

Statistical Studies on Marine Accidents Happened on the Bohai Sea

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ABSTRACT: a statistical study is carried out on the basis of information of marine traffic accidents occurred from 1996 to 2005 on the Bohai Sea. The time distribution and geographic distribution of the marine traffic accidents, as well as the relationships between the accidents and weather condition, type of accidents area, accident category, size of ships are analyzed, which provide references for adopting safety decision-making and take relative precautionary measures to avoid and decrease occurrence of accidents.

1 STATISTICAL STUDY ON MARINE TRAFFIC ACCIDENTS

In order to find out the laws of occurrence of marine traffic accidents, so as to provide references for the maritime safety administrations to adopt reasonable safety decision-making, and for seafarers to take relative precautionary measures, statistical study of marine traffic accidents is important and effective tool, which has been often used governmental bodies and experts worldwide.

A statistics and analysis of marine traffic accidents in Chinese navigable waters during the period 1993-2002 have been carried (Wu, et al 2005), the following conclusions have been formulated:

- with the rapid development of Chinese domestic economics, the requirements on waterborne transportation are also enhanced. There is a trend that the marine traffic in Chinese waters will continuously increase.
- the marine safety situation in Chinese navigable waters is still not optimistic. Although the number of marine traffic accidents reduced drastically during the period of 10 years, the loss

of life and direct economic still keep at high levels.

- the causes of marine traffic accidents are multi dimensional. The major factors that lead to the accidents in Chinese waters are human error, marine traffic environment and ship conditions. The incompleteness of the waterborne transportation safety ensuring and supporting system has also somewhat negatively influenced on the maritime safety situation.
- for the purpose of Chinese waterborne transportation, it is necessary for Chinese government to pay more attention to the completeness of Chinese waterborne transportation safety and its supporting systems.

The findings of above research is beneficial to the maritime safety administrations of Chinese central government to adopt national decision-making on maritime safety management, but it is also important to carry out statistics and analysis of marine traffic accidents in a given sea area to help local maritime safety administrations to adopt proper safety management decision-making, and help seafarers to take relative precautionary measures. In this paper a statistical study is carried out on the basis of information of marine traffic accidents occurred on

the Bohai Sea from 1996 to 2005, because that the Bohai Sea is one of important navigable waters in the northern China and is also a sea area in which marine traffic accidents occur frequently.

2 STATISTICS AND ANALYSIS OF THE MARINE TRAFFIC ACCIDENTS ON THE BOHAI SEA

The data used in the following statistics and analysis come from the marine traffic accidents investigation department of four maritime safety administrations located around the Bohai Sea, which are responsible for the marine safety of one of part area of the Bohai Sea .From 1996 to 2005 the total number of marine traffic accidents occurred in the Bohai Sea is 1738, including all kinds of marine traffic accidents.

2.1 Time Distribution of accidents by month

In Figure1 the statistical distribution of marine traffic accidents on the Bohai Sea by month is represented. About 145 traffic accidents occur every month on average. The Figure 1 shows that there are two periods with high frequency of accident happening, they are from April to June and from October to November. During last ten years, most. The proportion of accidents occurred in April is 10.4% of the total and 24% higher than the month average. The proportions of October and November are 10% and 9.8%, and 19% and 17% separately higher than the month average. The proportions of May and June are 9.3% and 9.6%. The number of accidents in the period of from October to April of next year is 60.7% of the total. The numbers of the marine traffic accidents in October and November increase obviously and maintain in a high level, because that the first cold wave and gale often come in this two months of each year, which shows that the first cold wave and gale of each year has a bigger impact on the safety of the vessels navigating on the Bohai sea.

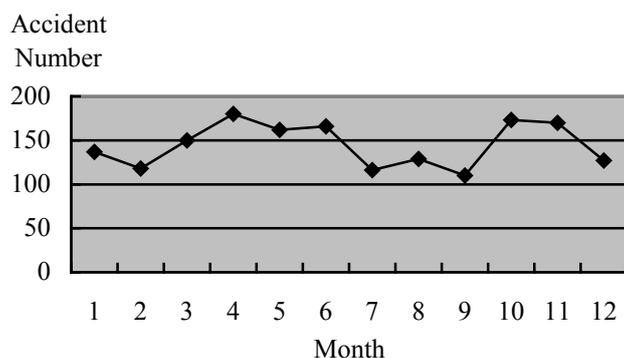


Fig. 1. Time distribution of accidents by month

2.2 Time distribution of accidents by date

In Figure 2 the statistical distribution of marine traffic accidents on the Bohai Sea by day is represented. About 56 marine traffic accidents occur every day on average. Generally the marine traffic accidents by day keep fluctuation.

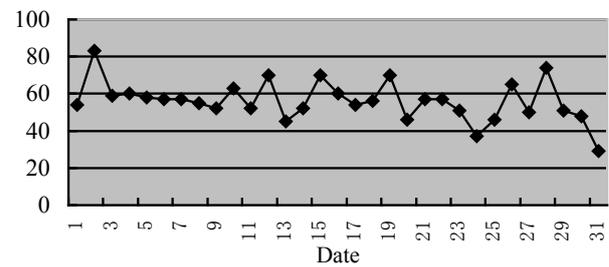


Fig. 2. Time distribution of accidents by day

2.3 Geographical distribution of accidents

According to the data of the locations of marine traffic accidents, geographical distribution of traffic accidents by the type of water area could be known. Figure 3 implies that majority of marine traffic accidents occurred in port waters, up to 63%, the coastal waters(exclude port waters) is of 34%. It indicates that it is necessary to strengthen the port waters safety management, improve the VTS functions as well, to pull down occurrence rate of marine traffic accidents.

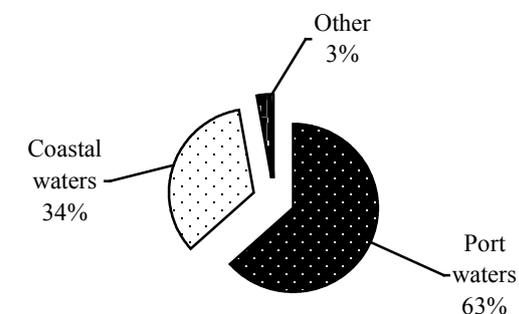


Fig. 3. Geographical distribution of accidents

2.4 Statistics of accidents by accident category

According to Regulations on Statistics and Reporting of Marine Traffic Accidents established by Chinese maritime safety administrations, marine traffic accidents are divided into collisions, contacts, groundings, fire, heavy weather (such as serious damage and capsized by strong winds and waves) and others. By initial accident category, the numbers of collision, grounding and contacting accidents are on the top 3 (see Figure 4), which is 73% of the total accidents. Among them the number of collision accidents is at the first and is 40% of the total. It

seems that because of high speed development of shipping, higher density of ships, converge of sea routes, crowded and complicated marine traffic on the the Bohai Sea increase risk of collision enormously. On the other hand, fire and heavy weather accidents do not happen frequently and the proportion is separately 3% and 1% of the total.

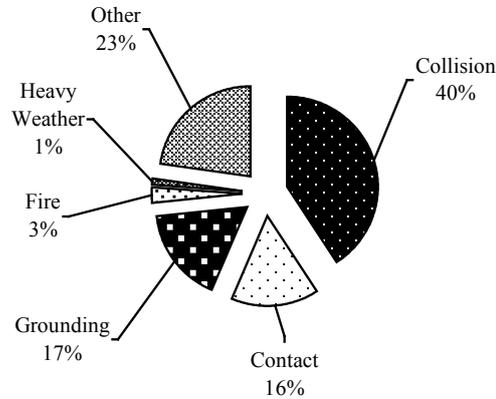


Fig. 4. Statistics of accidents by initial accident category

2.5 Statistics of accidents by accident grade

Marine traffic accidents are divided into four grades, according to the losses of lives and property, in Chinese marine traffic accidents reporting and statistics regulations, which are small accident, general accident, serious accident and very serious accident separately. Figure 5 gives proportions of different grade of marine traffic accidents occurred on the Bohai Sea. As seen from the Figure 5, most of the accidents were small accident, accounted for 72%; then general accidents for 16%; thirdly, serious accidents for 7%; lastly, very serious accidents for 5%.

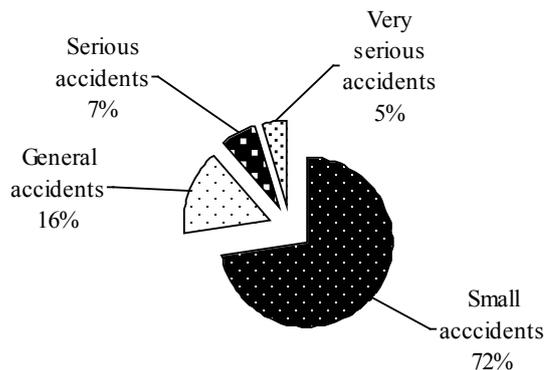


Fig. 5. Statistics of accidents by accident grade

2.6 Statistics of accidents by ship appearance

According to statistics by ship appearance, the proportion of accidents of underway ship is largest, about 79%, and then accidents of anchoring ships (11%), accidents of going / leaving berth ships (6%),

and accidents of mooring ships (3%), see Figure 6. It is consistent to that majority of accidents is collisions and groundings.

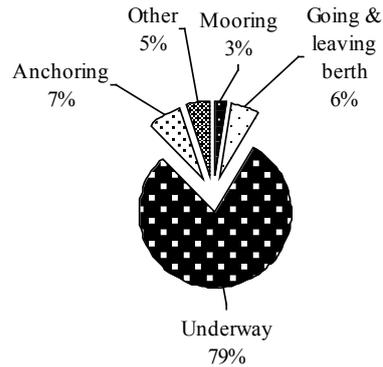


Fig. 6. Statistics of accidents by ship appearance

2.7 Relationship between accidents and wind

For weather condition the wind is an important factors affecting navigational safety of ships. From Figure 7. It could be seen that the proportion of marine traffic accidents under the wind condition (Beaufort scale) of No. 5 (Fresh breeze) and below accounts for 39%, and under the wind condition of No. 6 (Strong breeze) is 61%. It indicates that the wind conditions have important influence on occurrence of marine traffic accidents.

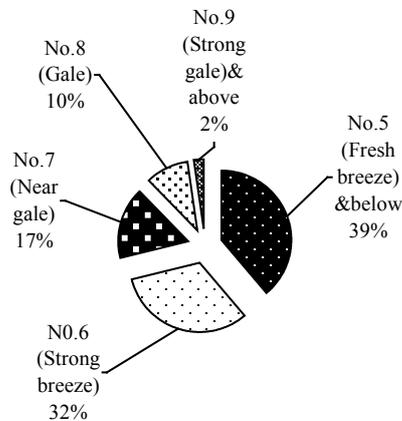


Fig. 7. Statistics of accidents by wind condition

2.8 Relationship between accidents and wave

For sea condition the wave is another important factors affecting navigational safety of ships. From Figure 8, it could be seen that the proportion of marine traffic accidents under the condition of very rough sea account for 8%, and under the condition of rough sea, moderate sea, light sea account for 23%, 36% and 33% separately. It indicates that the sea condition has important influence on occurrence rate of marine traffic accidents.

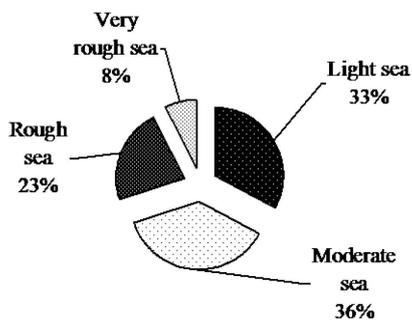


Fig. 8. Statistics of accidents by wave condition

2.9 Statistics of accidents by ship type

According to statistics by ship type, the proportion of accidents of general cargo ship is the largest one, about 45%, then oil tanker for 11%, and then bulk cargo vessel and fishing vessel for 10%. The proportion of accidents of passenger/Ro-Ro ship is only 6%, see Figure 9.

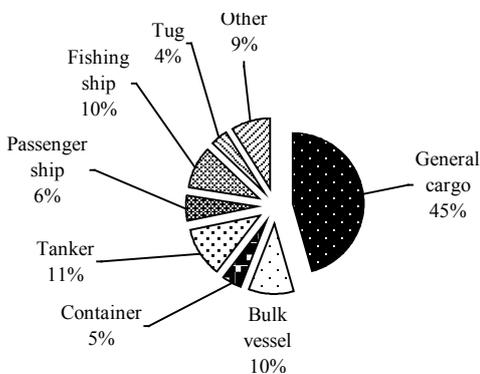


Fig. 9. Statistics of accidents by ship type

2.10 Relationship between accidents and length of ships

According to statistics by ship length, the largest proportion of accident lay on ships which length is between 50m and 90m, about 32%. Ships of length between 90m and 135 m are about 24%, as the same as ships of length below 50 m. The lowest proportion of accidents lay on ships which length is above 246m, see Figure 10.

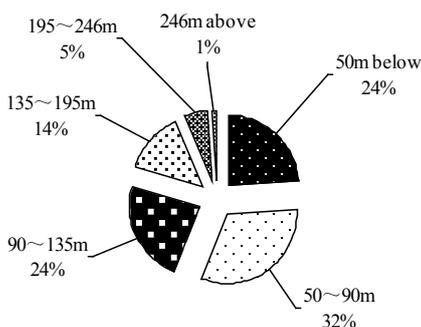


Fig. 10. Relationship between accidents and ship length

2.11 Relationship between accidents and gross tonnage of ships

According to statistics by the gross tonnage of ships, the proportion of accident of ships whose gross tonnage is between 500 and 2999 is the largest, amount to 48%. Followed by ships gross tonnage between 3000 and 9999 (25%), ships gross tonnage below 500 (15%), ships gross tonnage between 10000 and 29999 (6%), ships gross tonnage 30000 (2%), see Figure 11.

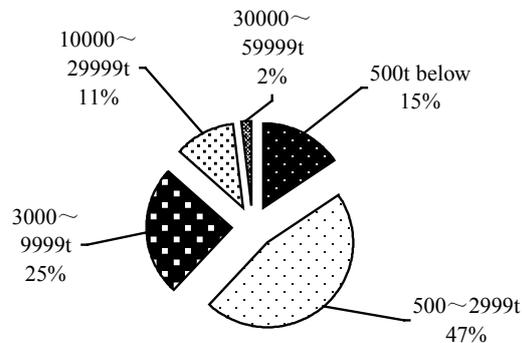


Fig. 11. Relationship between accidents and ship tonnage

3 CONCLUSION

The above statistical study indicates that the occurrence of marine traffic accidents occurred on the Bohai Sea in last ten years has its statistical laws and has different relationship with conditions of ships and some influence factors, which is valuable for the officers of maritime safety administrations and seafarers to consider, because that accident data used for above statistical study is reliable data from official resources, and the accidents data cover the whole part of the Bohai Sea in ten years time. But it is also suggested that the findings of above statistical study should be properly referenced and used by consideration of local environments, practical conditions and individual experiences. Further work to be done is statistics and analysis of causes and contributing factors of marine traffic accidents occurred in last ten years time on the Bohai Sea, then more valuable information could be provided for reference and consideration.

REFERENCE

Wu, Zhaolin & Liu, Zhengjiang (2005). Statistics and analysis of maritime traffic accidents in Chinese navigable waters. IAMU Journal, 1, 2005, 63-72.