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ANALYSIS OF THE CAUSES OF LOSS OF LIFE AS A RESULT OF THE SINKING OF THE M/V BATUHAN-A, USING THE FISHBONE METHOD

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Abstract
There are many large -or small-scale accidents in world maritime history. In addition to the fact that maritime is a dangerous profession, when the human factor is added, accidents become an inevitable reality. Maritime accidents have various consequences, such as pollution, injury and loss of life and others. Precautions are taken to prevent accidents and consequences occuring as a result of accidents. Despite all precautions, maritime accidents occur and many seafarers are injured or even loss their life. Six personnel lost their lives in the accident that resulted in the ship named Batuhan-A, sinking in the Sea of Marmara on 15 February 2024. The fact that all personnel lost their lives in the accident that took place 4 nm away from the shore is an issue that should be particularly examined. In this study, the fishbone method, also known as the Ishikawa diagram, was used to seek an answer to the question of why there was loss of life in the accident. As a result of the analysis, it was revealed that there was a delay of order to abandon the ship and that the emergency procedure was not operated correctly.

Keywords: M/V Batuhan-A, abandon ship, sinking, fishbone method, loss of personnel

Introduction
Sea transportation is a transportation method that has the lowest transport unit cost and therefore accounts for approximately 90% of international trade (Friedrich et al., 2007). Therefore, as trade volume increases, world fleet capacity also increases in direct proportion. Among a variety of factors, human-oriented and shift work on ships are the main elements of the sector, and considering the numerical increase of these factors, the risk of accidents also increases. The main source of risk are technical glitches and human-oriented work. Additionally, when harsh weather and sea conditions are added to these resources, the risk potential increases even more (Lafçı & Öztekin, 2020). Accident rates are regularly monitored to analyze the root causes of maritime accidents. In year 2022, 2637 ship accidents occurred and 14 ships sank as a result of

these accidents. A total of 36 deaths and 621 injuries were recorded (EMSA, 2022). Risk potential and accident are two interrelated variables. Any reduction of these factors may reduce the risk potential and this is reflected in the accident statistics. For this purpose, IMO (International Maritime Organization) has set rules for ship and personnel safety through various conventions. These rules and practices determine what the personnel must do in emergency situations and enable the personnel to react immediately and correctly through drills and training programs on ships. The immediate reaction of the personnel means that they can be saved by quick responses following the procedure, especially when abandoning the ship. For maritime accidents, root cause analyzes are performed to determine the reasons of the accident. Analysis results made with different root cause analysis methods are used to prevent further accidents. For example, Kum and Şahin (2015) analyzed 65 accidents that occurred in the Arctic Area between 1993 and 2011, using the root cause analysis method, and according to the results, the biggest reason was found to be human error. Also, 60 ship accidents that occurred in Mersin Gulf were examined with the Fault tree method and it was determined that 28% of the accidents were caused by conflict and 83% of this was caused by human error (Buber et al., 2018). Six people lost their lives in the accident that resulted in the sinking of the ship named M/V Batuhan-A to a depth of approximately 51 meters in the southwest of İmralı island (Türkiye) at around 06:30 on 15 February 2024. This study aimed to determine the root causes of personnel deaths using the fishbone method.

Material and Method

In order to perform a root cause analysis regarding the accident evaluated in this study, data about the ship and the accident have been collected. Since accidents that occur especially in the maritime sector are not on the agenda very much, the necessary data cannot be accessed until the accident report is published. However, the accident involving the ship named Batuhan-A was constantly kept on the agenda by the press and the public, and a regular flow of information about the accident was ensured. This information flow enabled the collection of sufficient data for root cause analysis for this study.

There are many methods to determine the cause of accidents. The root causes of the accident can be determined using methods such as 5 whys, fishbone method, fault tree analysis. All three methods are acceptable in performing analysis depending on the characteristics of the event. Among these methods, the fishbone method has been used in the present study.

The fishbone method is used to identify possible causes of a particular problem or condition. The causes of the problem can be reached by using statistical methods and based on the analysis results, and visually in a way that can reveal the cross-relationship between the results and the reasons for the accident. The process is completed when reasons are made explainable. This method is supported by brainstorming and was discovered by Kaoru Ishikawa. Hence it is also known as the Ishikawa diagram, and later called as “fishbone” due to its appearance (Sivaraman & Varadharajan, 2021).

Main causes and sub-causes are determined by the people participating in the brainstorming. Sub-causes are scored by the participants and the sub-cause with the most points is considered the source problem (Kerridge, 2012).

Results and Discussion

The ship named M/V Batuhan-A commenced voyage to Roda Port in Gemlik with a cargo of 1250 tons of marble dust, which it bought on Marmara Island, on 14 February 2014 (Çapkın, 2024). Due to bad weather and sea conditions, it sank 4 nautical miles north of Karacabey District of Bursa (southwest of İmralı island) and 6 personnel on board were lost (Sezgin, 2024). The personnel working as an oiler on the ship states in the video he sent to his wife that the ship has taken on water and that they have been in the same position for 6 hours. Additionally, in the video, it was seen that the tarpaulin stretched over the hatch cover has opened and sea water has reached the top of the hatch cover (Candemir, 2024). As the hatch cover leaked, the sea water that filled the hold was absorbed by the marble dust that was the cargo of the ship, and the weight exceeded the carrying capacity of the ship. To prevent this situation, ship personnel tried to evacuate water by tying themselves to the deck with belts (İstikbal, 2024). The ship sank while the personnel was on work, which lasted approximately 6 hours, but did not yield any results.

In the HTS (Historical Traffic Search) records uncovered within the scope of the investigation, it was determined that the personnel did not contact the Gendarmerie, Coast Guard, Port Authority or surrounding ships until 06.28 (4 minutes before the ship sank). During this period, the ship's crew met with their relatives and did not call for emergency help. The ship owner was also on the ship and contacted Turkish Radio at 06.28, saying that the ship was sinking and requesting help. The ship sank approximately 4 minutes later (Çelikler, 2024).

During the dives made to the wreck of the ship, which was 4 nautical miles north of Karacabey and at a depth of 51 meters, the lifeless body of a personnel was found on the bridge of the ship. It was determined that the body found was that of the ship's cook and was found near the helm (Kayhan, 2024). The causes of deaths that occurred with the sinking of the Batuhan-A ship were analyzed using the fishbone technique and the problems in Figure 1 were revealed.

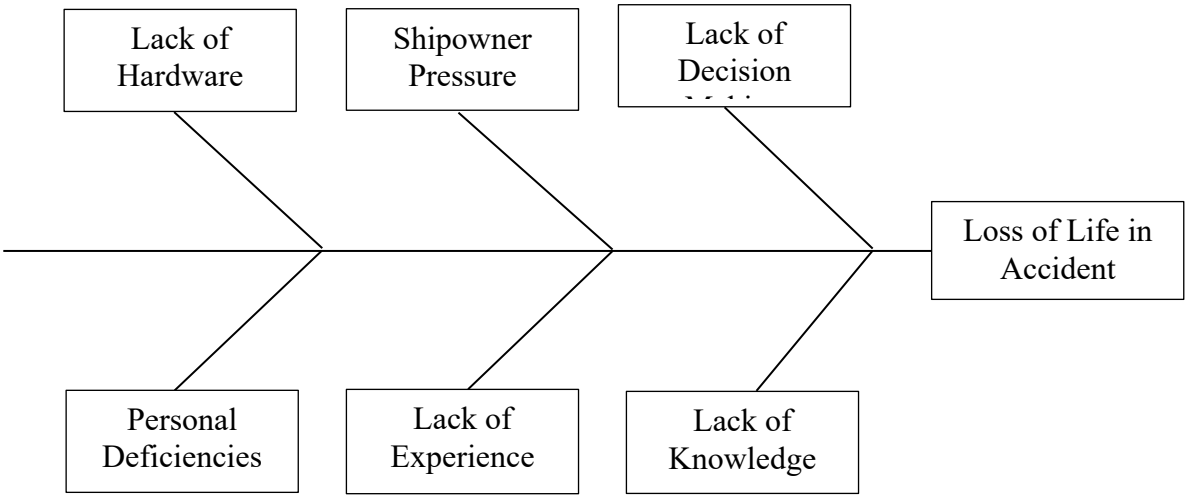

Figure 1. Hazard identification and risk assessment program flow chart

As can be seen in Figure 1, one main and six sub-problems were identified in the study. The main problem is that although the ship was 4 nm away from the shore, the survivors could not leave the ship and loss of life occurred. The sub-problems that are thought to cause this can be listed as follows.

- Failure to fully analyze the situation, especially on the part of the ship master, resulting in lack of decision making,
- Possibility of intervention in the decision-making process of the shipowner as a personnel on the ship,
- Lack of equipment that can be used in accident conditions, including lifesaving equipment on the ship,
- The personnel's time working at sea and not gaining the desired experience during this period,
- Personnel with lack of information regarding the procedure to be followed in case of abandoning the ship or flooding,
- The emergency equipment to be used in these conditions, such as personal protective equipment, have not been used or deemed unnecessary at the time of the incident.

After the causes of the accident are determined, the risk assessment of the post-accident situation is reduced to an acceptable risk level with control measures in accordance with legal obligations and workplace policy, so as not to cause harm and damage. The cause & effect diagram of the fatalities that occurred on the Batuhan-A ship is given in Figure 2. By applying the fishbone method, the main causes and sub-causes that may cause deaths are separated in the order of importance. According to this; inability to analyze the situation, hesitation in ordering to abandon ship, lack of control over the situation, ignorance of emergency procedures, failure to broadcast emergency messages, failure to use position reflecting devices, thought of material loss, authority hesitation, overload ship condition, lack of collective lifesaving equipment, lack of abandon ship equipment, lack of position reflective devices, lack of experience of the captain and staff, inability to cope with the pressure of the emergency, not wearing a life jacket, working in a way that restricts movement and not communicating with the authorities were found among the reasons for the occurrence of fatalities.

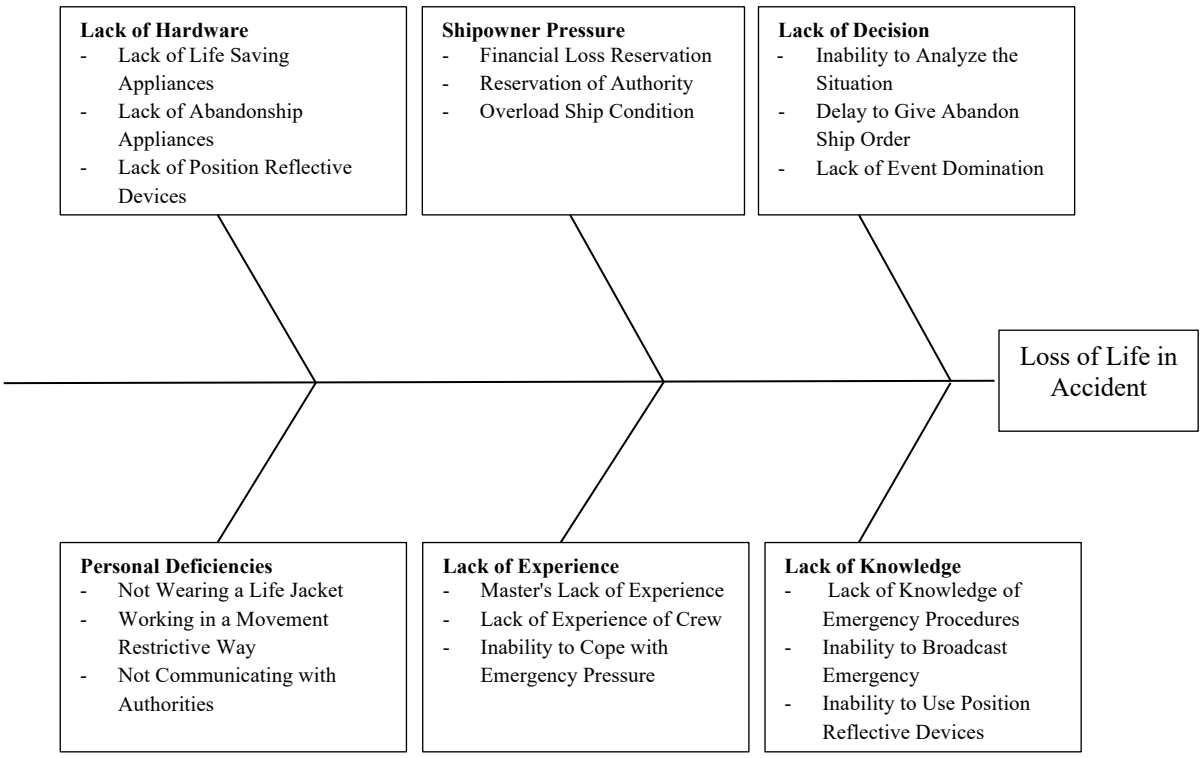

Figure 2. Cause-effect diagram of loss of life in an accident

All reasons were listed and analyzed using the brainstorming technique with 2 oceangoing masters, 2 occupational safety experts and 3 academicians, using the main and sub-causes diagram shown in Figure 2. According to this evaluation, the following outcomes were underlined;

- Lack of equipment is not a common issue on ships. The reason is that surveys are carried out regularly by the General Directorate of Maritime Affairs. Within the scope of the survey, the ships are also checked in terms of equipment, their missing equipment is completed, and if necessary, they are not allowed to sail during this period.
- The shipowner is on the ship as personnel. This may have caused pressure on staff. However, sub-causes are very unlikely, especially when the ship is overloaded and there is a reservation from the authority. Surveyors of the relevant authority do not allow the ship to depart with overload. Therefore, it is unlikely that they were sailing in a condition that violates the rules.
- It is not clear whether personal protective equipment is worn by the personnel. However, in the video recorded by the oiler working on the ship, it is seen that he is not wearing a life jacket. It is also known that the personnel tied themselves to the stanchion to straighten the tarpaulin pulled over the ship's hold. This is likely to have a restrictive effect on their movements.
- The seafarer who serves as a captain has been working on ships for about 40 years and is known to have risen from seaman to master. For this reason, it would not be correct to think that the master, who is the decision maker, lacks any experience. However, it is known that the personnel on ships operating on these lines complete the required service period on such ships, as they can obtain the necessary certificates to work on oceangoing ships. So, it is possible that they cannot act as a team with personnel who lack experience.
- There is a strong possibility that the personnel do not have enough knowledge about emergency issues and therefore do not carry out the necessary procedure. It appears that actions such as abandoning the ship, broadcasting the emergency message on time, and manually operating position reflecting devices were not taken.
- There is a possibility that the master was busy with tarpaulin pulling and therefore could not maintain control of the situation. For this reason, his failure to give the order to abandon ship is a reflection of this process. This explains why the captain, who was in a position to analyze all events, could not give the necessary abandon ship order in time.

Conclusion

When the process of the accident is followed, it is possible that the shipowner indirectly intervened in giving the order to abandon the ship, but it is thought that the captain did not give the order to abandon the ship or gave this order with a delay. It is seen that the life raft found at the end of the accident was opened by a hydrostatic lock. It is thought that if there was no delay in giving the order to abandon the ship and the evacuation of the personnel from the ship were completed without any problems, the probability of survival until the arrival of the rescue teams would have been quite high.

Ethical approval

No ethical approval needed for this study since no living organisms were used.

Informed consent

Not available.

Data availability statement
The authors declare that data can be provided by corresponding author upon reasonable request.

Conflicts of interest
There is no conflict of interests for publishing this study.

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Contribution of authors
The author contributed to conceptualization, data curation, formal analysis, writing the original draft, investigation, methodology, resources, validation, visualization, and finalizing the paper.

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