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Analysis of Risk Factors in Fishing Activities in Lake Erçek (Van, Turkey) for Occupational Health and Safety

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ABSTRACT

Fishing activities have always been a dangerous profession and numerous factors have a direct or indirect impact on the health, safety, and working conditions of fishermen. The present study aims in order to reveal the risk factors affecting the occupational health and safety of small-scale fishermen in Lake Erçek (Van, Turkey). Data were obtained from fishermen by survey between March 2022 and May 2022 and evaluated using the" *L type matrix*" method. "Having no training in occupational health and safety (OHS)" and "Fatigue from irregular and long working hours" are the important risk factors that affect the working conditions of fishermen. This study will make a significant contribution to the work efficiency of the fishermen and the planning to be made in the following processes, by making a risk analysis in terms of occupational health and safety before the possible increase in the number of fishermen in Lake Erçek (Van, Turkey).

Keywords: Fisherman, Occupational health and safety, Lake Erçek, Van, Turkey.

1. INTRODUCTION

Occupational Health and Safety (OHS) is expressed as a dynamic and multidisciplinary discipline that is constantly developing as a result of a human-oriented approach, nowadays. The main objectives of occupational health and safety practices are to protect employees in all sectors from work accidents and occupational diseases, and thus to increase production and quality (Soykan, 2021). OHS issues have become one of the important issues that are emphasized both in Turkey and in the world, since work accidents that occur in a working environment and occupational diseases, which are their natural reflections, are an obstacle to the development of countries due to the results they create (Sevinç et al., 2016).

Each sector has its own unique working conditions. One of these sectors is fishing (Soykan, 2021). The global catch generated by fishing is 96.4 million metric tons (MT), which is mostly driven by marine ecosystems. Globally, 4.56 million fishing vessels (from small, undecked and non-motorised boats up to large industrial vessels) and 59.51 million individuals are engaged (on a full-time, part-time, or incidental basis) within the essential segment of capture fishing (39.0 million individuals) (Abu Zakari et al., 2022). This sector has a special importance in terms of occupational health and safety, considering the number of employees and dangerous working conditions (Doğanyılmaz Özbilgin and Tok, 2017). Fishing activities

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generally take place in harsh sea conditions. When the weather is difficult, the number of accidents and injuries is quite high (Kaplan and Kite-Powell, 2000). In such a situation, a fisherman may be far from professional health care in the event of illness or accident and may need the assistance of other ship's personnel until he is brought ashore. However, the salaries of the fishermen are not fixed, they are given a certain share from the catch. This situation causes fishermen to prefer to stay in the sea even in bad weather conditions, to get tired as a result of working for very long hours, and therefore to be exposed to higher risks and to encounter more accidents (Soykan, 2018). For these reasons, fishing is considered the most dangerous and risky occupation in many countries of the world (ILO, 2010). According to International Labour Organization (ILO) and Food and Agriculture Organization (FAO), 7% of all labourer mortalities occur in the fishing industry (Antao et al., 2008). These casualties and serious wounds put fishing as a profession at the top of the list of risk hierarchy. In a study, fishing mortality at sea was reported as 0.08% per year (Conway et al., 2006). This is mainly due to the insecure working atmosphere (Jeżewska et al., 2012).

Although the number of studies on OHS in fishing activities in the world is high (Matheson et al., 2001; Windle et al., 2008; Frantzeskou et al., 2012; Eckert et al., 2018; Jennifer et al., 2021; Krishnan, 2021; Laura et al., 2021, etc), these studies in Turkey are quite new and have been carried out in the last ten years (Perçin et al., 2012; Tantoğlu, 2016; Ulukan, 2016; Doğanyılmaz Özbilgin and Tok, 2017; Tatar et al., 2018; Köken et al., 2019; Soykan, 2018, 2021; Atay and Cengiz, 2022; Mermer et al., 2022). Most likely, the biggest reason for this is that this concept was enacted in 2012 in Turkey. Available information on occupational health management and safety issues is almost non-existent in Van Lake Basin and any study on occupational health and safety (OHS) of fishing activities in Lake Erçek (Van, Turkey) have not been carried out before. In this study, it is aimed to reveal what kind of hazards the workers on fishing boats may be exposed to during fishing activities and what kind of risks these hazards pose. Thus, it is hoped that safe conditions will be provided for those working on fishing boats, taking into account the risk analysis application prepared within the scope of this study.

2. METHODOLOGY

2.1. Study Area and Sampling

There is one fishing coastal structure in Lake Erçek, which is located within the borders of Van Province (Fig 1). Between March 2022 and May 2022, twelve fishermen working on two fishing boats were asked 30 questions through face-to-face surveys.

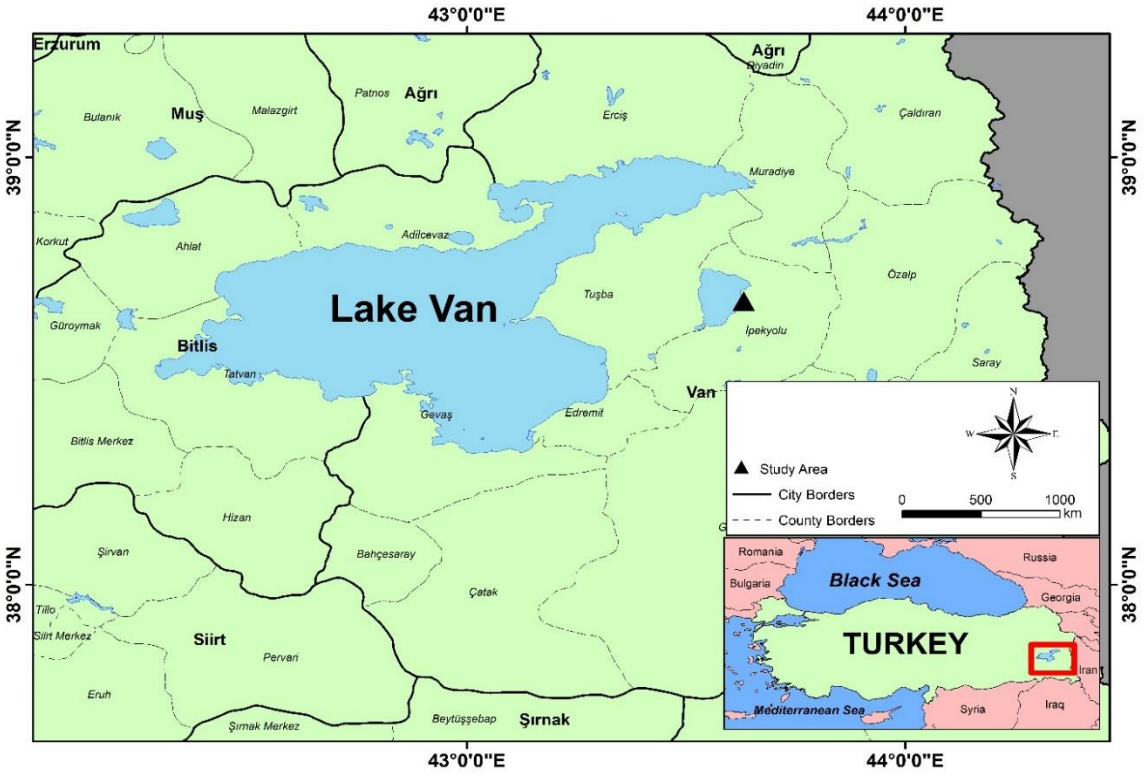

Figure 1. Van Lake Basin and study area (Lake Erçek).

2.1. Data Processing and Analysis

In order to analyze the risk factors of fishing activities in Lake Erçek, the "*L Type Matrix*" method was used because it is practical in the field and easy to be applied to all sectors. The detection, grading and evaluation of risks with the help of this method was demonstrated by the study conducted by Loughran et al. (2002) and the applicability of the method in the fishing industry was observed. As a result, it has been adapted to the fishing industry for risk management on industrial fishing vessels in Western Australia (Fletcher, 2005). In addition, the International Maritime Organization (IMO) has recommended this method since 2002 (Tantoğlu, 2016).

The "*L-Type Matrix*" method is a method used in the analysis of the cause-effect relationship (Özkılıç, 2005). In this method, the probability of occurrence of a risk/dangerous event (Table 1) and the severity of this risk/dangerous event if it occurs (Table 2) take numerical values from 1 to 5. Afterwards, the risk score is obtained by multiplying the probability of occurrence of the risk/dangerous event and the degree of severity of this probability (Table 3). Thus, the actions to be taken (control measures) are decided.

Table 1. Realization probability of the risk.

Possibility	***Risk Realization Frequency***
Too small	(1) Hardly ever
Small	(2) Very little (once a year)
Medium	(3) Few (several times a year)
High	(4) Frequently (once in a month)
Very high	(5) Very often (once a week / every day)

Table 2. Severity of the risk, if realized.

Severity		***Possible Outcome***
Very light	(1)	No loss of working hours, needing first aid
Light	(2)	No loss of working hours, no lasting effect and requiring outpatient treatment
Medium	(3)	Condition that causes minor injury and requires inpatient treatment
Serious	(4)	Condition that causes serious injury and requires long-term treatment, occupational disease
Very serious	(5)	Condition causing death or permanent incapacity for work

Table 3. Deciding the action to be taken according to the risk score.

Risk Score	***Meaning***	***Action***
1	Minor risks	There is no need to take measures to eliminate the identified risks.
2-3-4-5-6	Low risks	There is no need for additional measures to eliminate the identified risks. Existing measures need to be maintained and their sustainability monitored.
8-9-10-12	Medium risks	Although not urgent, measures should be taken to reduce the identified risks.
15-16-20	High risk	Work should not be started until the risk has been reduced. Considerable resource allocation may be required to mitigate risk. If business is to continue despite this risk, urgent measures must be taken.
25	Intolerable risks	Work is not started until the identified risk is reduced to an acceptable level. Ongoing activities are stopped.

A risk assessment table was created for the fishermen in Lake Erçek using the "*L Type Matrix*" method. The sample table has been prepared based on personal observations and experiences of Tantoğlu (2016); and Soykan (2018). In this table, 30 risks and possible consequences of risks are indicated. In the research, the fishermen were asked a) what the current safety measures are against these risks and the possible consequences of the risks; b) the probability of the occurrence of these risks and the severity of these risks if they are faced;

c) whether the current safety measures are sufficient by creating a risk score; and d) Even if it is sufficient, it has been decided that additional safety measures should be taken.

3. RESULTS

Face-to-face interviews were made with twelve fishermen in the fishing coastal structure of Lake Erçek, and the findings in table 4 emerged as a result of the answers given by the fishermen. The likelihood and severity of the risk are the average of the numerical values given by the fishermen.

Table 4. Risk analysis results of fishing activities in Lake Erçek.

Risk/Dangerous Event	***Possible Outcome***	***Current Safety Measure***	***Risk Level***			***Additional Safety Measure***
			Likelihood of Risk	***Severity of Risk***	***Risk Score***	
1) Not checking the weather before sailing	Boat sinking, loss of life	Weather is checked, regularly	1	4	4	Current safety measure are sufficient
2) The occurrence of unpredictable weather conditions	Boat sinking, loss of life	Boats return to fishing coastal structure	1	3	3	Current safety measure are sufficient
3) Not using the pier during boarding and disembarking	Falling overboard, injury	The scaffold is in continuous use	1	2	2	Current safety measure are sufficient
4) Boats are not equipped with fenders	Damage/material loss caused by boats rubbing against each other	There are fenders, but not enough	2	3	6	The number of fenders should be increased
5) Unevenness of the working area on the deck	Injuries resulting from falls, loss of life	Working area is kept tidy	1	3	3	Current safety measure are sufficient
6) Working hanging from the deck	Falling overboard, loss of life	Not working by hanging	1	4	4	Current safety measure are sufficient
7) Netting not neatly stacked on deck	Injury from tripping and falling	Network is regularly stacked continuously	1	3	3	Current safety measure are sufficient
8) Fishermen's inexperience	Injuries, decreased in work efficiency	Newly hired fisherman is being informed	3	3	9	This information should be provided by specialized institutions
9) Working in wet and cold conditions	Employee cold, decrease in work efficiency	Fishermen wear underwear and overalls	1	1	1	Current safety measure are sufficient
10) Letting go of the rudder	Boat sinking, loss of life	The captain is always at the helm.	1	1	1	Current safety measure are sufficient

11) Falling overboard	Death by drowning	All fishermen can swim	1	1	1	Current safety measure are sufficient
12) Noise	Not hearing instructions	Sign language is used when necessary	1	2	2	Current safety measure are sufficient
13) Transport of catch/fishing gear	Injuries to the hands, back and lumbar	Fishermen help each other	4	2	8	Current safety measure are sufficient
14) Slippery deck	Injuries resulting from falls	Fishermen wear non-slip boots	1	1	1	Current safety measure are sufficient
15) Fatigue from irregular and long working hours	Injuries, decreased in work efficiency	No current safety measures	5	4	20	Fishermen must work in shifts
16) Getting tangled in the net while the net is being laid	Falling overboard, loss of life	The net is thrown into the sea by experienced people	1	1	1	Current safety measure are sufficient
17) Fire	Boat sinking, loss of life	Such a situation has never happened	1	1	1	Fire extinguishers should be available on the boats.
18) Insufficient number of life-saving equipment	Loss of life	Sufficient life-saving equipment is available and placed in a visible place.	1	1	1	Current safety measure are sufficient
19) Fishermen do not know how to swim	Death by drowning	All fishermen can swim	1	1	1	Current safety measure are sufficient
20) Absence/control of litter boxes	Environmental problems, risk of infectious disease, hygienic problems	There are trash cans and they are emptied at every return to port.	1	1	1	Current safety measure are sufficient
21) Lack of hygiene in the boat galley	Food poisoning	Foodstuffs and kitchen are cleaned regularly	1	1	1	Current safety measure are sufficient
22) Lack of hygiene in common areas such as WC	Hygienic problems	Common areas are cleaned daily	1	1	1	Current safety measure are sufficient
23) The shelves are not fixed	Injury from tipping	Shelves are fixed	1	1	1	Current safety measure are sufficient
24) Problems with freshwater requirement	Infectious disease risk, hygienic problems	There is no problem with the freshwater requirement.	1	1	1	Current safety measure are sufficient
25) Lack of first aid cabinet on the boat	Injury	There is a first aid cabinet according to the first aid regulations	1	1	1	Current safety measure are sufficient

26) Lack of first aid training	Injury	Fishermen have the information they need	2	3	6	Current safety measure are sufficient
27) Having no training in occupational health and safety (OHS)	Injury, loss of life, occupational disease, material damage	No informing about OHS	5	4	20	Fishermen should be given training in OHS as soon as possible
28) Trying to land before the boat docks fully at the pier	Falling overboard, injury	No current safety measures	5	2	10	Do not go ashore before the boat is moored to the port and the engines are turned off.
29) Insufficient communication in case the boat is moored to the pier	Falling overboard, injury	It is stated that the communication is made by a single expert.	1	1	1	Current safety measure are sufficient
30) Electric leakage	Injuries due to electric shock, loss of life, fire	It is stated that the sockets are solid	2	5	10	Plugs should be checked periodically.

As a result of the answers given by the fishermen, it was observed that 15 of the 30 risks were in the insignificant risk group (50.0%), 9 of them were in the low risk group (30.0%), 4 of them were in the medium risk group (13.3%) and 2 of them were in the high risk group (6.7%). As a result of the answers given by the fishermen in the study, "Having no training in occupational health and safety (OHS) and "Fatigue due to irregular and long working hours" are in the high-risk group.

4. DISCUSSION

From this point of view, FAO (2001); Roberts (2004); Jensen et al. (2014); and Asumeng and Folitse (2019) etc, underlined that fatigue is one of the main factors affecting accidents in the marine environment. In addition, Asyali and Kızkapan (2012) stated that the risk of accidents in marine environments increases due to overwork and resulting fatigue of fishermen. However, Doğanyılmaz Özbilgin and Tok (2017) emphasized that lit cigarettes due to fatigue caused by long working hours caused a fire on the boat as a result of sleeping without extinguishing. Finally, Mermer et al. (2022) stated that the fishing industry cannot benefit from OHS services adequately, that it is important to create occupational safety awareness among fishermen, and that raising awareness of fishermen about these activities will contribute to the formation of safer working conditions.

5. CONCLUSION

Along with Lake Van, Lake Erçek also has endemic and commercially quite important "pearl mullet fish (*Alburnus tarichi* Güldenädt, 1814)", and this fish species constitutes the livelihood of approximately 15 thousand people directly or indirectly in the Van Lake Basin. Strict measures are implemented for the continuity of the stock and illegal, unreported and unregulated fishing activities are not tolerated.

Van city is a province that constantly receives immigration from neighboring provinces. Therefore, in the future, with the increase in the population in Van Province, the people of the region will want to find new employment areas. In this context, Lake Erçek, like Lake Van, is one of these employment areas in terms of fishing. To the extent that the van fish stock is maintained, it is highly probable that there will be an increase in the number of fishermen in the coming years. In this context, this study will make an important contribution to the work efficiency of the fishermen and the planning to be made in the following processes, by making a risk analysis in terms of occupational health and safety before the increase in the number of possible fishermen. In addition, it is hoped that this study will be a resource for researchers interested in the subject in different parts of the world.

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