

# Health status and occupational risk factors in Greek small fisheries workers

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## ABSTRACT

**Background:** Fishing is an extremely dangerous occupational activity that predisposes to occupational diseases and accidents. Greece, with about 16,000 km of coastline and its unique morphological characteristics with small islands and peninsulas, represents a strong proof of its great tradition in the fisheries sector since ancient times. The aim of the study was to examine the health status and the health risk factors present in Greek fishery workers, by exploring their working environment, thus providing a current baseline for documentation of the needs for prevention and health promotion.

**Materials and methods:** An interviewer-administered questionnaire was distributed in 2013 to a random sample of 172 professional small-scale fishermen of the Evros district in North-Eastern Greece.

**Results:** Eighty-eight per cent worked in coastal fisheries and 73% were using small fishing vessels, less than 10 m in length overall. Health disorders included musculoskeletal, cardiovascular and visual problems and to a minor degree by hearing, dermatologic and respiratory problems in all age groups. Seventy per cent had experienced at least one occupational accident. Heavy smoking and daily alcohol consumption was seen among nearly half of the fishermen.

**Conclusions:** The health effects observed are causally related to the work process exposures on board and to diet, smoking, and lack of exercise. This in turn relates to the specific working conditions, the culture and level of education in small-scale fishing that need to be taken into consideration together in the prevention programmes.

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**Key words:** fishermen, health, accident, smoking, alcohol, culture and educational level

## INTRODUCTION

Fishing is an extremely dangerous occupational activity that predisposes to occupational diseases and accidents. As described by Roberts [1], fishermen were 52 times more likely to have a fatal accident at work compared with other British workers. The hazard is probably similar worldwide [2]. Data from those countries that collect accurate accounts show that occupational fatalities in the fishing industries far exceed their national average [3].

Almost one fifth (18%) of the EU-28's fishing fleet is registered in Greece. On average, however, these Greek vessels are small, with an average size of 4.9 gross tons (much less than the EU-28 average of 19.2 gross tons) and an average engine power of 28.8 kilo-

watts in 2014 (compared with an EU-28 average of 75.9 kilowatts) [4].

Internationally, work in the fishing industry has mainly focused on preventing accidents and vessel disasters. Medical conditions, including nutrition-related ones, have received less attention. In Greece there is lack of fishery research studies and the few available studies from other countries like Poland show a higher overall mortality of fishermen from all causes, cardiovascular diseases (CVD) in addition to fatal accidents [5–7]. The pattern of hospitalised cases indicates a need to improve working and living conditions in fishing. For this reason fishermen's Occupational Health Services have been constituted in recent years in different countries, such as Denmark [8].



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The aim is to assess all the related risk factors affecting Greek fishermen's health and safety, taking into account the special characteristics of Greek fisheries and their effect, with the form either of an occupational disease or accident.

The study explores both the influence of purely occupational characteristics of the production process during the fishing activity by types of fishing gear (nets, long lines, trawls, etc.) and those elements of occupational origin predisposing fishermen professionals to smoking, consumption of alcohol, poor eating habits, insomnia, anxiety, depression, and reduced physical activity. The study attempts to evaluate quantitatively those factors by using appropriate scales in order to record their impact as occupational risk factors for workers in the Greek fisheries sector.

## MATERIALS AND METHODS

This study is based on a pilot study, the first carried out in Greece on health and safety in fisheries, which helped in the proper configuration of the present study's research tool (questionnaire) and represented a source of the first main conclusions regarding the health and safety profile of the workforce in the fisheries sector [9]. Thus, the present study represents the natural continuation of this pilot study and was addressed the entire workforce in the fisheries sector in Evros district. Data collection was taking place during 4 months period of time (August 2013–November 2013). Interviews were taken place at working places or at fishermen's homes, by personal or telephone interviews after an appointment.

The source population consisted of all professional fishermen of Greek Evros region registered in the updated lists of Occupational Fishermen Corporation (according to registries of 2013). As a source benchmarking, the fishermen's data was compared with the health of the general population in the Attica Study [10].

### FORMATION OF THE QUESTIONNAIRE

The questionnaire was original and was based on: a) indicators from the European programme DIRERAF [11] for identifying the most important health and safety indicators in fishing; b) nutritional questionnaire based on the fitting to the Mediterranean diet model (MedDietScore) [12, 13]; c) demographic information; d) occupational history and features of their type of fishing; e) medical profiles including self-reported CVD, injury experiences, alcohol and smoking history; f) assessment of anxiety, depression, insomnia, physical activity measured by scales.

### STATISTICAL ANALYSIS

Data entry and the statistical analysis were performed using SPSS 19. Besides the uni-variable analysis, cross-table analyses were completed in order to select the possible rel-

evant independent variables for the multivariable analysis. Logistic regression analysis was employed to estimate the relative risk of occupational accidents and CVD with adjustment to age, gender and the relevant exposure factors.

### MEDICAL CONFIDENTIALITY AND CONSENT

The study protocol complied with the medical research ethics outlined by the National and Kapodistrian University of Athens. Fishermen were given all necessary information about the aim of the study and they fully agreed with it before the interview started. Their ability to stop the interview and withdraw their consent to participate in the study at any point was absolutely clearly explained to them. All data were processed only by the researcher herself and no other person had access to this material. After the completion of the study, the results were expressed in accordance with the medical ethics and confidentiality rules.

## RESULTS

The study included 161 fishermen, out of a total of 172 (5 denied to participate and 6 could not be reached) giving a participation rate of 93%. One hundred and twenty-five (78.2%) fishermen were occupationally active and 35 (21.8%) were pensioners. The gender distribution in the study population was 80% males and 20% females and the average age was 53 years (25–91). Most of the fishermen were married (79%) (only 0.7% were divorced) and 40% had children.

The place of birth was a rural area for 51%, whereas 48% came from an urban area. Only 1.2% were born abroad. The main part of the sample – 88% of the study population – worked in coastal fisheries and for 96% and 91% fishing was the main and only occupational activity, respectively. On average they started working as a fisherman at the age of 25 and they had worked in the fisheries for 34 years. Fishing was a full-time job for 91% and 94% of them were working in the fisheries during all seasons, 12 months per year with an average of 10.9 h per day. Some other demographic and occupational characteristics (including the types of vessels) are presented in Table 1.

### HEALTH INDICATORS

Table 2 describes the fishermen's main health characteristics with 64% of those over 50 years of age being obese with a body mass index of 30 or more. Among those over 50 years of age, 89%, 65%, 63%, 72% and 72%, respectively, had cardiovascular, dermatological, musculoskeletal and respiratory diseases and hearing problems. In those under 50 the prevalences of all type of diseases were lower. The sample included in the study seems to fit moderately to the pattern of Mediterranean diet ( $32.7 \pm 5.1$ ).

**Table 1.** Demographic and occupational characteristics of 161 active Greece fishermen

<b>Family status</b>	Married: 127 (79%)	Single: 27 (17%)	Divorced: 1 (1%)	Other: 5 (3%)
<b>Children</b>	Yes: 64 (40%)	No: 97 (60%)		
<b>Birth location</b>	Urban: 77 (48%)	Rural: 81 (51%)	Abroad: 2 (1%)	
<b>Educational level</b>	0–6 years: 77 (48%)	7–9 years: (22%)	10–12 years: (21%)	≥ 13 years: (4%)
<b>Type of insurance</b>	Agricultural: 132 (83%)	Seafarers: 27 (16%)	Other: 1 (1%)	
<b>Length of fishing vessel</b>	> 20 m: 19 (12%)	15–20 m: 4 (3%)	10–14 m: 21 (13%)	< 10 m: 117 (73%)
<b>Engine power of vessel</b>	< 10 kW: 9 (6 %)	10–20 kW: 46 (29%)	10–20 kW: 45 (28%)	> 50 kW: 60 (37%)
<b>Fishing vessel conditions</b>	Satisfied: 120 (76%)	Unsatisfied: 38 (24%)		
<b>Type of fisheries</b>	Costal: 88%	Deep sea: 12%		
<b>Occupational activity</b>	All seasons: 150 (94%)	Seasonal: 10 (6%)		
<b>Retired fisherman</b>	Yes: 35 (22%)	No: 125 (78%)		

**Table 2.** Main health characteristics of the sample of Greek fishermen (n = 160)

		Age groups		Odds ratio	95% CI	P
		< 50	≥ 50			
Body mass index*	18.5–24.9	10 (17%)	13 (13%)	1.00	–	
	25–29.9	26 (43%)	41 (42%)	1.21	0.5–3.2	NS
	≥ 30	24 (40%)	43 (44%)	1.38	0.5–3.6	NS
Hearing problems	Yes	9 (15%)	23 (24%)	1.81	0.8–4.2	NS
	No	51 (85%)	72 (76%)			
Dermatologic problems	Yes	7 (15%)	13 (24%)	1.13	0.4–3.0	NS
	No	51 (88%)	84 (87%)			
Respiratory problems	Yes	11(19%)	28 (29%)	1.76	0.8–3.8	NS
	No	48 (81%)	69 (71%)			
Musculoskeletal problems	Yes	46 (78%)	77 (80%)	14.30	6.5–31.7	< 0.001
	No	13 (22%)	19 (20%)			
Vision problems	Yes	14 (23%)	57 (61%)	5.10	2.4–10.4	< 0.001
	No	46 (77%)	37 (39%)			
Cardiological problems	Yes	14 (23%)	59 (58 %)	1.75	0.7–3.6	< 0.001
	No	46 (76.7%)	42(41.6%)			
Belief that work in fishing affects health negatively	Yes	46 (74%)	74 (75%)	1.00	0.5–0.937	NS
	No	16 (26%)	25 (25%)			

\*Underweight: BMI < 18.5; normal: BMI = 18.5–24.9; overweight: BMI = 25–29.9; obesity: BMI ≥ 30

## SMOKING

The details of smoking are presented in Table 3 with 44% current smokers, 28% ex-smokers and 28% non-smokers. Half of the smokers had 60–200 pack-years of smoking (pack-years are calculated by multiplying the number of packs of cigarettes smoked per day by the number of years the person has smoked; 1 pack year is equal to smoking 1 pack per day for 1 year, or 2 packs per day for 6 months, etc.).

## CARDIOVASCULAR DISEASES

The probability of CVD in Greek fisheries' workforce was related to age, sex, the duration of work in fisheries sector, the fitting to the Mediterranean diet and the level of depression (Table 4). The relative probability of CVD in male fishermen was higher than that in females of the same age. Despite this fact, the adherence to the Mediterranean diet and the absence of high levels

**Table 3.** Smoking habit characteristics of the sample of Greek fishermen (n = 160)

Pack years	Smoking years	Smoking at work
1–20: 6 (8%)	1–10: 1 (1%)	Heavy smoking: 16 (10%)
21–40: 18 (24%)	11–20: 3 (4%)	Too much smoking: 26 (16%)
41–60: 12 (16%)	21–30: 13 (17%)	Moderate smoking: 36 (23%)
61–80: 11 (15%)	31–40: 25 (33%)	Light: 18 (11%)
81–100: 10 (13%)	41–50: 18 (24%)	Non-smoking: 63 (40%)
101–120: 11 (15%)	51–60: 13 (17%)	
121–140: 6 (8%)	61–70: 3 (4%)	
141–160: 1 (1%)		
181–200: 1 (1%)		
Smoker: 71 (44%); Ex-smoker: 45 (28%); Non-smoker: 45 (28%)		
Periods of non-smoking: Yes: 25 (22%); No: 91 (78%)		
Average number of cigarettes per day = 36		

**Table 4.** Logistic regression of risk factors for cardiovascular diseases in the sample

	Coefficient (B)	S.E.	Wald	OR	P*
Age	-0.121	0.046	4.987	0.93	< 0.02
Sex (reference value is male)	-1.932	0.698	4.29	0.19	< 0.05
Duration of work in fisheries	0.021	0.017	7.941	1.31	< 0.01
MedDietScore	-1.936	0.792	4.521	0.20	< 0.01
Score of depression ZUNG	0.048	0.0213	7.932	0.98	< 0.01
Constant	4.102	1.716	4.691	28.83	< 0.05
-2logLik = 185,332, Nagelkerke R <sup>2</sup> = 0.429; *2-tailed Hosmer and Lemeshow Goodness of fit test: 0.552					

of depression were causing a protective effect against CVD in fishermen.

## ACCIDENTS

In the sample, 70% had experienced at least one occupational accident in lifetime. Summarising the findings about occupational accident experience (Table 5), it seems that the most important causes of accidents were an object's hurling (e.g., stone, hook, catch) during the hauling of the fishing gear, the severe fatigue/exhaustion, the entry and exit from the boat, walking along the deck, bad weather, and mishandling during throwing the nets or long lines. Furthermore, the most frequent anatomic locations of injury were the fingers of the hand. The most important causes of accident were a) slipped (42%) due to slippery or deck full of obstacles; b) trapped by the nets at the time of throwing or hauling them (3%) and c) other causes (55%). The most important other causes were an object's flung (e.g. a stone) coming up during hauling the nets – 23%, fatigue – 13%, and bad weather conditions – 9%

Occupational accidents most frequently happened during processes like a) hauling the nets (39%); b) throwing the nets (14%); c) handling the catches (10%); d) repairing the nets (0.9%), and e) other tasks (36%). Most important of other tasks proved to be a) the entry and exit from the fishing vessel (24%), b) walking along the deck of the vessel (14%), c) bad weather conditions (9%), d) traffic accidents while going to or returning from work (12%).

Digits of the hands were found to be the most frequent anatomical location of injuries (20%).

The part of the fishing vessel where injuries happen most frequently was the vessel's bow, and this seems to be causally related with the location of the vessel's pulley for hauling the nets that is usually there in coastal vessels of Greek fisheries.

## DISCUSSION

The study attempts to evaluate quantitatively the most relevant occupational risk factors influencing health and wellbeing by using appropriate scales for workers in a sam-

**Table 5.** Causes of accidents in the sample of 161 Greek fishermen

1. An object's flung (e.g. stone) coming up during hauling the fishing tool like nets or longlines
2. Collision with another vessel (due to bad navigation, conflicts with fishing or military vessels of other interests)
3. Bad weather conditions either causing vessel's capsizing or not
4. Poor infrastructure and conditions in the working environment
5. Fatigue during returning home after work
6. Handling of catches (e.g. removing the catches from the fishing tools, e.g. the nets)
7. Repairing the damaged nets due to dolphins, crabs, strong sea currents
8. Extreme musculoskeletal loading
9. Insufficient light
10. Slips due to fish's slime, non proper wearing and shoes, narrow space in the vessel, sharp speed drop of vessel's velocity
11. Mishandling during throwing the nets or longlines
12. Bites by sea fauna during hauling or handling the catches

ple of 161 Greek fishermen who represent the 94% of the work force of professional fishermen in one Greek district, the so called Evros district of North-Eastern Greece (the district includes Samothrace Island). The study explores both the influence of purely occupational characteristics of the production process during the fishing activity and those elements of occupational origin predisposing fishermen professionals to smoking, consumption of alcohol, poor eating habits, insomnia, anxiety, depression, and reduced physical activity.

It is the strength of the study that 94% of the approached fishermen wanted to participate and that it was possible to get a relatively large questionnaire completed. The weakness of the study could be the recall bias for the pensioners, although they don't exceed 21.85% of the sample and the majority of them have never really quitted fishing. By this aspect this study is one of the most comprehensive studies of professional fishermen.

It is also worth to mention that there were no fishermen younger than 25 years of age in the study population. This could be explained by the tendency of Greek coastal fisheries' workforce to quit fishing activity due to economic crisis, fish depletion of the Mediterranean Sea and lack of necessary support by the Greek authorities in order to maintain their traditional family owned fishing enterprises. Thus, it seems younger ages are not encouraged to become professional fishermen in the Evros region of Greece.

The demographic characteristics is typically family-owned small-scale coastal fishing in rural areas where the sons in the family start early in fishing without any longer education. The educational level of the sample is low with only primary school for 52%. The small scale fishing vessels under 20 m are not in all countries subject to statutory survey. The study sample consisted of 80%

males and this is very common as males worldwide dominate the fisheries sector. Despite this fact, the percentage of female fishermen in this sample reached 20%, which is one of the highest in the European Union, representing a strong proof of the family character of Greek fishing enterprises, especially those of coastal type. It is interesting that among the female participants of the study there were women who had the experience of even carrying their newborn babies with them on board for breast feeding or leaving the baby alone for a few hours inside the temporary cage in the Evros River Delta, where they had to stay for a few days in order to obtain a good catch, which gives a new dimension to the issue of safety in fishermen's families.

For the great majority of the fishermen participating in the study, fishing represented their main occupational activity (96%). For 91% of the sample it represented their only activity and only for 9% it is considered as a part-time activity. A significant portion of the sample reported being professionally active (78%), as it is common among fishermen to continue working in fisheries despite the fact they are pensioners. The average age of starting to work as a fisherman for the sample was 25 years. Fishermen in this sample had been working in fisheries for about 33.7 years on average. Coastal fisheries were the main type of fisheries in this sample (88%). Most of the fishermen of the study (94% of the sample) worked 12 months per year, with an average of 10.9 h per day. Also, as far as it concerns the fishing fleet characteristics of the sample, it was reported that 73% of sample's fishermen work in a fishing vessel of less than 10 m length, 62% of the sample work in a fishing vessel of an engine power less than 50 kilowatts and 37% of the sample's vessels have a horsepower of 20 kilowatts maximum. The ma-

jority of fishermen (76%) declared their satisfaction from the working conditions on the fishing vessel where they work and only 24% of the sample did not consider it as sufficient. Of course one should take into account that most of the study's fishermen are repairing their vessels themselves, thus they may have the tendency to overvalue the quality of the maintenance work they perform.

A prevalence of smokers of 48% was similar to what was found by Marco Jordan et al. [14]; although, it seems to have been lowered. Overweight and obesity have been clearly described too; 64% of those over 50 years of age are obese with a body mass index of 30 or more and 61% of those over 50 years of age are overweight.

Furthermore, focusing on those over 50 years of age, we noted that 89% had cardiovascular, 65% dermatological, 63% musculoskeletal disorders, 72% respiratory disorder and 71.9% hearing problems. For those under 50 the prevalence was lower for all types of diseases. As hearing problems were quite common (reported by 21% of the population surveyed), this could be linked to noise exposures while at work; in this type of vessel, it was found that an average noise level in the engine room was from 95 dbA to 105 dbA [15]. Respiratory problems were reported by on average 72%. Marco Jordan et al. [14] found a prevalence of chronic bronchitis, asthma and smokers to be 18%, 10% and 48%, respectively. Dermatological problems were mainly skin lacerations object to secondary infections, fungal infections of skin and nails, skin aging and skin cancer sun induced.

Fishermen in this sample seem to moderately adhere to the Mediterranean model of nutrition. This result reflects a relatively high adherence of Greek fishermen to the traditional Greek Mediterranean diet if compared with the results of a study performed in almost all inhabitants of small borderline Greek islands of Aegean Sea (islands like Nisiros, Anafi, Patmos, Thymaina, Kasos, Agathonisi, Leipsoi, Fournoi, Tilos, and a part of Rodos island) which concluded that population of small borderline islands has been urbanised in terms of dietary choices, thus raising the consequences in terms of cardiovascular disorders and depression [16]. Alcohol consumption is found to be a daily habit for the present study's fishermen.

Daily alcohol consumption of at least 300 mL or more was declared by 34% of the sample and 19% reported a consumption of 500 mL or even more per day, which is a finding in agreement with the international experience about fishermen's alcohol abuse [17].

The health risks factors studied included excessive weight, cardiovascular incidents, and dermatologic, mus-

culoskeletal, respiratory, and hearing problems. The occupational health risk factors included alcohol, smoking, insufficient sleep and fatigue.

The probability of CVD in Greek fisheries' workforce is related to age, sex, the duration of work in fisheries sector, the fitting to the Mediterranean diet and the level of depression. The probability of CVD in male fishermen is higher than that in females of the same age. Despite this fact, the adherence to the Mediterranean diet and the absence of high levels of depression are causing a protective effect against CVD in fishermen. This is in correspondence with the Attica study where it has been proved that adherence to the Mediterranean diet seems to mediate the unfavourable effect of depression and anxiety on CVD risk [18].

There are no previous studies on health and safety in the Greek fisheries sector. This study is the continuation of a pilot study which was based on a sample of 100 professional fishermen from areas all over Greece (urban, suburban, rural, island, and mainland regions of the country) [9]. The results of the present study are quite in accordance with the findings of the pilot study drawing a profile of the fisheries' population of the country.

## CONCLUSIONS

Working as a fisherman in the territory of Evros district in North-Eastern Greece is a dangerous occupational activity in terms of the risk of accidents and CVD. The health effects observed are causally related to smoking, alcohol consumption and fatigue, which are all related to the specific working conditions and culture in small-scale fishing. Greek fishermen lack education on occupational health and safety matters and occupational services.

## KEY POINTS

1. Working as a fisherman in the territory of Evros district in North-Eastern Greece increases (after adjustment for age and the exposure to other factors) in a statistically significant manner the likelihood of CVD and occupational accident.
2. The health effects observed are causally related to smoking, alcohol consumption and fatigue, which in turn relate to the specific working conditions and culture in small-scale fishing.
3. Fishermen are lacking education on health and safety matters and occupational medicine services — a conclusion which needs to be taken into consideration by the country's authorities and occupational medicine services for the implementation of prevention programmes with effective measures, carefully adapted to the specific conditions present in Greek fisheries.

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