF's chair and deputy chair

Jonas Bäckstrand from Sweden was elected by acclamation, as he was the only candidate. Tiago Teixeira from Portugal was elected as his deputy. The legislative term is two years.

5.3 International Maritime Organization

5.3.1 IMO audit

The main IMO audit for the flag and port State of Germany, the so-called IMSAS (IMO Member State Audit Scheme), took place from 10 to 25 October. This is a procedure that was introduced on a voluntary basis in 2006 and has been mandatory since 2016, in which all IMO Member States are required to undergo an audit of the implementation of IMO rules by IMO auditors. All government bodies and authorities that implement IMO regulations are audited. In addition to the 'classic' maritime authorities of the federal government, such as the Federal Maritime and Hydrographic Agency, the Ship Safety Division, the Federal Waterways and Shipping Agency, as well as we at the BSU, this also applies to the federal state authorities responsible for seaports, to the German Maritime Search and Rescue Service (DGzRS) or also to the Federal Ministry for Digital and Transport as the actual legislator. Private bodies, such as shipping companies and classification societies, are not affected by the audit. The audit was originally scheduled for 2021 but had to be postponed to the autumn of 2022 because of the coronavirus pandemic. Nevertheless, a large part of the audit took place as a virtual conference.

The audit proceeded as follows: First, the IMO informed the state to be audited, in this case Germany, specifically the BMDV, about the planned audit. A task force was set up there, which informed all the federal and state authorities involved accordingly and requested that appropriate preparations be made. The BMDV acted as coordinator and leader on behalf of Germany throughout the entire period, including for the BSU. Extensive questionnaires covering virtually all aspects of the BSU's work were sent beforehand in preparation, as marine casualty investigation is regulated in great detail internationally. These had to be answered and a great deal of additional information, such as procedural instructions, process flows and similar internal documents, had to be prepared, i.e. translated and presented. On 'the day of truth', two of the four auditors for the BSU spent half a morning asking detailed questions, clarifying procedures and requesting additional documents. An initial positive assessment had already been made at the end of the meeting. The final result was notified after the audit was completed. It is encouraging to note that the German authorities were given an excellent appraisal overall with only a few objections – none of which were directed at the BSU. A result that is something to be proud of.

5.3.2 Implementation of mandatory IMO instruments (III-9)

The ninth meeting of the Triple I sub-committee was held in July. Normally held in London at the IMO, this meeting also had to be moved to the virtual space because of the coronavirus. From my point of view, the meetings at the IMO are less suitable for this, however. These meetings are perhaps more dependent on personal exchanges, listening to one another and discussions than the others mentioned above, as they also concern the development of new legislation and standards. A strictly controlled virtual meeting obstructs a lot of creativity or willingness to engage in discussion. The main topics last year were:

- revision of SOLAS 1974, Regulation XI-1/6;
- modification of the investigation procedure;
- lessons learned;
- accidents involving fishing vessels;
- falls/falls from aloft.

The proposals developed were either expanded upon in the correspondence group³⁵ or passed to the relevant (sub-)committee of the IMO for further consideration. The BSU participated in various sub-working groups of the correspondence group, e.g. on the issue of 'falls/falls from aloft'. Findings from the investigation into the very serious marine casualty on board the [SEOUL EXPRESS](#)³⁶, in which a sailor fell down a cargo hold ladder of several metres in height, were incorporated into the work. The sub-working group analysed a total of 70 accident investigation reports on falls from a height. Almost half of the accidents (34) occurred on ladders or stairways and all of them ended fatally. Various safety deficits were identified, including that safety management systems and preventive measures, such as work meetings, often do not seem to be effective or have the desired effect. Moreover, the risk of falling from aloft, in particular during routine activities, is often not recognised or not considered and personal protective equipment is not worn. *Inter alia*, the sub-working group recommended the development of guidelines and that flag States be urged to address the identified safety deficits in ISM audits.

³⁵ Working groups whose members are recruited from the Forum and continue to address a topic in the period between meetings.

³⁶ See Investigation Report 103/21, published last year.

Statistics

6.1 General information and explanatory notes

As usual, a few explanatory notes precede the statistics presented here to make them easier to understand.

Section 1a SUG defines the term 'marine casualty' as being any event caused by or in connection with the operation of a ship that has at least one of the following consequences:

- the death or serious injury³⁷ of a person;
- the disappearance of a person from aboard a ship;
- the loss, presumed loss or abandonment of a ship;
- [substantial] material damage to a ship;
- the grounding or constructive total loss of a ship or the involvement of a ship in a collision;
- [substantial] material damage;
- environmental damage resulting from damage to at least one ship,

and any event caused by or in connection with the operation of a ship that poses a risk to a ship or a person or the consequences of which could cause serious damage to a ship, an offshore structure or the environment (incident, Section 1b SUG).

Depending on the consequences, German law states that the generic term 'marine casualty' must be further divided into:

Very serious marine casualty (VSMC):

A very serious marine casualty is one resulting in loss of human life, constructive total loss of a ship or substantial environmental pollution.

Serious marine casualty (SMC):

A serious marine casualty is one that cannot be classified as a VSMC but which additionally involves

- the failure of the main engine;
- substantial damage to the accommodation spaces;
- serious damage to the ship's structure;
- damage to the underwater shell plating with which the ship becomes unseaworthy;
- pollution, regardless of the volume of pollutants released, and/or
- an accident that necessitates towing or shore-based assistance.

³⁷ Assumed in the case of incapacity to work for at least 72 hours.

The IMO has actually discontinued use of the term 'serious marine casualty', but it continues to apply at European and German level and is still legally relevant. Therefore, the summaries continue to follow the usual pattern under the hitherto usual designation 'Marine casualties according to the IMO Code'.

Less serious marine casualty (LSMC):

Any marine casualty according to the above definition that cannot be classified as a VSMC, SMC or incident is classified as a less serious marine casualty. This sometimes leads to classifications that are difficult to understand in terms of wording. While the grounding and subsequent tug-assisted re-floating of a commercially used sailing yacht is classified as a serious marine casualty by law, an occupational accident resulting in the paralysis of a crew member is initially 'only' a less serious marine casualty – even though the consequences are far more severe. This 'imbalance' has already been resolved internationally by removing the distinction between serious and less serious marine casualties through the complete elimination of the serious marine casualty. This still has to be transposed into European and then subsequently German law.

Incident (I) (as defined above). This also includes minor accidents or malfunctions which have not caused significant damage and therefore cannot be classified as an LSMC, but which did endanger a ship, her crew or the surrounding area (environment/traffic). Since incidents are not categorised as a marine casualty according to the IMO Code³⁸, they are shown separately in the statistics section.

Other casualties or incidents (OCI) are all other cases that were reported to the BSU's but outside its statutory responsibility. By definition, this also includes the cases defined in Section 1(4) in conjunction with points 2 and 3 of Section 1(3) SUG, i.e. accidents involving only recreational craft used privately or small fishing vessels. Such accidents are not marine casualties under international law but the BSU may still investigate them when certain conditions are met.³⁹ However, the corresponding classification as an OCI remains.

Since the BSU does not investigate accidents involving privately used recreational craft on the basis of international rules but rather only in exceptional, duly substantiated cases, these and other accidents classified as an OCI are not recorded in the database. Accordingly, the statistics section only provides information on such accidents in exceptional cases.

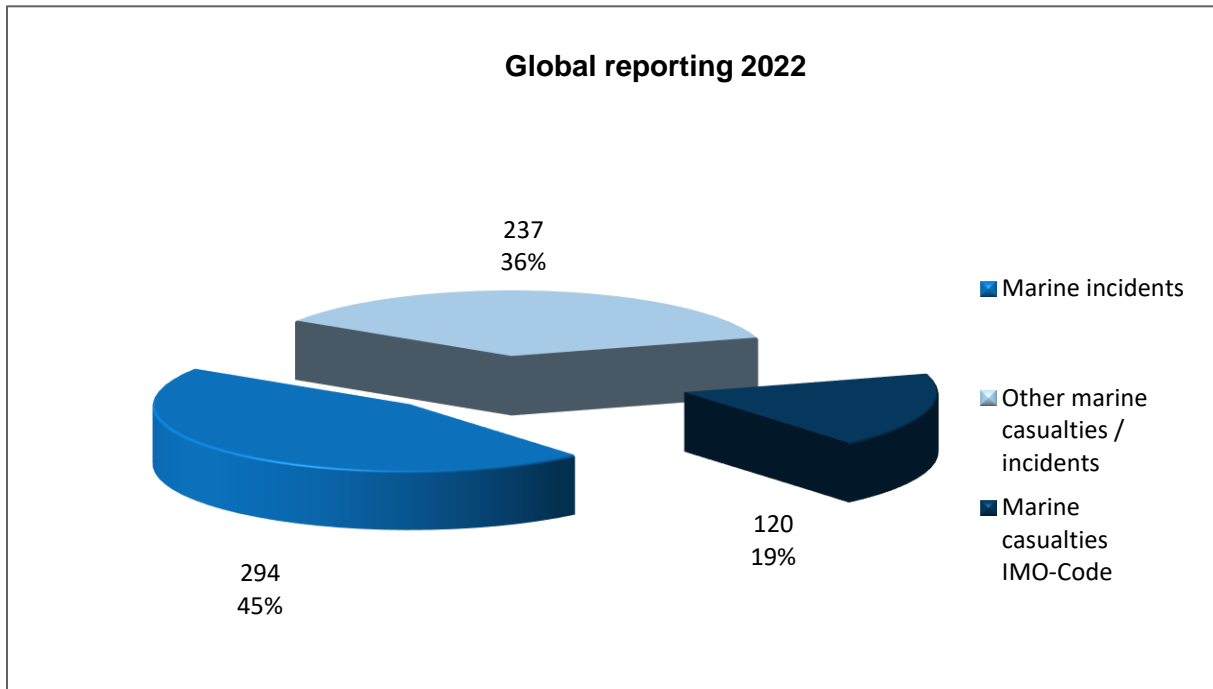
6.2 Notifications received

The total number of notifications remains almost the same as in the previous year: 659 in 2021 compared to 651 in 2022.

³⁸ Resolution MSC.255(84) of the IMO, the Casualty Investigation Code.

³⁹ See also the explanatory notes at point 1 of this annual report.

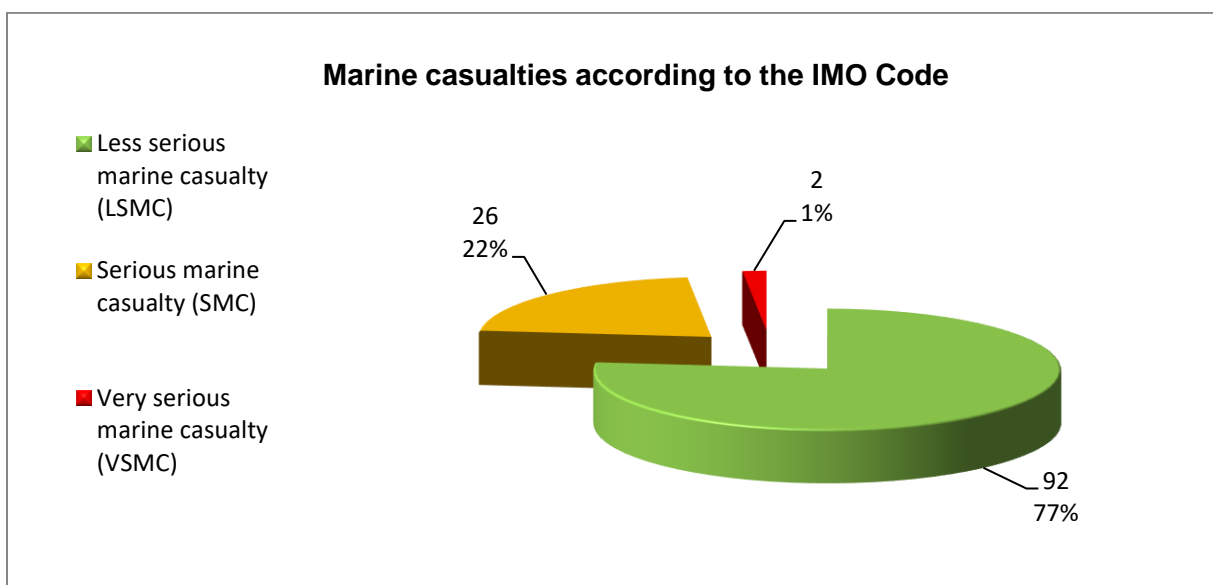
Graph 3: Global reporting 2022



The number of reports that do not concern the statutory responsibility of the BSU has changed only marginally: 247 in 2021 compared to 237 this year. Marine casualties according to the IMO Code have dropped slightly from 132 to 120, a reduction of about 10%. On the other hand, the number of incidents has increased slightly by 5% from 280 to 294.

Let us begin with the differentiation within the 'Marine casualty' category. The following statistics concern all the cases which fall within the BSU's area of responsibility, i.e. not only the German-flagged seagoing ships.

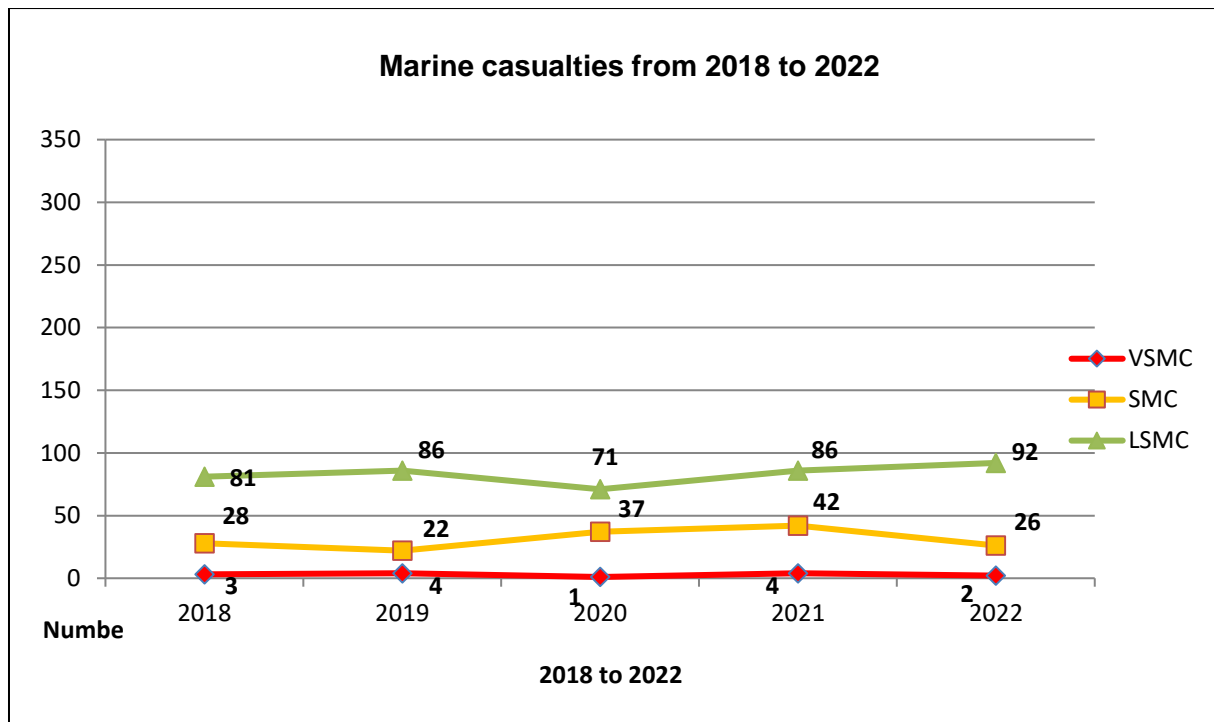
Graph 4: Marine casualties according to the IMO Code in 2022



There were some quite significant and encouraging changes as compared to the year before. Although LSMCs have increased from 86 to 92, SMCs have dropped from 42 to 26 and VSMCs from four to two cases. Fortunately, serious marine casualties have become a rather rare occurrence.

The following graph shows the trend over the past five years.

Graph 5: Comparison of marine casualties from 2018 to 2022



The figures for 2022 as compared to those for previous years demonstrate that it was a relatively normal year. The figures regularly fluctuate somewhat but on the whole there have been no marked changes – except for very serious marine casualties, where the figures have dropped sharply.

Nevertheless, the sharp drop in the number of serious marine casualties from 42 to 26 cases, i.e. by about 40%, should be explained for 2022. Can you recall the pandemic-induced jump in numbers in the two previous years? In 2021, 23 of these accidents occurred on sailing yachts hired without a skipper. This situation had ceased to exist in 2022. From the perspective of the BSU, this has distorted the statistics considerably, especially since it makes no significant difference in terms of danger whether someone runs their own sailing boat aground or one that is hired. The focus in the case of both boats is the purely private use. For this reason, it was decided to treat these two categories equally and to generally exempt recreational craft hired without a skipper in accordance with the German Ordinance on Seagoing Recreational Craft from the application of the SUG and to no longer assess corresponding accidents as marine casualties. However, this does not apply if a sailing yacht is hired with a skipper. In this case, commercial use by the owner prevails.

On the other hand, it remains encouraging that the number of fatalities in **merchant shipping** remains at a low level compared to previous years, as shown in the table below. In contrast, the number of people injured has risen again. However, 11 cases only concerned people with minor injuries, which puts the increase into perspective. All in all, these figures may well be due to increased safety awareness on board ships and in shipping companies. Perhaps the work of the BSU has also contributed to this. In contrast, the number of fatalities in **recreational boating** has risen sharply. For example, there were two fatalities in 2020 and one in 2021. There were eight in the previous year, which is the highest number in more than ten years. Three of the fatal accidents involved single-handed sailors who went overboard, while two accidents were due to motor boats travelling far too quickly. In any case, the high number is worrying.

Spreadsheet 2: Number of deceased and injured people from 2016 to 2022

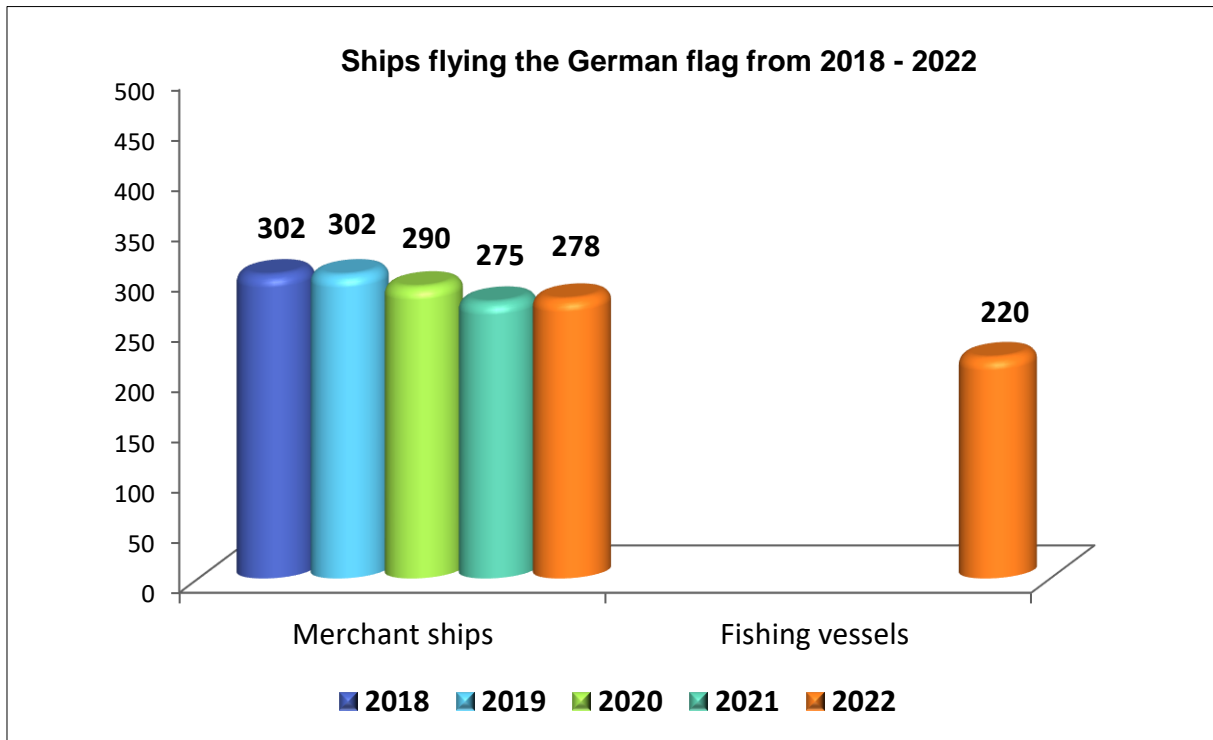
	2016	2017	2018	2019	2020	2021	2022
Fatalities	5	4	2	2	1	2	2
Injured	60	51	31	36	24	21	33
Fatalities (recreational craft)	4	2	1	4	2	1	8

6.3 Ships flying the German flag⁴⁰

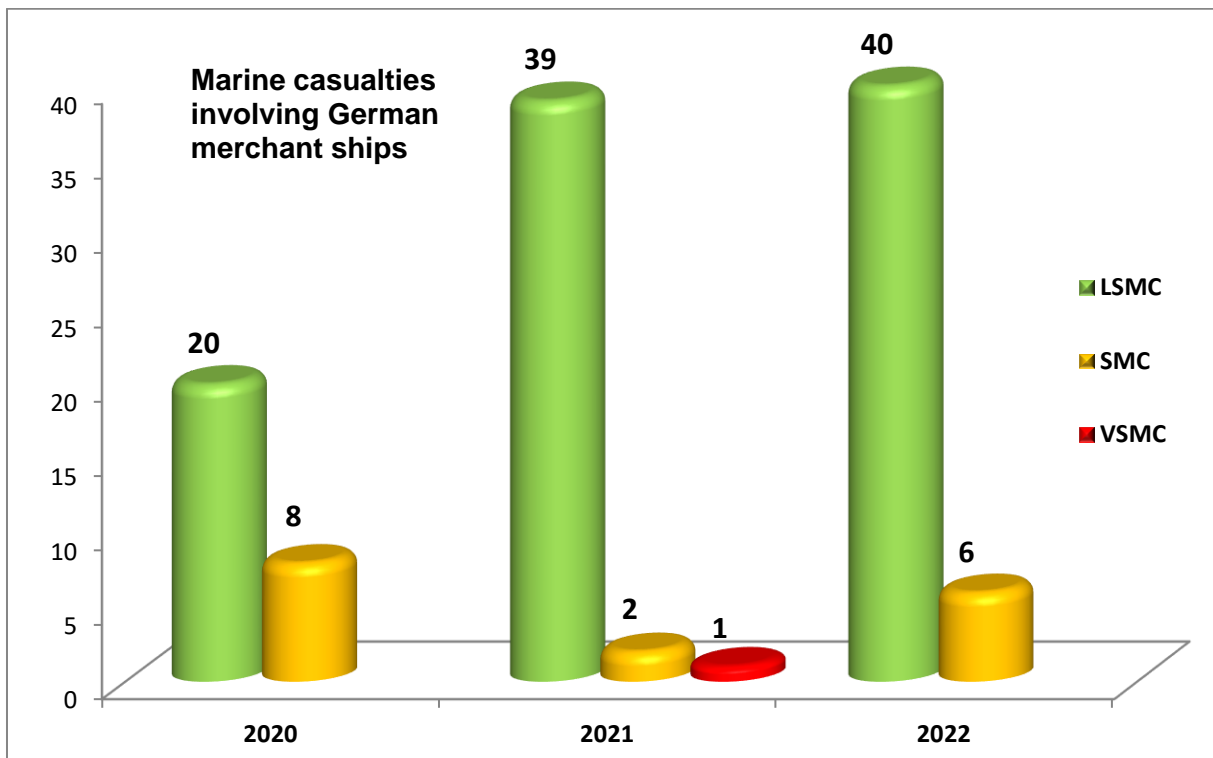
The contraction of merchant ships seen in previous years was at least temporarily halted last year. The number of merchant ships registered under the German flag now stands at 278. That is three units, i.e. about 1%, more than in the previous year but still 48 fewer than in 2017 or as much as 170 fewer than in 2012. The counting method for the seagoing fishing vessels was restarted in 2022 due to the new data provider.

⁴⁰ Source (merchant ships): Federal Maritime and Hydrographic Agency. Source (fishing vessels): Federal Office for Agriculture and Food.

Graph 6: Development of ships flying the German flag

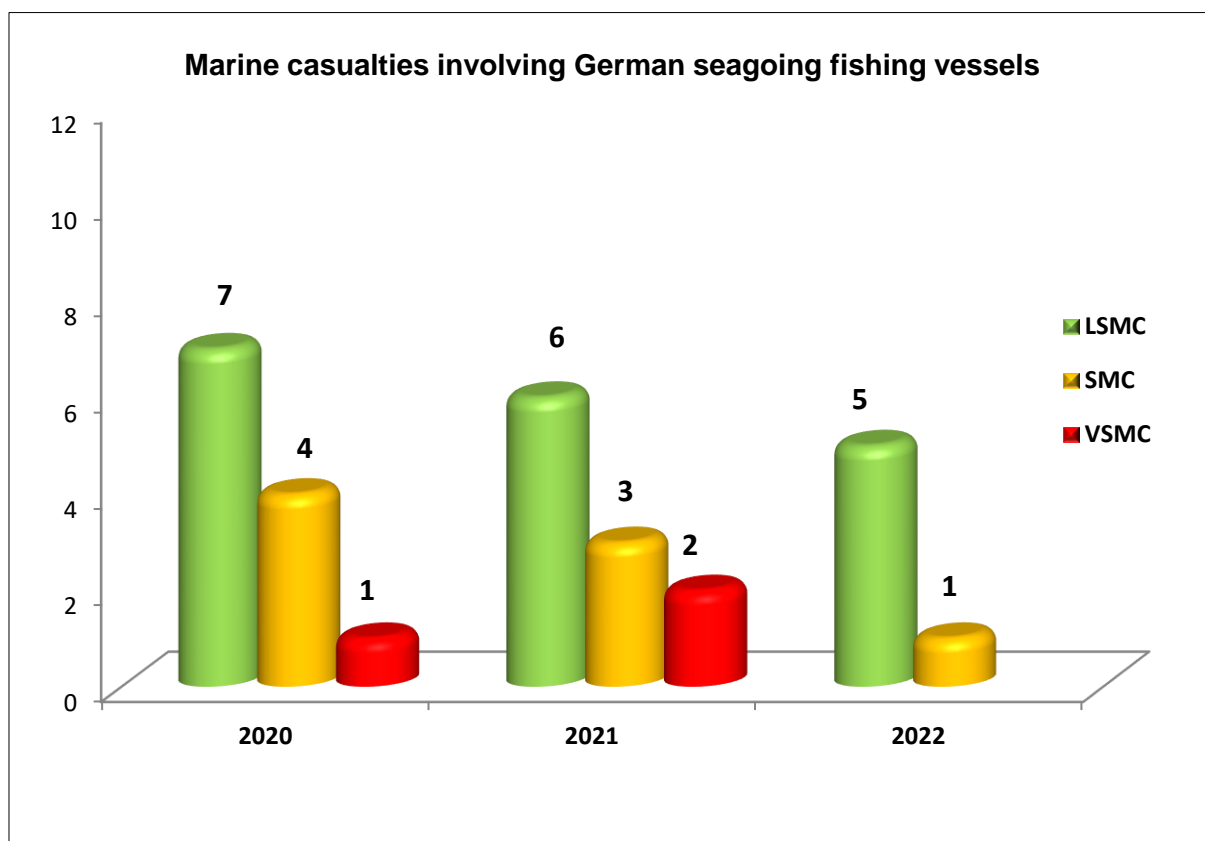


Graph 7: Marine casualties on merchant ships flying the German flag



There were four more marine casualties on merchant ships flying the German flag in 2022 than in 2021. There were no very serious marine casualties on German-flagged merchant ships last year.

Graph 8: Marine casualties involving German seagoing fishing vessels



Fishing vessels have seen changes for the better. In 2022, a very serious marine casualty did not occur for the first time in three years. In all other respects, the figures correspond to those of previous years, remaining stable and at a low level.

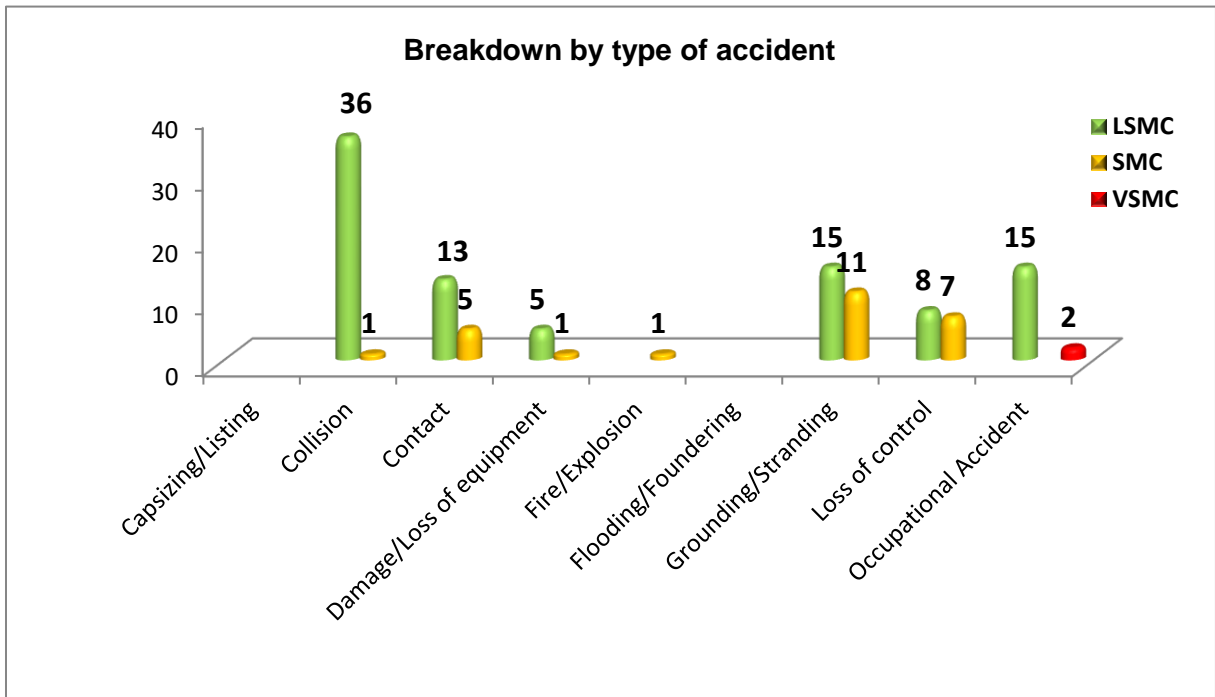
6.4 Distribution by kind of accident and type of ship

However, there have been no major differences in the distribution by kind of accident and type of ship compared to the last few years. Collisions have always topped the statistics – this time followed by groundings and personnel accidents. However, collisions with solid structures or buoys have decreased, as they are often only minor. Accordingly, they play a greater role in incidents. The first of the two fatalities involved a skipper falling overboard and drowning on the [SPEEDY GO](#)⁴¹ and the second an occupational accident on the bulk carrier PETER OLDENDORFF⁴².

⁴¹ File 138/22, the report was published in 2023.

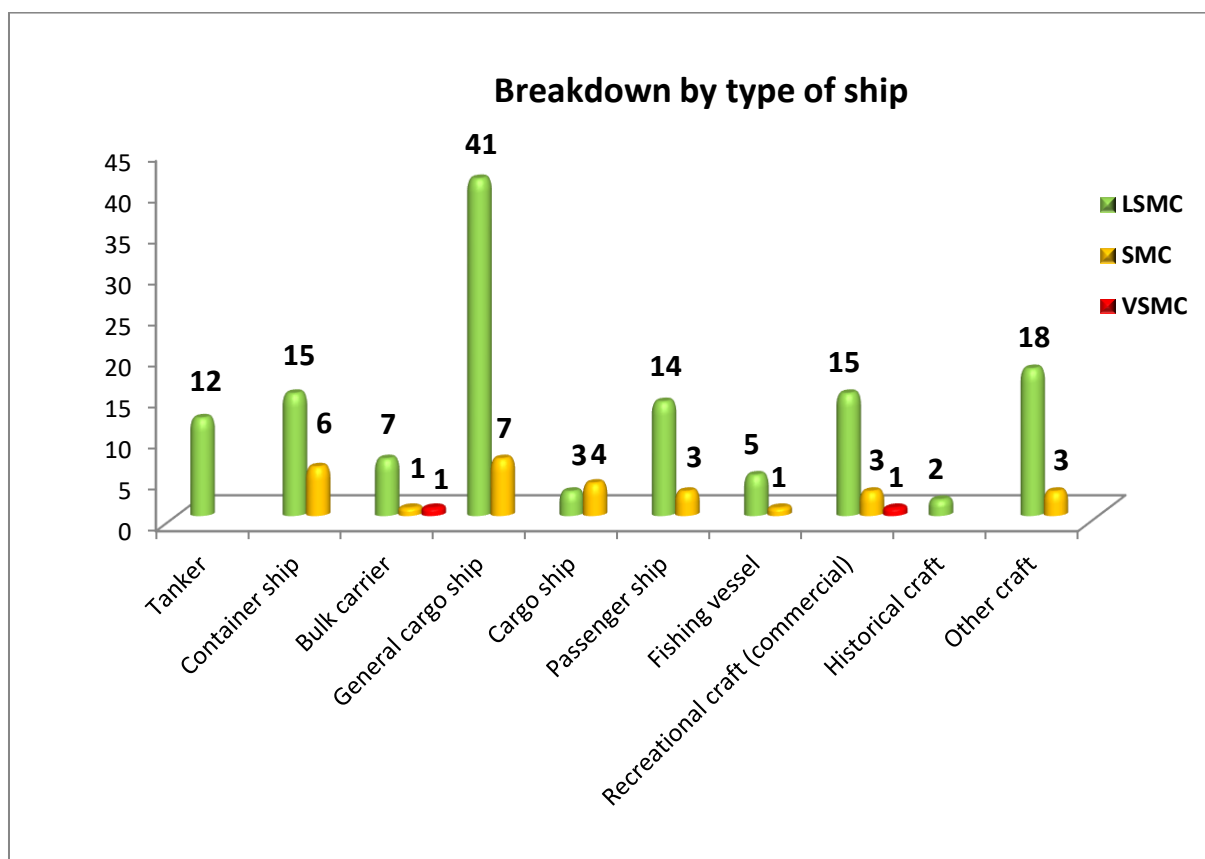
⁴² See sec. 2.3 of this report.

Graph 9: Distribution by the various kinds of accident



Loosely speaking, general cargo ships once more 'lead the pack' when it comes to distribution by type of ship. They are followed by the other vessels, container ships, as well as commercially used recreational craft and passenger ships. There was no change here compared to last year. 'Others' are the ship types covered by the SUG that have yet to be mentioned, such as tugs, pilot boats, offshore supply vessels, etc. 'Cargo ships' are those ships that cannot be classified under the previously mentioned categories of container, bulk or general cargo ship, such as ro-ro cargo ships or car carriers, for example.

Graph 10: Distribution of accidents between the different types of ship



6.5 Causes of a marine casualty

We now move on to the causes. The BSU does not classify every accident only according to LSMC, SMC or VSMC, but also decides according to cause. The following categories are available to the BSU for cause assignment:

Spreadsheet 3: Technical causes

No	Occurrence/technical – T –
1	Damage to/breakdown of main engine ⁴³
1.1	due to damage to/breakdown of auxiliary machinery
1.2	due to damage to/breakdown of electrics/electronics
1.3	due to fuel/bunker issues (use/quality/supply)
2	Damage to/breakdown of rudder or steering gear
2.1	due to damage to/breakdown of auxiliary machinery
2.2	due to damage to/breakdown of electrics
3	Damage to equipment
4	Defective nautical equipment
5	Overall condition of the ship
6	Other technical causes
7	Failure of/defective lifesaving appliance(s)

⁴³ If the cause can be classified as 1.1-1.3, then no entry is made after 1.

Spreadsheet 4: Human causes

No	Occurrence/human factor – HF –
1	Error in judgement
2	Improper ⁴⁴ communication
3	Simple navigational error
4	Poor navigation
5	Misjudgement of right of way
6	Misjudgement of pilot/VTS
7	Under the influence of alcohol
8	Insufficient occupational safety
9	Improper speed
10	Fatigue
11	Operating error
12	Other human causes

Spreadsheet 5: Caused by hazardous material

No	Occurrence/Hazardous material ⁴⁵ – HM –
1	Leaking gas/smoke
2	Damage to a transport unit
3	Spontaneous ignition of a (dangerous) cargo

Spreadsheet 6: Cause other agents

No	Occurrence/Other agent or vessel – AV –
1	Bad weather (as main cause)
2	Swell caused by passing ship
3	Restricted visibility, weather-related or shore-based
4	Ammunition find

Spreadsheet 7: Cause unknown

No	Cause unknown – U –
1	Floating waste (unknown origin)
2	Other

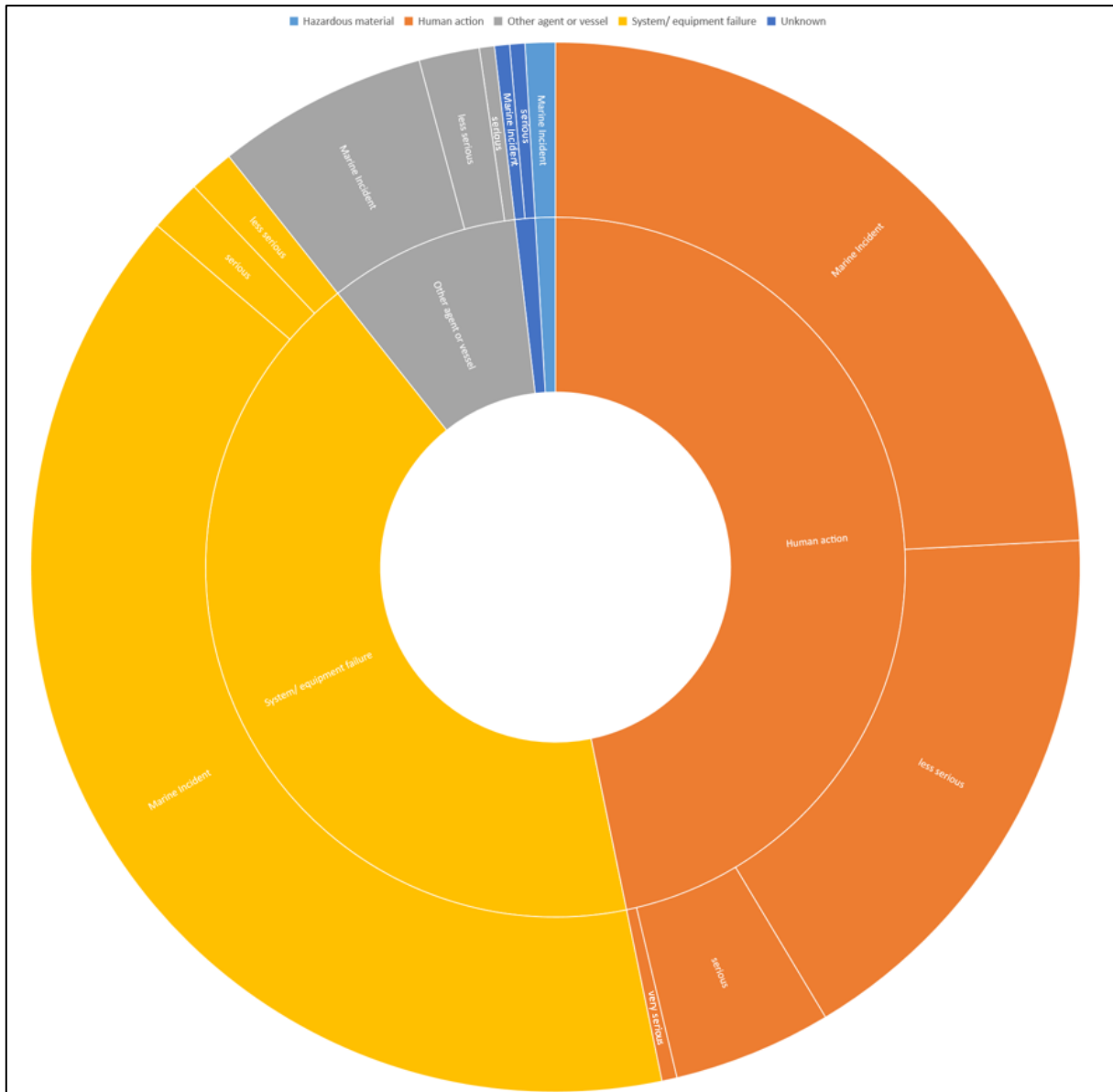
As can be seen in the following graph, human causes (so-called human factors or elements; here **orange**) are still predominant in marine casualties according to the IMO Code, whereas technical causes (here **yellow**) are predominant in incidents. This is due to the fact that in the case of a technical error, humans can often take countermeasures to prevent damage. This is usually no longer possible in the case of a human error, as it takes a certain amount of time for humans to recognise they have made an error as such and then take the necessary action. In this context, it seems all the more important to have well-developed communication and the principle of multiple

⁴⁴ Improper also means unsuitable, omitted communication or similar, for example.

⁴⁵ Non-hazardous material within the meaning of the IMDG Code.

control on board. Apart from these two, only the cause 'other agent' (here **grey**) is relevant.

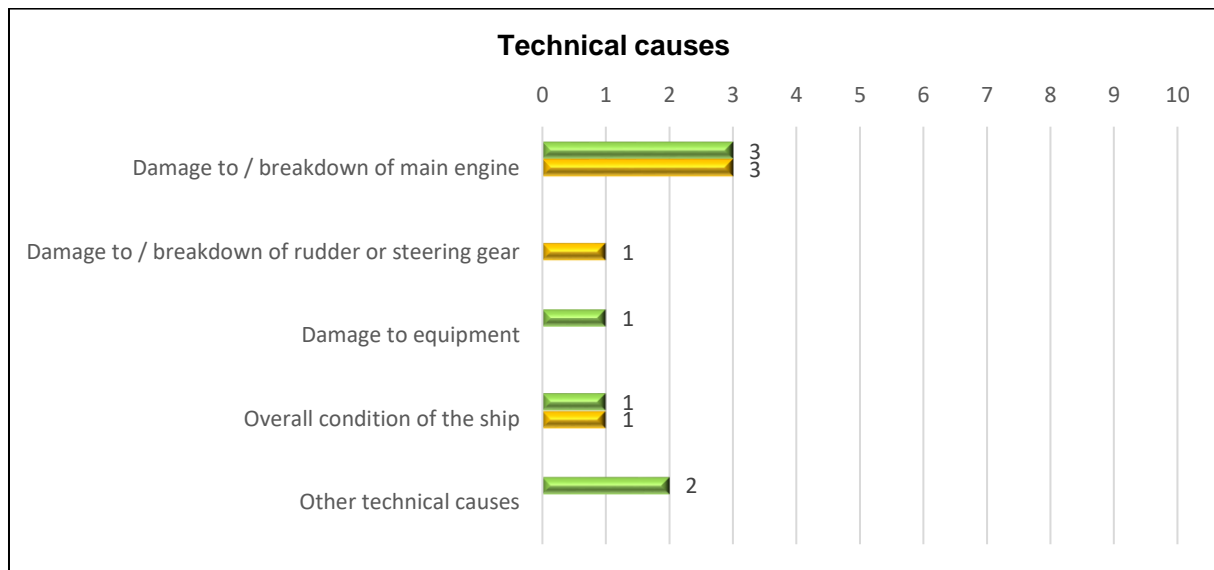
Graph 11: Causes and categorisation of incidents



Specifically, the causes of **marine casualties according to the IMO Code** can be shown as follows⁴⁶:

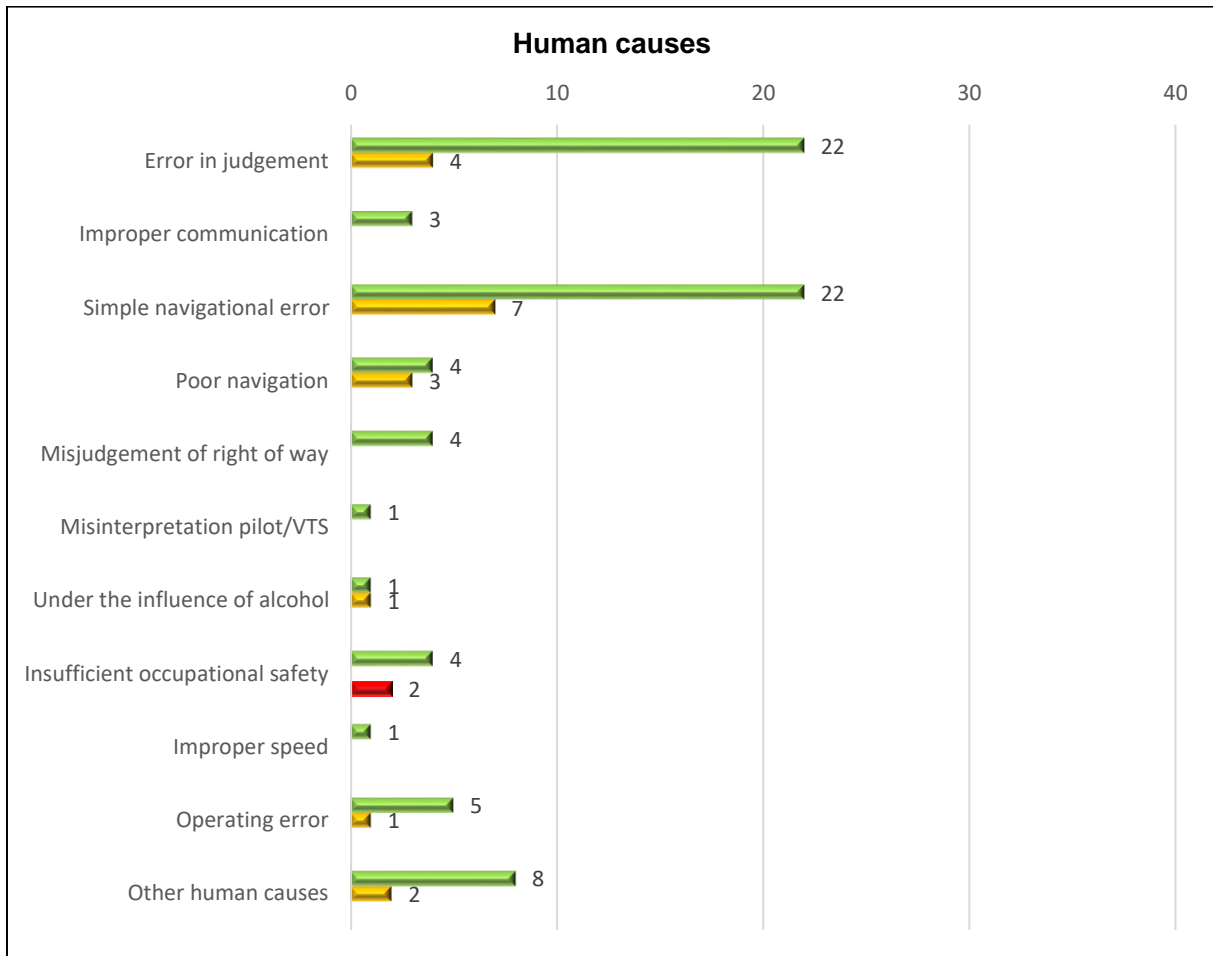
⁴⁶ No reference means number = 0; the colour scheme is based on the one previously used (green = LSMC, yellow = SMC and red = VSMC).

Graph 12: Technical causes



As is the case every year, the most common technical cause is damage to the main engine. Damage to the main engine or also to the rudder is often the cause of a serious marine casualty for purely statutory reasons and although they usually go unnoticed and are without consequences, they are anything but harmless. By way of example, a breakdown of the main engine causes a ship to run aground, a tug tows the ship back into the fairway and after repairs her voyage continues. Sounds harmless, and in most cases it is – but the potential danger can be very high if the ship cannot be towed free immediately, for example. Due to the low number of cases, a more detailed distinction was not made, especially since the far more frequent breakdowns of the main engine or rudder without further consequences are usually classified as an incident.

Graph 13: Human causes



In 2022, the accident causes attributable to human error were predominantly 'Error in judgement' and 'Simple navigational error', the total number of which has now even overtaken the former. The former is often the classic misjudgement or momentary lapse and the latter speaks for itself. In the case of other causes, it is notable that navigational errors lead to serious accidents more frequently than any other (three out of seven and thus 40% of cases). On the other hand, accidents due to a lack of occupational safety often have significant consequences for life and limb: two out of six of these accidents resulted in a fatality, which is equivalent to one third and seems exceptionally high. Accordingly, this figure should be explained because it does not reflect reality. Although near-misses are more likely to be predominant here, this figure is not reflected in incidents either. This is solely due to the fact that near-misses, which should actually be reported by law, are in the vast majority of cases not reported at all due to a lack of occupational safety – neither to the ship's command nor by the ship's command to shore-based authorities like the WSP or BSU. The person involved in the near-miss thinks: "That was lucky!" or "Nobody saw it." – and continues his task. Yet there are many lessons to be learnt from these very situations. Accordingly, I can only urge you to report such events, too.

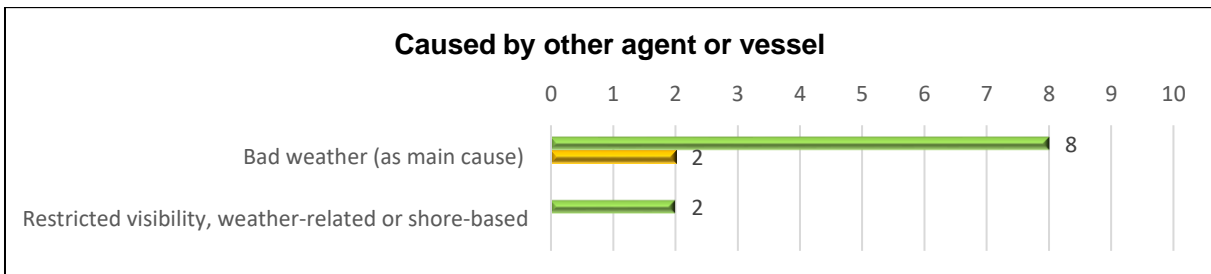
Finally, and for confirmation, an evaluation of the accident causes in merchant shipping that led to injuries or even fatalities. It becomes clear that human factors are usually decisive for an accident situation here, too. Half of the accidents involving personal injury and all the fatal accidents in 2022 in merchant shipping are due to insufficient occupational safety. However, this is a broad field, which includes, for example, a lack of protective equipment, faulty procedures on board/in a company or also inadequate instruction, which have had a causal effect on an accident.

Spreadsheet 8: Causes involving fatalities and injuries

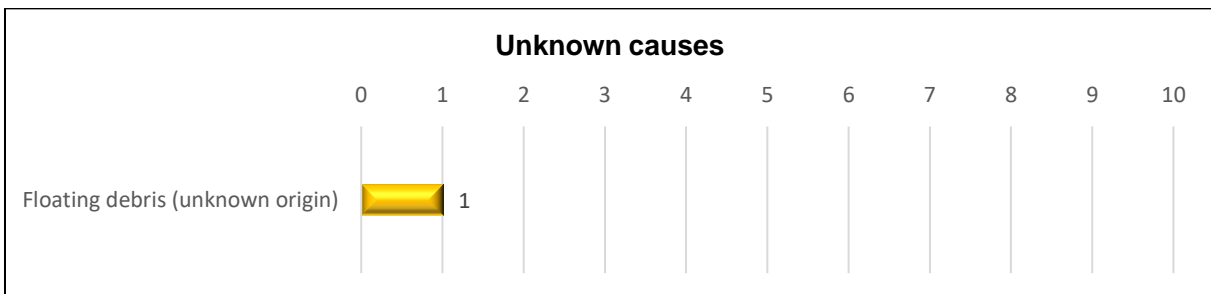
Fatalities and injuries			
	Number of accidents (total)	Accident with subsequent loss of life	Accident with subsequent injuries
Total	31	2	29
of which due to technical causes	9	0	9
of which due to human causes	22	2	20
of which due to insufficient occupational safety	10	2	7 ⁴⁷

With regard to the other accident causes, only 'bad weather' is relevant. However, the analyses should be inserted in full for the sake of completeness.

Graph 14: Other agent or vessel



Graph 15: Cause unknown

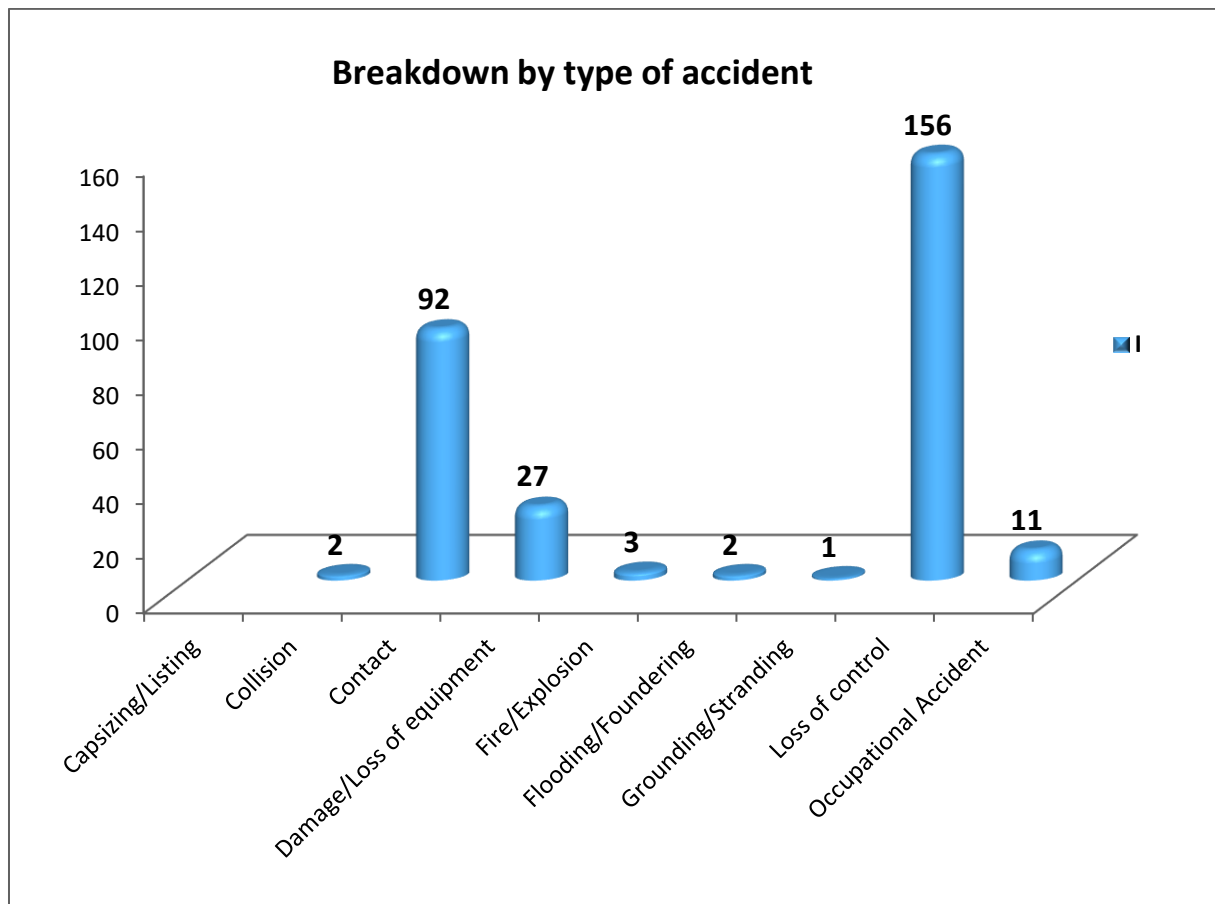


⁴⁷ The figure here differs from the figures for marine casualties according to international regulations and those for accidents due to insufficient occupational safety. However, the two facts are not in agreement. A marine casualty according to IMO regulations is only affirmed if there is an incapacity to work for at least 72 hours, while an injury is always affirmed if there was a physical impairment, regardless of severity.

6.6 Incidents

Although it is inherent in incidents that their consequences are not serious, they also pose a threat to safety. They are the cases that appear in the BSU's reporting list by far the most frequently. This remains the case in 2022. There were 294 incidents in the past year, i.e. far more than twice as many as all other marine casualties combined. Overall, they account for 45% of the global reports and 71% of the accident reports. The causes are manifold here, too, albeit significantly different because it is the technical causes that are predominant, as the below summaries will show.

Graph 16: Distribution of incidents by kind of event⁴⁸



Damage to the main engine or to the rudder, which usually has no consequences and, by definition, is therefore not a marine casualty according to international regulations, is the most common kind of event. The same applies to allisions, i.e. contacts or other minor damage, which are also strongly represented. The loss of equipment is also not insignificant. In most cases, the anchor is lost overboard. Other kinds of event are negligible because they are, by definition, mainly a marine casualty or substantial damage – which 'upgrades' the incident to a marine casualty – has been caused.

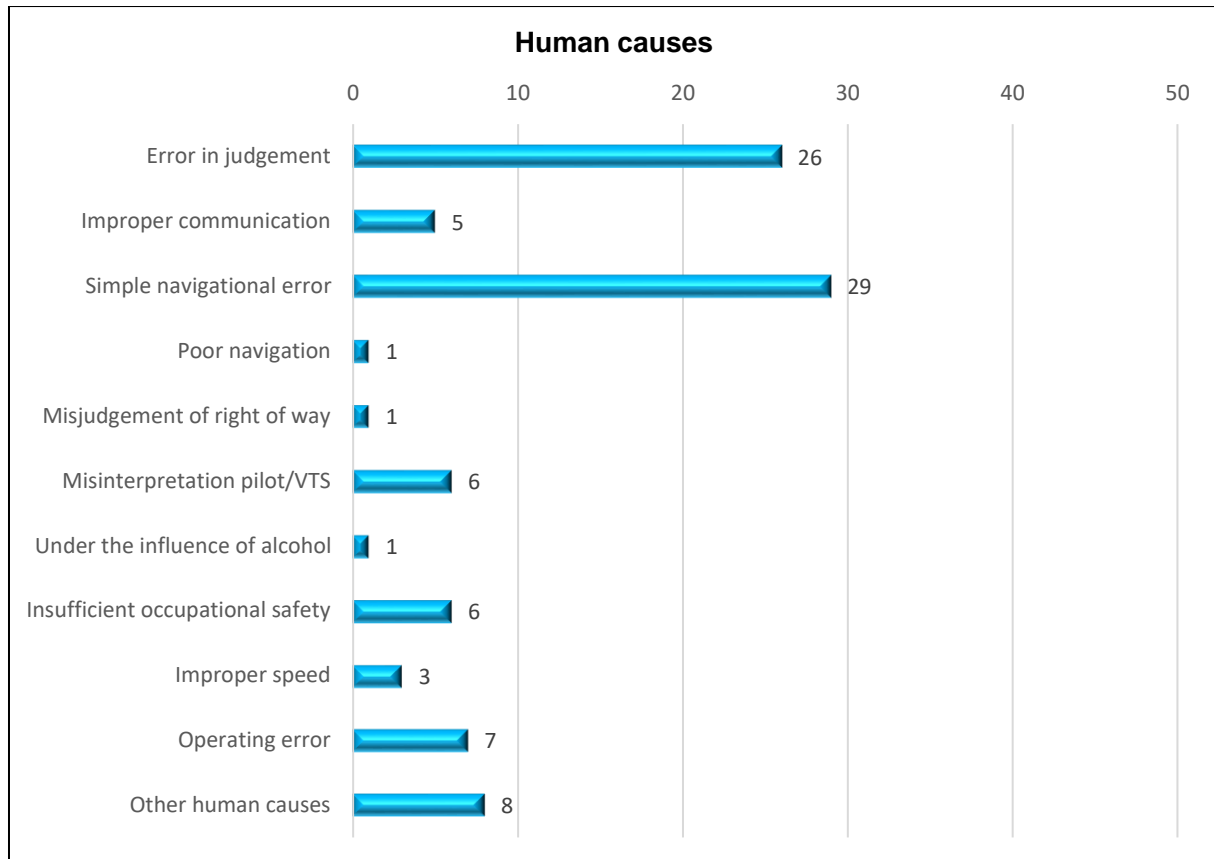
As with accidents, the BSU distinguishes between technical and human in the causes of an incident. Breakdowns of the main engine or of the rudder, blackouts or misfires (134 cases or 45% of all incidents) are the predominant causes. The damage can

⁴⁸ The two collisions shown in the graph and a grounding are near-misses, meaning they are incidents and not IMO accidents.

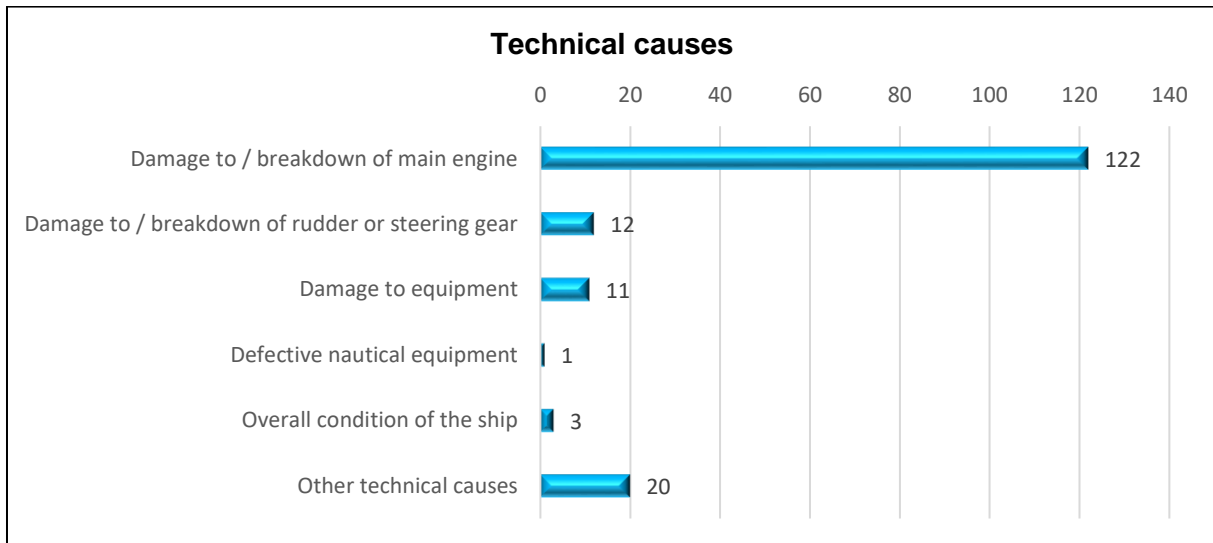
usually be quickly repaired while the ship is anchored in a roadstead or drifting and the voyage then continues. Overall, the ratio between the human and the technical causes is almost one to two for incidents. Added to this are the 'other' causes, especially bad weather, swell or the inherently dangerous and significantly increasing ammunition find (from six cases in 2021 to 11 in 2022).

The causes of incidents can be summarised as follows:

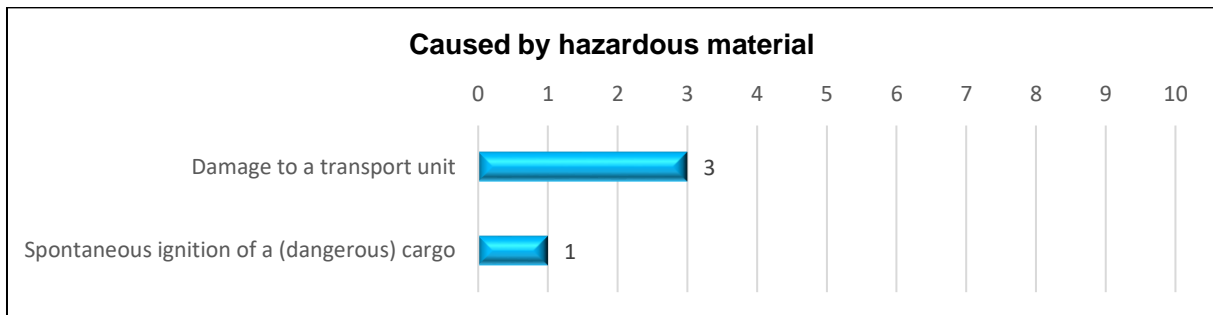
Graph 17: Human cause in incidents



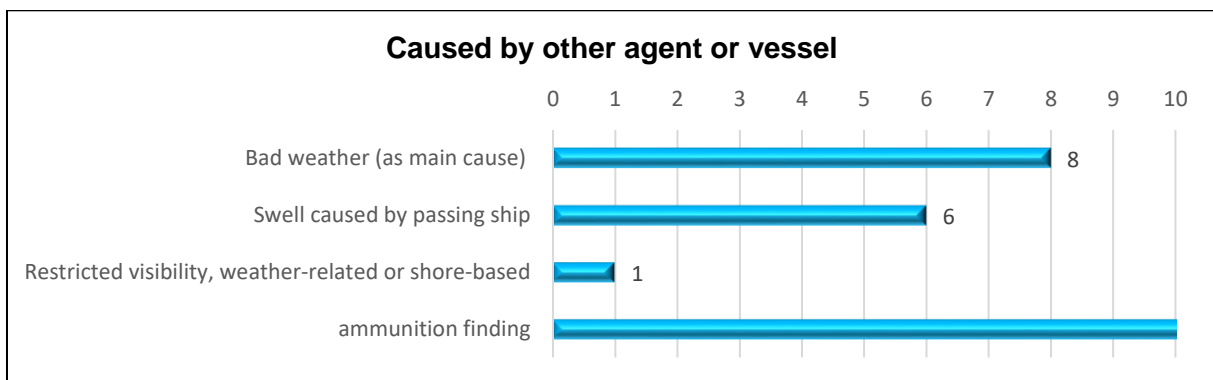
Graph 18: Technical cause in incidents



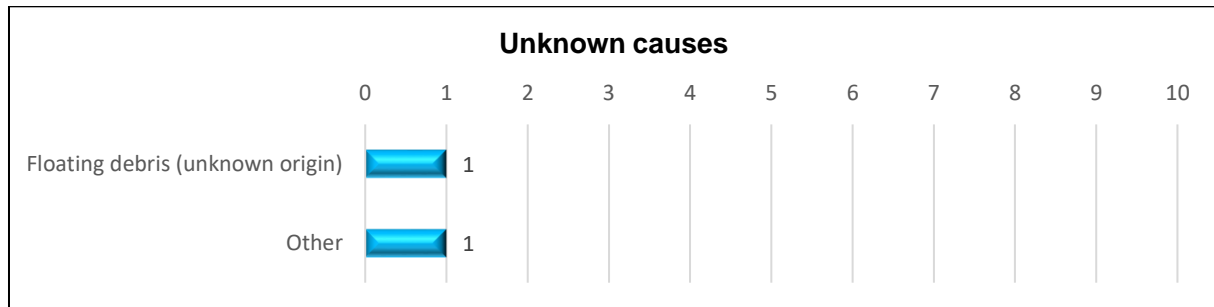
Graph 19: Caused by hazardous material



Graph 20: Other agent or vessel



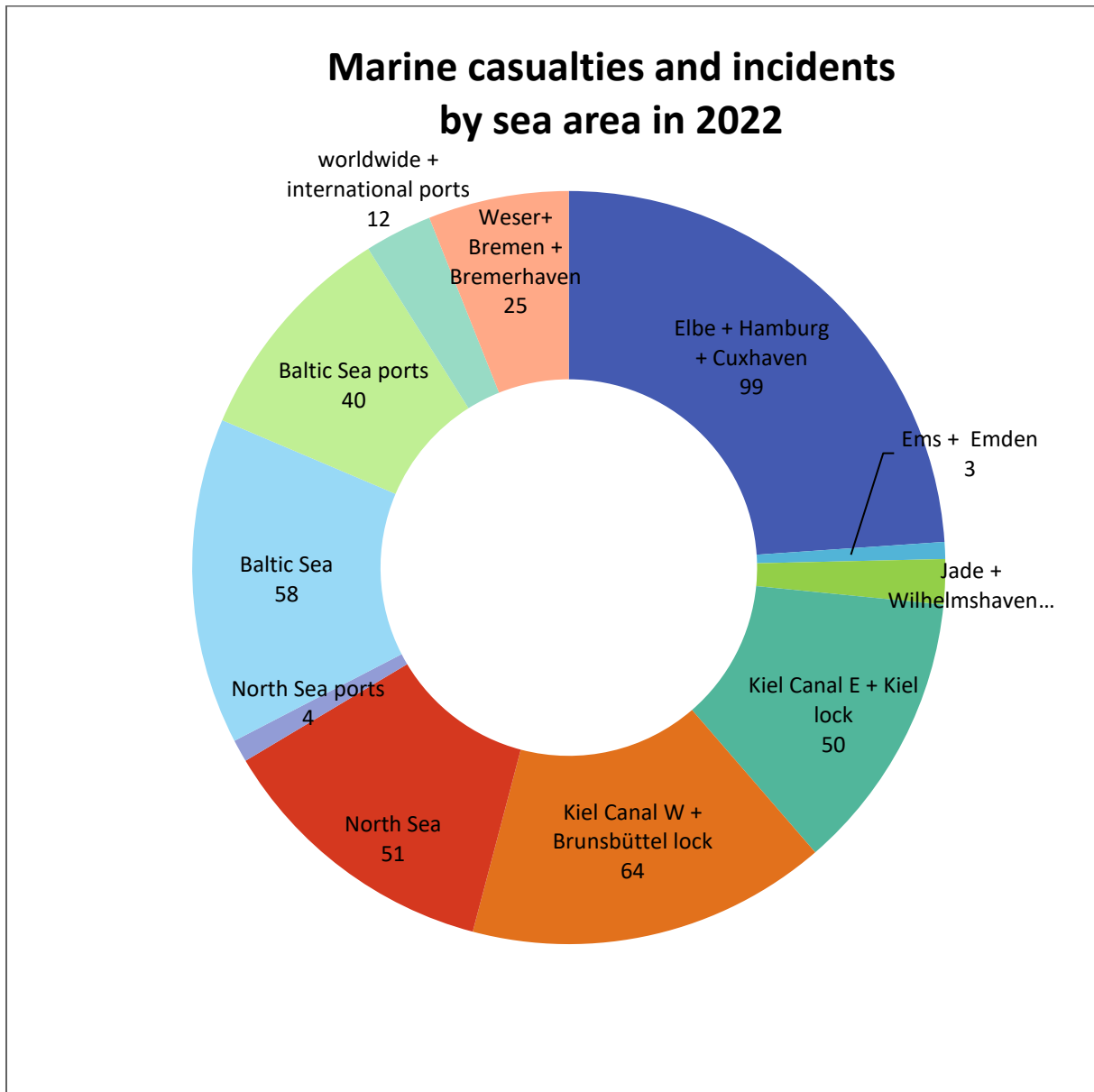
Graph 21: Unknown cause



6.7 Distribution of marine casualties and incidents by sea area

Accidents and incidents are again combined in these statistics. After all, the formal classification of an incident does not determine whether a location is particularly dangerous. Within German sea areas, the distribution is once more similar to previous years. The following graphs explain the differences.

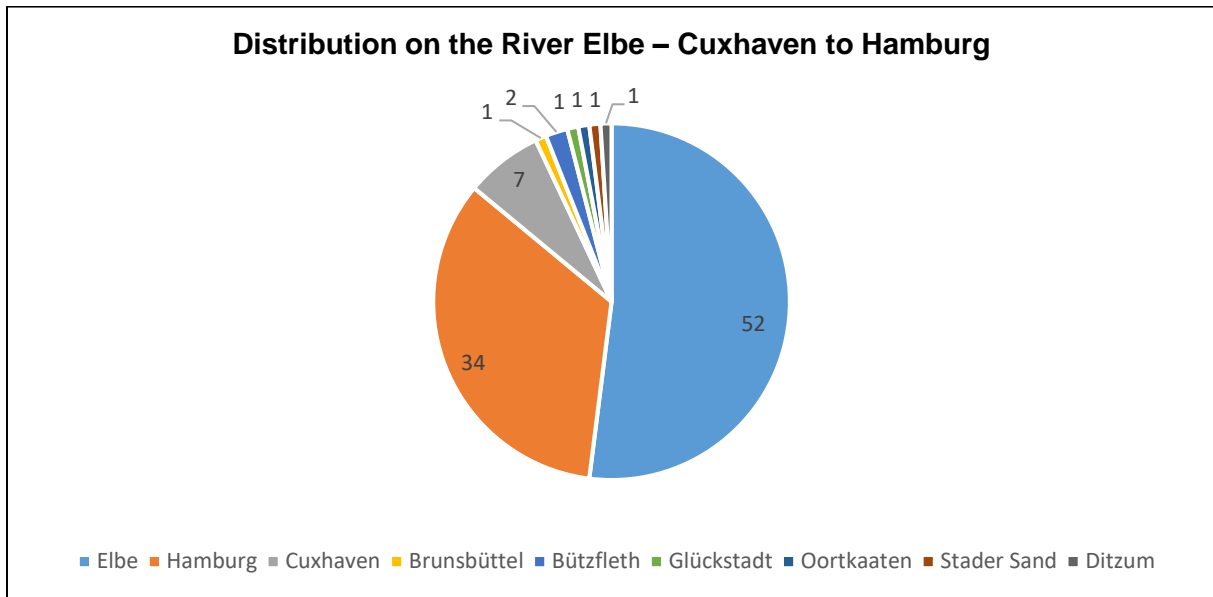
Graph 22: Distribution of marine casualties and incidents by location



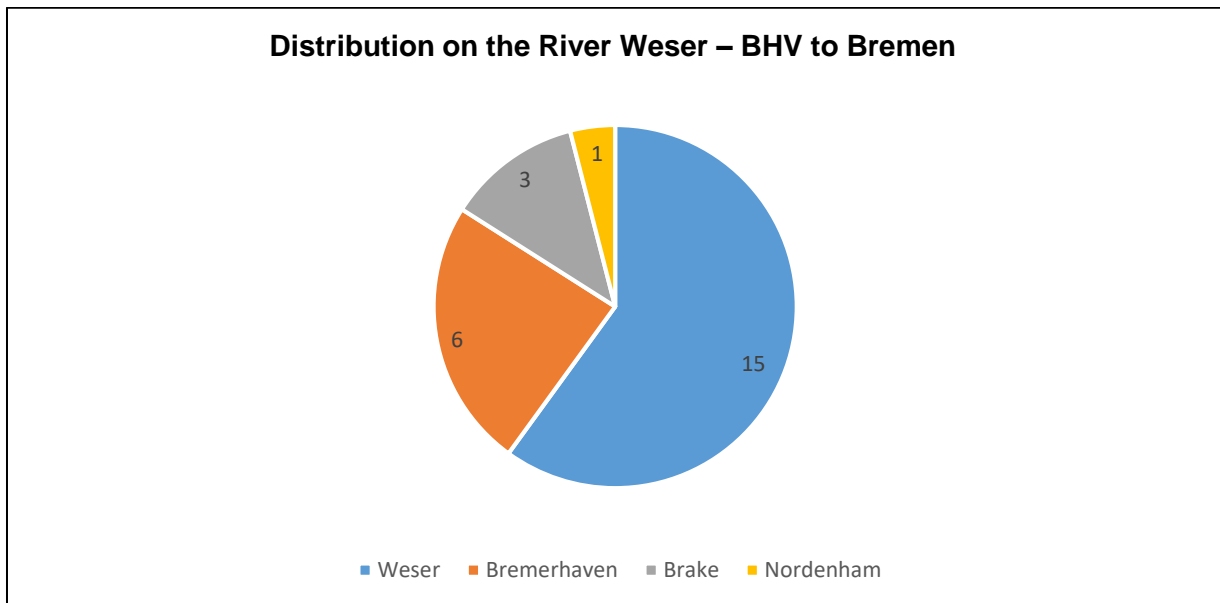
The port of Hamburg and the River Elbe, as well as the Kiel Canal and its locks continue to be the most dangerous places for merchant shipping. In terms of numbers, each of these is more strongly represented than the whole of the Baltic Sea and all its seaports.

A more detailed distinction between the Elbe and Weser shipping routes in terms of port and route reveals the following picture:

Graph 23: Distribution on the River Elbe



Graph 24: Distribution on the River Weser⁴⁹

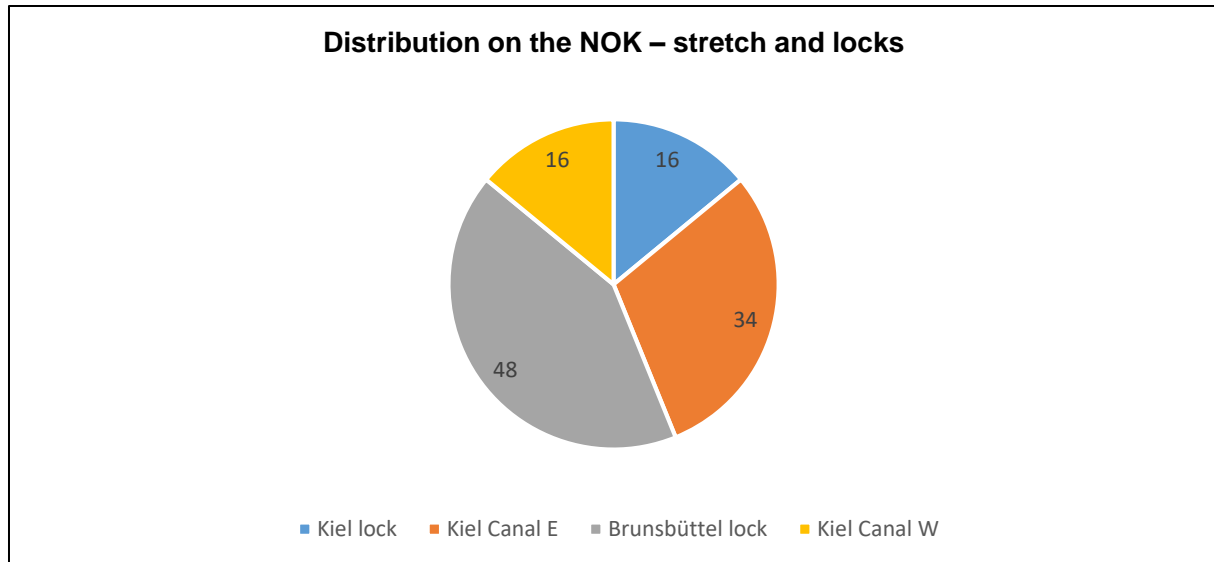


Both graphs show that there are more accidents on the open stretches than in the ports. This may seem somewhat surprising at first glance, as it is naturally more confined in the port and there is less room to manoeuvre. On the other hand, you are more exposed to the current and tide on the rivers and can only manoeuvre to a limited extent in narrow fairways.

⁴⁹ The port of Bremen was not forgotten in the graph; there were no accident reports concerning the port of Bremen in 2022.

If the same analysis is applied to the Kiel Canal and a distinction is made between the two locks and the western and eastern stretches, the following picture emerges:

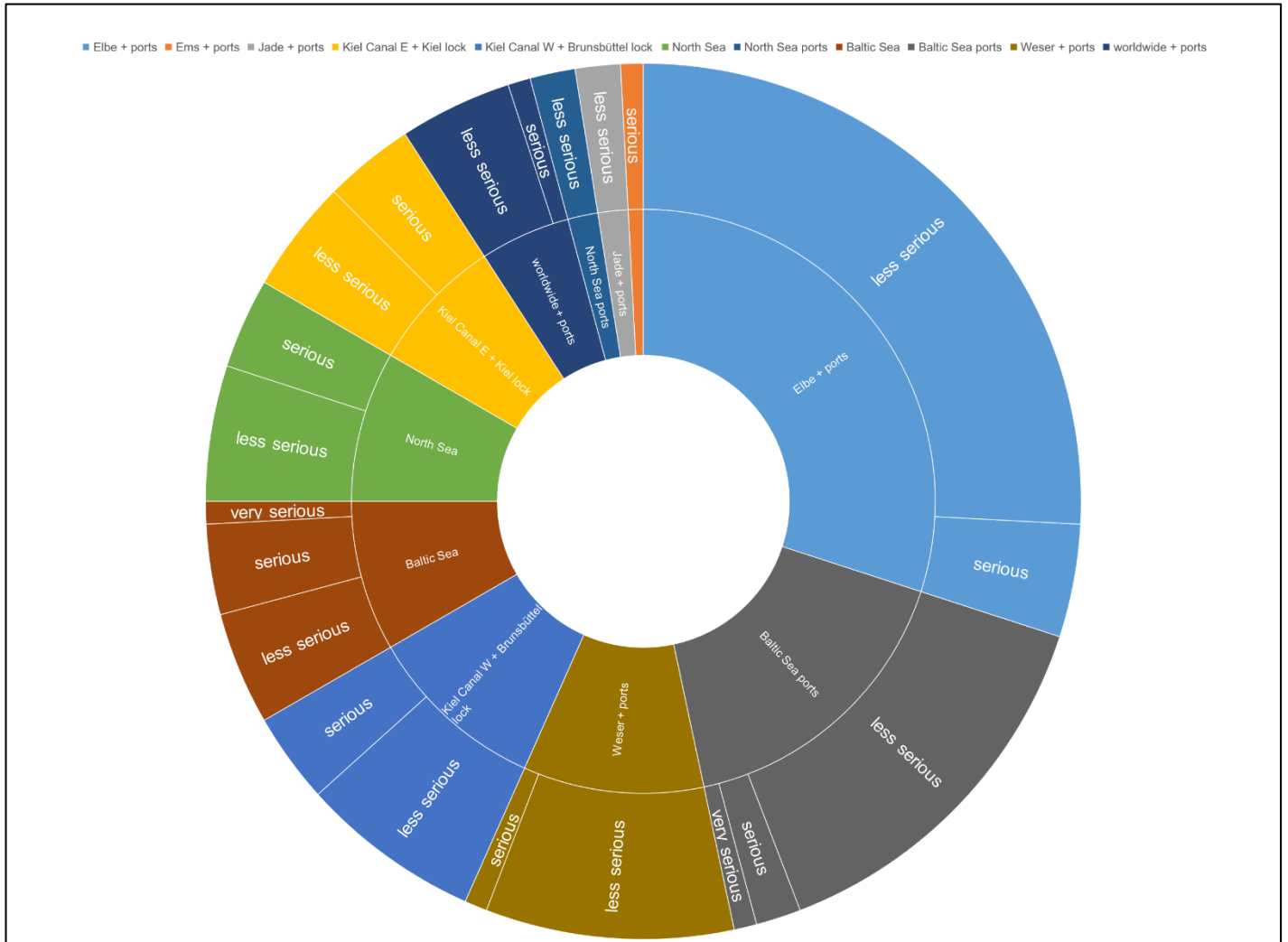
Graph 25: Distribution on the NOK



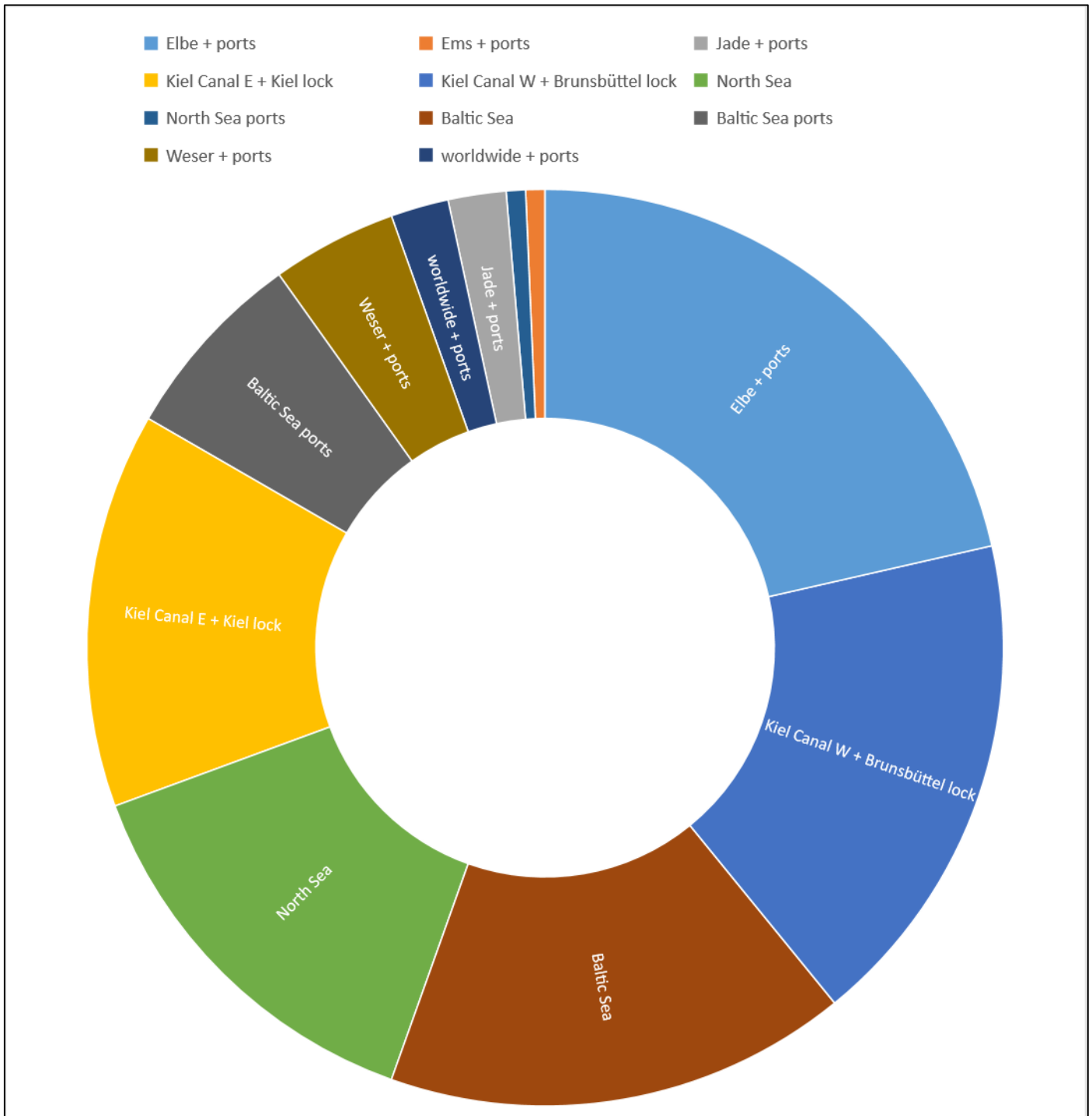
Most accidents occur in the lock at Brunsbüttel, as it is more difficult to enter than the one at Kiel-Holtenau due to the strong current in the River Elbe and the tide. On the other hand, there are more accidents along the stretches on the eastern side. This is due to the fact that development and the associated widening, including straightening bends, of the eastern stretch is not yet completed, meaning that the eastern stretch is more dangerous to navigate than the western stretch, which has already been widened.

Finally, it is worth taking a look at an evaluation of the accident categories in connection with the locations, i.e. whether significantly more serious marine casualties occur in a certain area than somewhere else, for example.

Graph 26: Locations and accident category (marine casualties)



Graph 27: Locations and accident category (incidents)



The comparison of the graphs shows that wherever there is a confined space and/or a vessel is additionally exposed to tide and current, the probability of a (serious) accident is increased because it is more likely that a ship will run aground and need tug assistance or collide with others, for example. On the other hand, other risks are not influenced by location, such as a fire or the frequent engine or rudder failure. This explains why the open North Sea or Baltic Sea has more incidents than accidents.

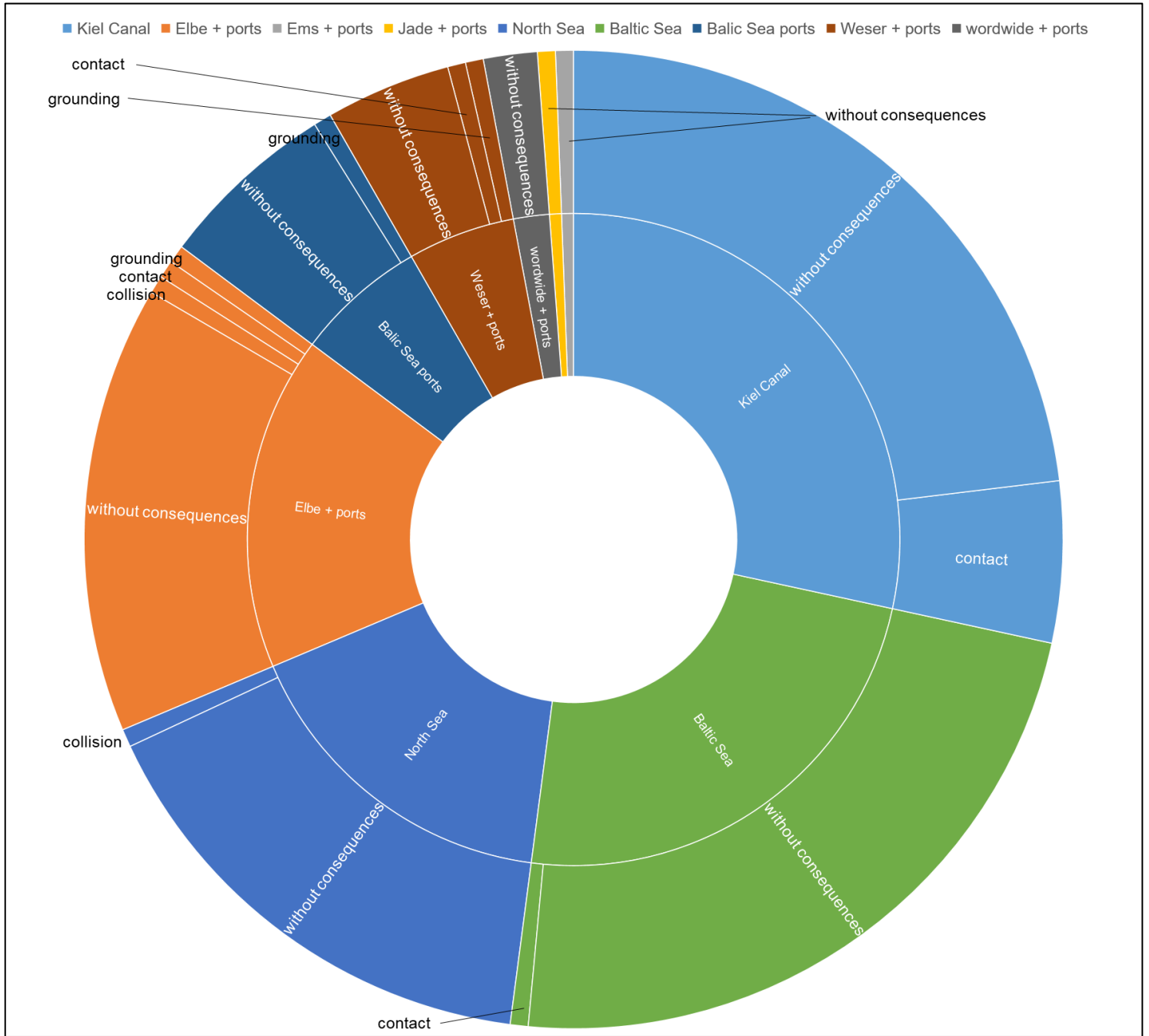
The number of accidents and incidents involving German ships in foreign waters or on the high seas also remains low. On the one hand, this is due to the continuous contraction of the German-flagged merchant fleet, but also to a poorly developed reporting culture. The BSU often only learns about such accidents, if at all, through reports from the foreign port or investigating authorities or from press releases, but not from reports made by the actual ships.

6.8 Consequences of an accident

The particular structure of the European Marine Casualty Information Platform (EMCIP) makes it possible to establish many more links between accidents and to better evaluate the consequences of an accident, or rather the consequences of an initial 'Accident event'. By way of example, the breakdown of a main engine leads to a grounding, which leads to damage below the waterline from which pollutants escape, which in turn leads to pollution. Alternatively, a fire leads to serious injuries to crew members, etc.

In particular, it is the breakdowns of a main engine or of a rudder (i.e. the loss of control of the ship) that can be linked to the scene of the accident which merit a closer look. The following graph shows accident consequences by location. Not surprisingly, it can be seen clearly that any location where a ship has sufficient room to wait or drift and thus for repairs to be carried out – the North Sea, the Baltic Sea and their roadsteads – have no further consequences. However, in locations where space is confined and limited and there is no time or room to manoeuvre, the consequences can be severe and materialise extremely quickly. This is especially evident in the Kiel Canal or in actual ports, where nearly one loss of control event out of three has further consequences, such as contact, collision or grounding.

Graph 28: The consequences of a loss of control event by scene of accident⁵⁰



⁵⁰ This graph should be enlarged when viewed.

6.9 Investigation reports published and lessons learned

It is appropriate to close the statistics section and thus also this annual report with the summaries of the published investigation reports (including interim), as well as the lessons learned. The BSU published 12 investigation reports in 2022. They include four interim reports (*in italics*).

Spreadsheet 9: BSU investigation reports published in 2022

No	Published on	Report number	Description of accident
1	16/03/2022	95/21	<i>Allision with pier/dry dock by the car carrier ENDURANCE after a line parted in Bremerhaven on 13 March 2021</i>
2	25/03/2022	103/21	<i>Personnel accident with subsequent loss of life on board the container ship SEOUL EXPRESS at sea between Manzanillo and Long Beach on 27 March 2021</i>
3	07/04/2022	282/20	Grounding of the RUBINA after steering gear failure on the River Weser on 27 August 2020
4	09/05/2022	117/20	Collision between the coastal motor vessel SCHELDEBANK and Kiel Canal (NOK) ferry HOCHDONN on 8 May 2020
5	13/07/2022	218/21	The small craft TÖWI VI had to be towed after her outboard engine failed while sailing from Juist to Norddeich on 20 July 2021
6	02/09/2022	300/21	<i>Fire in the engine room with subsequent foundering of the fishing vessel FREYJA in Schleswig-Holstein's Wadden Sea during the night of 17 to 18 September 2021</i>
7	21/09/2022	301/21	<i>Foundering of the fishing vessel RAMONA in the mouth of the River Elbe on 21 September 2021</i>
8	22/09/2022	103/21	Personnel accident with subsequent loss of life on board the container ship SEOUL EXPRESS at sea between Manzanillo and Long Beach on 27 March 2021
9	26/10/2022	285/20	Allision with a lock gate at Kiel-Holtenau on the Kiel Canal (NOK) by the multi-purpose vessel ELSE on 29 August 2020
10	30/11/2022	261/20	Fire in the engine room of the ferry BERLIN in the approach to the port of Rostock on 13 August 2020
11	08/12/2022	276/21	Foundering of the sailing boat SILJA and death of a crew member in the Accumer Ee tidal inlet on 26 August 2021
12	20/12/2022	301/21	Foundering of the fishing vessel RAMONA in the mouth of the River Elbe on 21 September 2021

The BSU also published five lessons learned:

Spreadsheet 10: Lessons learned

Serial number	Date	Kind of accident	Description of accident
10	11/02/2022	Contact	Allision with a quay wall
11	23/11/2022	Collision	Collision in the Kiel Canal in dense fog
12	23/11/2022	Contact	Allision with a closed lock gate
13	08/12/2022	Capsize and sinking	Foundering of a recreational craft and death of a crew member
14	08/12/2022	Personnel accident	Death of a crew member after falling from a height in the cargo hold companionway
