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RESEARCH ARTICLE ARAŞTIRMA MAKALESİ

Occupational health and safety in large-scale fishing vessels registered in Aegean ports

Ege limanlarına kayıtlı büyük-ölçekli balıkçı teknelerinde iş sağlığı ve güvenliği

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Abstract: This study aimed to determine the occupational safety knowledge level of the fishers and the factors affecting it in large-scale (trawl-purse seine) fishing vessels registered in Aegean ports. In the survey study, conducted with the participation of 295 person from both types of fishing, 40% (118) of the participants consisted of fishers working in trawlers and 60% (177) in purse-seiners. The knowledge level of 51.5% of the fishers was insufficient under score 7, while 48.5% of them were found to be sufficient with score 8 or more. It was determined that 40% of the fishers had occupational accidents, and hastiness with 15.5%, carelessness with 14.9% and fatigue with 5.8% followed the first place among the causes of accidents. It has been determined that the accidents occurred not only during the operation, but also at the port operations and during the cruise. As a result, it is considered that awareness and training activities to increase the knowledge level of fishers on occupational health and safety will be the most effective method in reducing the possibility of accidents and getting occupational diseases.

Keywords: Trawl, purse seine, accident, safety

Öz: Bu çalışma, Ege limanlarına kayıtlı büyük ölçekli (trol-gırgır) balıkçı gemilerinde, çalışanların iş güvenliği bilgi düzeylerini ve bunları etkileyen faktörleri belirlemeyi amaçlamıştır. Her iki balıkçılık tipinden toplam 295 kişinin katılımı ile gerçekleştirilen anketin, %40'ını (118) trol teknesinde, %60'ını da (177) gırgır teknesinde çalışan balıkçılar oluşturmuştur. Balıkçıların %51,5'inin bilgi düzeyi 7 puanın altında yetersiz kalırken, %48,5'i ise 8 puan ve üzerinde yeterli bulunmuştur. Balıkçıların %40'ının iş kazası geçirdiği tespit edilmiş olup kaza nedenleri arasında ilk sırayı %15,5 ile acelecilik, %14,9 ile dikkatsizlik ve %5,8 ile yorgunluk takip etmiştir. Kazaların, sadece operasyon sırasında değil, limanda ve seyir sırasında da yaşandığı tespit edilmiştir. Sonuç olarak balıkçıların iş sağlığı ve güvenliği konularında bilgi düzeylerini artırmaya yönelik farkındalık ve eğitim çalışmalarının, kaza yapma ve hasta olma olasılıklarını azaltmada en etkili yöntem olacağı değerlendirilmektedir.

Anahtar kelimeler: Trol, gırgır, kaza, güvenlik

INTRODUCTION

Commercial fishing is one of the oldest occupation and regarded as the most dangerous job due to its workplace and working conditions in the world (Msed, 2010). Furthermore, fishing turns out to be an occupational group with high disease and accident rates. There are many risks in the activities performed in fishing vessels. Every year more than 24 000 fishermen lose their lives and about 24 million fishermen are estimated to be injured in this sector worldwide (Håvold, 2010). The injury and mortality rates caused by fishing in Australia, America and many European countries are substantially higher than the average rates. Jin and Thunberg (2005) reported that 16 out of every 10 000 fishers died in various accidents at sea in America in 1996 and that this rate was 16 times greater than the deaths experienced at the fire and police departments. According to a study carried out in England between 1976 and 1995, some 454 (74%) of the 616 fishermen who lost their lives died as a result of the accident they got involved in while working and 394 of them (87%) drowned. When compared with the other sectors, the rate of fishermen's getting involved in an accident resulting in death is 52.4 times greater (Roberts and Roberts, 2005). The dangerousness of fishing may be ascribed to many factors like the fact that people work for quite long hours under the hardest conditions of sleeplessness, the cold, and wetness. A safe and healthy working environment may be provided as a result of fishermen's knowledge of the existing risks and the fulfillment of sector-related legal obligations.

Although fishing is known to have high disease and mortality rates, there is rather little research on the effect of working conditions on the health of fishers particularly in developing countries (Matheson et al., 2001). Jin and Thunberg (2005) determined the common factors concerning the accidents in fishing vessels as the poor condition of the

fishing vessel or its equipment, inadequate emergency training, inadequacy in using the water survival equipment and the attention deficit about the vessel balance. In their study on this subject, Wang et al. (2005) concluded that a high rate (20.7%) of the accidents experienced in fishing vessels was caused by the crew and that, apart from this, the inadequacy of the number of crew members, their fatigue, the lack of crew management, poor boat design, hard working conditions and inappropriate arrangements substantially increased the accident rate.

Turkey has a total of 14 092 fishing vessels; 370 of them are purse seines and 790 of them are trawlers according to 2019 fishing records (TUİK, 2020). A total of 28 717 fishermen serve on these vessels, 3 649 in trawlers and 7 549 in purse seiners. A total of 5 995 fishers work in 63 trawler and 55 purse seiner in the Aegean Sea (TUİK, 2020). According to Social Security Institution of Turkey, the number of occupational (fishing and aquaculture) accidents in 2017 and 2020 are 273 and 372, respectively (SGK, 2021). From the reference, the number of occupational accidents in the fishing activities in Turkey has gradually increased over the years. Studies on the on occupational health and safety related to fisheries in Turkey are very limited. For this reason, this study aims to determine knowledge level of the fishers working in large-scale fishing vessels regarding occupational safety and factors influencing it.

MATERIALS AND METHODS

The numbers of trawler (63) and purse seiner (55) vessels operating in the Aegean Sea with a length greater than 12 meters were obtained from the Izmir Provincial Directorate of Agriculture. This study was carried out with 33 trawlers and 32 purse seiners and their employees (295 fishers).

A questionnaire was prepared by making literature review and taking in consideration International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) prepared by the International Maritime Organization IMO, Fishing Boats Sea Survey Checklist of the Ministry of Transport, Maritime Affairs and Communications, Seafarers Regulations and Regulation on the Safety of Fishing Vessels published by this ministry and Regulation on Health and Safety Precautions in the Work Performed on Fishing Vessels published by Ministry of Labor and Social Security, and the Occupational Health and Safety Law No. 6331.

The questionnaire consisted of 35 questions in total. The first 15 questions were related to socio-demographic variables. In the survey, there are 6 questions that measure the level of knowledge about maritime safety and 10 questions about occupational accidents and work safety.

The scoring of the questions related to the level of knowledge is given in Table 1. According to the average score of the participants according to the knowledge level scores; those who scored “average and below” had “insufficient knowledge”, those who scored above the average were evaluated as “sufficient knowledge”.

This study covered the large-scale fishing vessels, purse seiners and trawlers registered in the Aegean Sea ports. Sample selection was carried out by simple random sampling method (Kadilar and Cingi, 2006). The total number of fishers working on trawler and purse seine vessels was firstly estimated, and then it was calculated to conduct a sub sampling group a total of 1250 person sampling volume (Calculated as Prev 50%, Pattern Effect 1, Error 5%, Confidence Interval 95%). A total of 295 person participated in the survey. Of the person who participated in the survey, 118 were trawl and 177 purse seine fishermen. Some of the fishermen participating in the study were captains and personnel of the vessels.

The independent variables in the study were age, experience, whether or not he has a second profession, marital status, educational status, reason for choosing fishing, thinking of quitting fishing, wanting his children to do this job, position, type of boat he works, daily working time, income, income satisfaction, social security and document he has identified as the type. Dependent variables were determined as the level of knowledge about safety at sea and measured as "Occupational Health and Safety Score", which was formed from the answers to the questions.

The survey data were evaluated using the SPSS 18 package program. Chi-square test was used to find differences between the groups according to $p<0.05$.

Table 1. Questions regarding maritime safety knowledge and score table

Questions	Answers	Score
Which role scale does your ship have?	Fire, Abandon ship Man over board	3
Should it be done frequently until abandon ship or fire drills?	Once a month	1
In what situations is an emergency alert issued on the vessel?	Fire, Abandon ship Man over board	3
How many fire extinguishing equipment should be on the vessel?	At least 2 trawlers At least 3 purse seiners	1
What is the protective equipment that must be used in terms of safety when going on deck in bad weather conditions and at night?	Life jacket	1
Can you tell me a feature that should be on life buoys on the vessel?	Reflective tape, Smoke, Light	3
Total Score		12

RESULTS

According to socio-demographic data, the mean age and age group of the fishers were found 44.6 ± 9.93 years and 25-69 years. The average experience of the fishermen was 26.6 ± 10.7 years. About ¾ of the fishermen were married and 58.3% of them graduated from elementary school, while only 2% of them had higher education. It was determined that 53.6% of them performed fishing as it was their fathers' occupation. 21% of them were skippers, whereas 79% of them were crew. 84.1% of them stated that they worked more than 13 hours per day. 72.9% of them stated that they earned their income for a share. It was found that 22% of them had a Master certificate that 77.6% of them had a Fisherman-class deck crew certificate, and that 0.3% of them had a Deck-class seaman certificate.

It was determined that, 62.4% of the fishermen smoked and 47.1% consumed alcohol. In the findings, 99.7% of the fishermen stated that they wore gloves while working on the boat. 96.3% of them stated that they wore a hard hat in addition to wearing gloves. In our study, it was found that the types of accidents were distributed as follows: 16.7% cut injuries and 8.5% fall injuries (Table 2).

In the study, it was determined that the accidents were caused by different reasons. While 69% of the accidents (118 fishers) occurred during fishing, accidents experienced during navigation and port operations were 18% and 13%, respectively.

Table 2. Distribution of the types of accidents

Type of Accident	Number	Percent (%)
Cut	40	16.7
Fall	25	8.5
Hitting	11	3.7
Striking	7	2.4
Slipping and falling	5	1.7
The falling of the material	5	1.7
Hitting and striking	5	1.7
Hand and arm injuries	3	1.0
The falling of the equipment	3	1.0
The falling of a man into the sea	2	0.7
Getting stuck	1	0.3
The falling of an object	1	0.3
The falling of an eyebolt	1	0.3
Total	118	40.0

The busy work schedule (hastiness) was the primary reason for the accidents on boats. Lack of experience was more frequently seen among those crew members who have just started working on the boat (Figure 1).

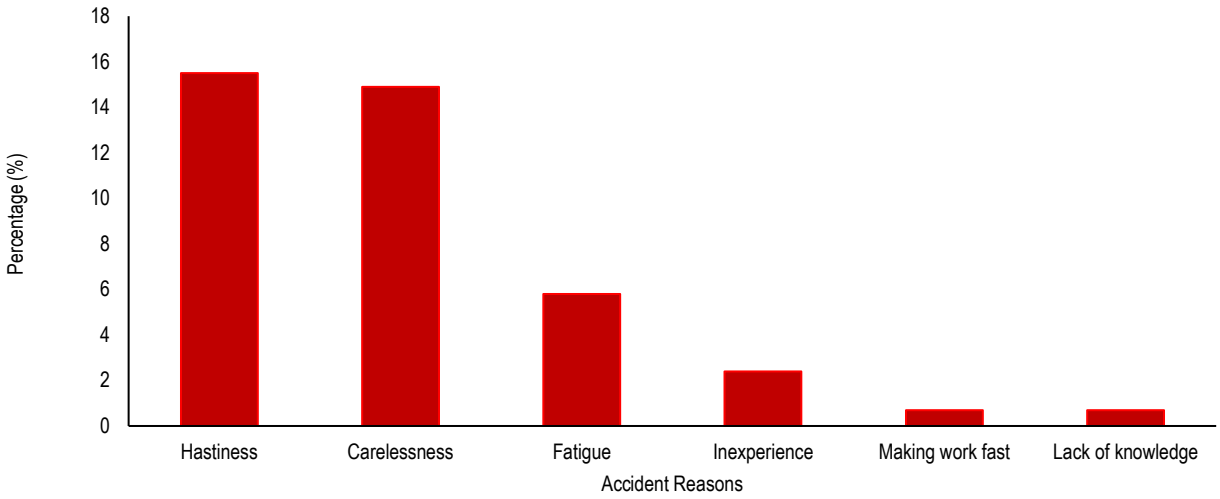

Figure 1. The percentage of the accidents according to the occurrence reasons

In the assessments of safety knowledge level of the fishers, 51.5% was found insufficient with scores 7 and below (inadequate), while 48.5% reached sufficient level with scores 8 and above (adequate). In the statistical evaluation made between the factors affecting the knowledge levels of the fishermen and the other variables, it was seen that some variables were statistically significant (Table 3).

In addition a statistical evaluation was made to determine the factors affecting the occupational accidents. The variables of marital status, reason for choosing fishing, thinking of quitting fishing, boat type, working time, income, and social security were included in the analysis. The results were given in Table 4.

Table 3. The factors affecting the knowledge levels of the fishermen (p<0.05)

Factors	*p value*
Age	0.622
Experience	0.328
Non-fishing occupation	0.580
Marital status	0.132
Education	**0.048**
Reason for choosing fishing	0.484
Thinking of quitting fishing	**0.072**
Children's doing this job	0.900
Type of boat	**0.000**
Duty	**0.000**
Working period	**0.000**
Income	**0.058**
Income satisfaction	0.908
Social security	**0.000**
Certificate held	**0.000**
How safe is fishing	**0.013**

Table 4. The factors affecting the occupational accidents (p<0.05)

Factors	*p value*
Age	0.717
Experience	0.298
Non-fishing occupation	0.333
Marital status	**0.026**
Education	0.306
Reason for choosing fishing	**0.005**
Thinking of quitting fishing	**0.020**
Children's doing this job	0.059
Type of boat	**0.000**
Duty	0.129
Working period	**0.001**
Income	**0.032**
Income satisfaction	0.543
Social security	**0.018**
Certificate held	0.152
How safe is fishing	0.392

It was statistically determined that there was no significant difference between knowledge levels and occupational accidents (Table 5).

Table 5. Distribution of the occupational accidents by knowledge level group.

	Experiencing of an occupational accident					
	Yes		No		Total	
Knowledgelevel	Number	%	Number	%	Number	%
Adequate	62	21	81	27.5	143	48.5
Inadequate	56	19	96	32.5	152	51.5
Total	118	40	177	60	295	100

DISCUSSION AND CONCLUSION

The occupational health and maritime safety knowledge level of more than half of fishermen participating in the study was insufficient. McGuinness et al. (2013) conducted a study investigating deaths in the Norwegian fishing fleet in 1990-2011. He found that fishermen had severely limited knowledge of health and safety practiced within the common coastal industry. It has been determined that the participants, who are sufficient in terms of their knowledge level about health and occupational safety at sea, have 1-20 years of experience. However, it was found that there was no significant relationship between work experience and knowledge levels.

In the study, we asked the participants about occupational accidents. It was stated that 40% of them had work accidents, 60% had no accident. In a study Håvold (2010) carried out in Norway concerning the safety culture in fishing vessels, it was stated that the primary accidents with injuries most experienced between 1999 and 2008 by Norwegian fishermen were falls on the vessel. In the study Piniella et al. (2008) carried out on the safe working conditions of Andalusian fishermen, they stated that 35% of the most frequently experienced injuries were caused by cuts. They further stated that of the other accidents, 15% were due to the striking of an object, 12% were accidents resulting from the moving equipment, and 8% were due to falls from high levels, followed by hitting and striking. In his study on the English commercial fishing, Roberts (2010) stated that 86% of the fatal fishing accidents experienced in England between 1996 and 2005 resulted from drowning. However, in our study, it was determined that the most common accidents experienced by fishers in Turkey were injuries caused by cuts, followed by fall and crash-impact accidents, respectively.

As stated by the fishers in this study that hand injuries constituted a high risk among the accidents experienced in the ports. McGuinness et al. (2013) investigated the deaths in the Norwegian fishing fleet, they stated that 20% of the most important mortality rates were comprised of the disasters of drowning in the port. They stated that the most common headings among all groups in a period of 22 years were drowning in the port (20%) and getting stuck/striking (10%). In their study for the classification and coding of the commercial fishing injuries in Denmark according to the work processes, Jensen et al. (2005) stated that the injuries concerning the preparation and repair of the equipment included in the work processes while working in the port made up about half of all injuries. They indicated the work processes as the repair of nets, installation of the otter boards used, working with gear, and the repair of gear. In another study carried out in Denmark, it was stated that the commercial fishermen generally fell from the wharf or that there was a risk of being damaged after falling from a lower level and that, in some cases, they could even drown within the port. It was explained that these tragedies could have been connected with the fact that the fishermen went to foreign ports and returned to the

vessel at nights (Jensen et al., 2005). In the study of Thomas et al. (2001) investigated the fatal and nonfatal workplace injuries of Alaskan commercial fishermen, they stated that fall injuries were the most common ways of injury, that twenty-four of these injuries had not taken place on a vessel, and that most of them had occurred as a result of falls from the port. Moreover, in our study, it was determined that foot and head injuries could also occur in the ports and that they made up half of these injuries.

Fishermen generally stated that they had an accident while fishing. It was found that the accidents had been experienced during the operation and that no fatal injury had occurred. According to Roberts (2004), most of the fatal accidents at sea happen while leaving or collecting the fishing gear during the operation. In the classification of the commercial fishing injuries in Denmark according to the work processes, the injuries occurring while pulling the gear and equipment at sea made up half of the injuries caused by the repair of the gear and the collection of the nets in Denmark trawl fishing. The work processes of collecting the nets include such practices as the casting and removal of the nets as well as the throwing and removal of the otter boards (Jensen et al., 2005). These practices were determined to have caused injuries in various areas of the body. The highest rate among them belongs to the accidents in which the whole body was injured. It was established that the overwhelming majority of the occupational accidents had developed during fishing and that these accidents had damaged the whole body. It was stated that the majority of the occupational accidents experienced on the fishing vessels had been experienced during the operation from the studies.

The accidents experienced during navigation were determined depending on the statements by the fishermen. Accidents during navigation could damage any part of the fisherman's body, moreover, the feet and heads were the most frequently injured limbs. The accidents had been experienced not only during the operation but also in the port operations. Almost all fatal occupational injuries in the US commercial fishing industry was occurred during navigation or as a result of docking (NIOSH, 2010). Thomas et al. (2001) investigated the fatal and nonfatal workplace injuries of Alaskan commercial fishermen, they determined that at least 90% of the injuries was occurred on vessel, 5% on land and generally at the pier, and that the scenes of the other 5%.

Roberts (2010) stated that fatal accidents resulted from fishing under bad weather conditions. Furthermore, he stated that the accidents experienced under bad weather conditions depended on the fishing performed without having adequate consciousness of safety.

Wang et al. (2005) analyzed the accidents on fishing boats, they stated that a high percentage (20.7%) of the accidents experienced had been caused by the negligence or carelessness of the employees. They further stated that employees' competence, fatigue, poor management of the vessel, hard working conditions, poor design and inappropriate arrangements made great contributions to such accidents. In our study, hastiness ranks first with 15.5% among the reasons for accidents, followed by carelessness with 14.9% and fatigue with 5.8%. Hastiness appeared the most important of the reasons for accidents.

In the study Piniella et al. (2008) carried out on the safe working conditions of Andalusian fishermen, they stated that the accidents experienced were found significant only in terms of age, work experience, and service period. Such factors as marital status, type of boat, working period, and income status were found statistically significant in our study. Additionally, in our study, it is seen that such factors as educational status, type of boat, duty, working period, and income status among the factors affecting the knowledge levels were statistically significant. They do not feel themselves in danger in terms of the job. This reveals that fishermen's knowledge levels about maritime safety were inadequate. They must use the necessary equipment and gear while performing their duties. It is of importance that they have adequate occupational knowledge. It should be known that even the minor mistake made while working might lead to serious injuries and even deaths.

Fishing sector cannot benefit from occupational health and safety services sufficiently. It was seen that this was due to a lack of education and knowledge. It has been determined that training is the first and most effective method on occupational safety and worker health, and even on safety at sea. It is important to reduce occupational accidents in the fishing sector and to increase the corresponding labor productivity. Creating occupational safety awareness among fishers is also important. Raising awareness of fishermen about their activities and providing safer working conditions will contribute to fisheries management.

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