

# Risk factors for fishermen's health and safety in Greece

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## ABSTRACT

**Background:** This is, to the best of our knowledge, the first occupational health study in Greek fishing.

**Aim:** The aim of the study is to determine the risks for health and safety in Greek fisheries workers by exploring their health status and the health risk factors present in their occupational environment, thus providing a current baseline for further research in the future and for documentation of the needs for prevention.

**Materials and methods:** A questionnaire pilot study was carried out in a random sample of 100 Greek fishermen.

**Results:** Twenty-eight per cent (28%) had experienced at least one injury, of which half caused more than one day absence, while 14% had a near drowning experience. The health risks factors studied include excessive weight, cardiovascular incidents and dermatological, musculoskeletal, respiratory, hearing, stress, and anxiety problems. The occupational health risk factors include alcohol, fatty food consumption, smoking, and lack of physical exercise.

**Conclusions:** The health effects observed are causally related to diet, smoking, and exercise, which in turn relate to the specific working conditions and culture in small-scale fishing that need to be taken into consideration in prevention programmes. The results are comparable with international fisheries experience, mainly from Poland, Denmark, and Turkey.

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**Key words:** fishermen, occupational epidemiology, health promotion, safety, accidents, public health

## INTRODUCTION

Fishing is a particularly dangerous profession with high risk of occupational and endemic diseases globally. Greece, due to its particular morphology and position in the South-Eastern Mediterranean, with a shoreline reaching 16,000 km, is intertwined with the marine environment leaving no doubt about its fishing tradition.

The Greek fleet, although the most numerous of the EU, mainly consists of small, low-engine power vessels of small-scale fisheries being compatible with the country's particular morphology (hundreds of small islands, inlets, bays, small peninsulas and capes) [1] but predisposing to higher mortality rates compared to sea-

men or deep-sea fishermen who work on bigger fishing vessels [2]. The 5 main species of fish in Greece are: anchovy, sardine, bogue, cod, and whitebait.

The recording of specific occupational hazardous exposures in the Greek fisheries workforce regarding health and safety by the official Greek authorities is largely inaccurate. The limited data available concerning disability in the general Greek working population [3] show the enormous lack of occupational health prevention services in the country, with no exception for the fisheries sector. Moreover, fishermen seek health services only for very serious health problems such as accidents or major health



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emergencies like cardiovascular events, as has been evidenced in Great Britain by Matheson et al. [4].

Injuries in fisheries are substantially under-reported, as has been evidenced in Denmark by Jensen [5]. Accidents in Greek fisheries are not reported if not fatal. Although the number of fatal accidents in the Greek fisheries sector seems to have decreased in recent decades [6], this is probably attributable to the concurrent shrinkage of the fisheries workforce in the country.

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 in addition to fatal accidents [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].

The aim of this cross-sectional pilot study is to assess the health risk factors in Greek fishery workers and to provide a current baseline of the major health and safety problems for further research in the future and a documentation of specific needs for prevention in the fisheries workforce distinguishing them into two age groups of < 50 and > 50 years of age (reflecting their short- and long-term employment status). The hypothesis of this study is that the working conditions are, in some aspects, of low standard.

## MATERIALS AND METHODS

### STUDY POPULATION

This cross-sectional study was based on a random sample of the workforce of fisheries in different regions of Greece. The sample included urban, suburban, rural, island, and mainland regions of Greece. Greek professional fishermen often have several different jobs during their lifetime as fishermen, as seafarers and jobs on shore. It was our intention to compare the health risks among "short- and long-term" fishermen and to describe the attributable risks for long-term fishermen. However, due to the small number of fishermen with less than 10 years in fishing (n = 9) it was impossible to obtain any significant results based on all the relevant co-variables.

### SAMPLING METHOD

The absence of study financing was a major limitation for the sample size. It proved cumbersome to recruit a weighted sample of professional fishermen, given

the time constraints of the study and the absence of financing, thus we opted to interview a certain number of fishermen in various parts of the country. As working conditions vary significantly in the different geographical regions of the country (small distant islands vs. big ports of the mainland), the aim of the sample selection was to form a representative sample of fishermen by using location characteristics as selection criteria.

Data was collected using a specifically designed questionnaire either by personal (32) or telephone (68) interviews. A total of 100 questionnaires were collected (7 individuals from different parts of the country – urban, suburban, rural, islands, mainland regions – refused to participate). Fishermen's health insurance booklets were a source of information about diagnoses and prescribed medicines.

### STATISTICS

The variables include 1) demographic information, occupational history, and features of their type of fishing, 2) medical profiles and injury experiences, and 3) health risk exposures: range of stress, dietary habits, etc. The questionnaire was original and was based on: a) indicators from the European program DIRERAF [9] for identifying the most important health and safety indicators in fishing; b) the current literature on the health and safety risk factors in fishing; and c) the Zung Anxiety Scale.

The study questionnaire is available on the site and is the property of the postgraduate programme "Environmental and Occupation Risk Assessment and Management" (<http://www.envocc.gr>), Athens University, Medical School, Department of Hygiene and Epidemiology.

Descriptive statistics and cross-tabulation tables were extracted using SPSS 18.0 (Table 1). Long-term fishery workers were defined as fishermen with over 10 years in fishing.

Information about hypertension, hyperlipidaemia, and other health risk factors (Table 1) is based on the fishermen's recollections based on their physicians' information. The correctness of the informed diagnoses was validated by checking the health insurance prescription booklet, which includes the prescribed medicines. For those interviewed by phone, the interviewer asked the fisherman or a member of his family to read out the prescribed medicine and the diagnosis written in the booklet. Definitions of health risk indicators:

– occupational accident – open wound, injury by hook, fish bone insertion, bite by marine fauna, sprain and soft tissues injuries, fractures, spinal

**Table 1.** Self-reported prevalences of occupational health risks (age < 50: n = 35; > 50: n = 65; total: n = 100)\* (They all answered all the questions)

		Age < 50	50 +	Total
Body mass index classification	Obese > 30	26%	37%	33%
	Overweight 25-30	51%	42%	45%
	Normal weight 18.5-25	23%	22%	22%
Occupational accident	Yes	31%	26%	28%
Hospitalisation due to occupational accident	Yes	9%	6%	7%
Near drowning episode	Yes	9%	17%	14%
Smoking	Yes	63%	28%	40%
Alcohol consumption	Yes	71%	83%	79%
Physical exercise work excluded	Yes	34%	34%	34%
Total cardiovascular*	Yes	14%	57%	42%
Dermatologic problems	Yes	29%	20%	23%
Musculoskeletal problems	Yes	77%	68%	71%
Respiratory problems	Yes	17%	18%	18%
Hearing problems	Yes	9%	20%	16%
Zung score anxiety scale	20-29	71%	65%	67%
	30-47	29%	35%	33%
Belief work affects health	Yes	69%	69%	69%
Red meat consumption	Never/occasionally	3%	17%	12%
	Weekly	77%	60%	66%
	Daily	20%	23%	22%
Fruits consumption	Never/occasionally	11%	9%	10%
	Weekly	31%	17%	22%
	Daily	57%	74%	68%
Vegetable consumption	Never/occasionally	17%	2%	7%
	Weekly	23%	29%	27%
	Daily	60%	69%	66%
Wine consumption	Never/occasionally	63%	31%	42%
	Weekly	20%	9%	13%
	Daily	17%	60%	45%
White meat consumption	Never/occasionally	14%	9%	11%
	Monthly	29%	14%	19%
	Weekly	43%	42%	42%
	Daily	14%	35%	28%

Most of variables are self-reported. The sign\* indicates that the validity of the information of the variable "total cardiovascular" (a common variable formed by arterial hypertension and/or coronary artery disease, and/or diabetes mellitus and/or hyperlipidaemia) is checked also in the fisherman's insurance prescription booklet in which the prescribed medication is written.

- cord injuries, amputation, traffic accident en route to or from the vessel, accidental fall into the sea;
- physical exercise – walking, running, or any other athletic activity;
- total cardiovascular – a common variable formed by arterial hypertension and/or hyperlipidaemia and/or coronary artery disease and/or diabetes mellitus;
- dermatological problems – fungal infections, contact dermatitis, skin redness, spots, and itching;
- musculoskeletal problems – lower back pain, pain in the upper and/or lower limbs, shoulder and neck pain;
- respiratory problems – respiratory infections, asthma, dyspnoea, and chest pain;
- hearing problems – hearing loss;
- stress and anxiety problems;

## ETHICS AND DATA PROTECTION

The study protocol complied fully with the medical research ethics outlined by the National and Kapodistrian University of Athens, and for the purposes of the study these refer to confidentiality in handling personal information according to the good research ethical standards and the rules set out by the Greek Personal Data Protection Agency. No biological sampling was involved or any type of medical act.

## RESULTS

### DEMOGRAPHIC AND WORKING CHARACTERISTICS

Female fishermen represented 13% (7 owners and 6 workers) of the total sample and worked mainly in gillnet and long line fishing methods. The mean

age of the sample was 55.5 years ranging from 24 to 86 years. Thirty-five per cent (35%) of the sample were pensioners, of whom 24% were active fishermen even after retirement. The start of the fishing activity in the sample appears to have been initiated, on average, at 13.9 years of age. Eighty-seven per cent (87%) of the sample were married, 83% had children, and 60% of the sample were lowly educated (maximum 6 years of education). The majority of the fishermen in the sample were owners of the fishing vessel they worked in. Seventy-nine per cent (79%) of the sample worked in coastal fishing.

The most common fishing methods were gillnet, long lines, and combination vessels (purse seine and trawler). The average length of fishing vessels was 10.58 m (median of 7.5 m and 6 m mode) out of which 74% were below 12 m overall length. The engine power of the fishing vessels was on average 110 horsepower, (median of 25 horsepower and mode of 15 horsepower). A total of 42% of the fishing vessels in the sample had less engines of less than 20 horsepower. When asked whether they considered the maintenance of the vessel in which they work satisfactory, 81% answered positively while 19% believed that it was not satisfactory. Average working hours exceeded 10 h per day (10.18) and average working months of the year reached 10.55.

### OCCUPATIONAL INJURY EXPERIENCES

Twenty-eight per cent (28%) of the sample had at least one accident during their whole life at sea. The absence from work was: more than one day 50.0% (absence from work on average 23.39 days), one day 3.5%, none 7.14%, and a few hours 35.7%. Nine per cent (9%) of the accidents were to employees and 91% to owners. The injury lesion types and injury mechanisms included: 1) bites (scorpions, drago, etc), 2) soft tissue injuries (hook or fish bone insertion), 3) falls with or without accompanying fractures, bruises, soft tissue injuries, musculoskeletal injuries such as sprained ankle, knee meniscus tear, cut tendon in hand, 4) tympanic membrane rupture during a swim, 5) hand or finger amputation by the rope line of purse seines, and 6) traffic accident after docking carried out under intense fatigue.

Fourteen per cent (14%) of the sample reported experience of at least one episode of near-drowning, and 3% of the sample reported a disability after an occupational accident. The anatomic locations of the injuries included: hands, side, spine, knee, ankle structure, and upper and lower extremities, with hands being the most common and also the most common location of disability in all sample cases. One case of disability was after

amputation of the middle finger distal phalanx of the hand, and the other 2 cases were permanent mobility impairment in flexion of the hand after a severed thenar in 1 case and after fracture in the other.

### HEALTH RISK FACTORS

Table 1 presents the distribution of the health risk factors in the sample. A total of 78% responded positively to alcohol consumption with 19.3 years average initiation age of alcohol consumption. Regarding physical activity, 66% of fishing workers did not perform any kind of exercise outside work, 32% preferred fat cooked foods, 51% added extra oil to their salad, and 15% consumed more than a bottle of wine a day. Current smoking referred to 40% of the sample and 41% were former smokers while 16.91% considered smoking very harmful to health. Smoking in the workplace for workers in the sample ranged from moderate to high at 46%.

### PREVALENCE OF HEALTH RISKS

Table 1 presents the distribution of the main health characteristics in the sample. A total of 78% of workers in fisheries were overweight, body mass index (BMI) = 25-30 (45%) to obese — BMI > 30 (33%), hearing loss occurred in 16% of the sample, 65% reported a moderately happy life, 27% reported a very happy life, and 8% not at all or just happy with life.

### DISCUSSION

This is, to the best of our knowledge, the first occupational health and risk study in Greek fishing. The small study sample size is a weakness of the study, but still the sample size is sufficient to document in a preliminary level the need for better health and working conditions and to make comparisons with international experience.

The lack of a comparison group from ashore with regards to risk indicators does not allow comparisons to be drawn with the data recorded among fishermen with short- and long-term experience.

### VALIDITY OF THE INFORMATION

The correctness of the informed diagnoses was validated by checking the health insurance prescription booklet, which includes prescribed medicine. According to the Greek health system, this is the most valid way to verify disease diagnosis. For those interviewed by phone, the interviewer asked the fisherman or a member of his family to read out the prescribed medicine and the diagnosis written in the booklet. Loss of memory for non-serious inju-

ries and absence of laboratory verification for self-reported disease information (like audiometric evidence for self-reported hearing loss) represent a weakness of the study.

### DEMOGRAPHIC CHARACTERISTICS

The demographic composition of Greek fisheries is mainly family-owned vessels passing from father to son, as can also be seen in Polish fisheries [10], and this reflects the status of the main part of the global fishery structure, including EU countries. In this way, it is relevant for the largest proportion of fisheries. A strength of the study is that it documents the need for improving the work and health conditions which are supposed to be highly influenced by the fishing structure, quota distribution, and management.

The majority of Greek fishermen adhere to a traditional lifestyle and social status. They get married and have children at a young age. They only receive a few years of education. The presence of women in the composition of Greek fishery enterprises is relatively noticeable compared with their percentage in countries of Northern Europe. This is probably explained by their engagement in family fishing enterprises mainly as supportive workers and less frequently as fully active crewmembers onboard.

The health, work, and living conditions are supposed to have a strong influence on family life, and on the conditions for fishing industry workers on land. These perspectives have previously not been taken into consideration in the political regulations of the fishing trade.

### OCCUPATIONAL INJURY EXPERIENCES

The results of the present study regarding the injury mechanism of accidents and the related types of lesions/traumas are in agreement with the findings of Bull et al. [11] documenting that bruises, cuts, fractures, and sprains are the most frequent types of traumas, and fingers, hands, and back are the most frequently injured parts of the human body.

The working processes of each fishing method predispose to different types of injuries, as has been evidenced by Jensen et al. [12]. Coastal fisheries, representing the main type of fisheries in Greece, largely consist of manual fishing methods, which seem to have a high incidence risk of occupational injury. A near-drowning episode proved to be notably common among Greek fishermen, giving the best proof of the hazardous working environment in Greek fisheries.

### OCCUPATIONAL RISK FACTORS

The majority of Greek fishermen work on a small vessel with low engine power, in a dangerous work environment with a variety of risks (Figures 1, 2).

The disease pattern and the proportion of serious injuries indicate that the occupational risk factors are related to a combination of risks at work and the specific living conditions on board and at home.

The occupational risk factors are very similar to those seen in Polish small-scale fisheries [8] and include: a) small working area inside vessels, b) the specific nature of each fishing method, c) the use of unsuitable or badly maintained fishing equipment, d) the extreme weather conditions combined with



**Figure 1.** Greek fishermen of coastal fisheries performing after-docking activities in the harbour of Koilada in Argolis, Peloponnese, Greece



**Figure 2.** Greek fishermen untwisting their nets. Harbour of Koilada in Argolis, Peloponnese



a wet and moist working environment and extreme temperatures, e) exposure to solar radiation, f) the poor technical maintenance of the vessel, and g) physical and psychological stress induced by conflicts with authorities or others for access to fishing fields and by the financial uncertainty due to fish stock depletion in the Mediterranean Sea. Of course climate differences and other specificities between the Baltic [9] and the Mediterranean Sea characteristics should be taken into account. Although the majority of fishermen state that they are satisfied by the condition of the fishing vessel they are working on, one should account that most fishermen are at the same time owners of this fishing vessel and their judgement is quite subjective and could be motivated by their tendency for embellishment of the present status of their obligational fulfilments.

### RISKS RELATED TO LIVING CONDITIONS

The most important risk factor is considered to be unhealthy eating habits, such as the increased consumption of sweets and snacks on the boat, fatty meals combined with heavy alcohol consumption after docking, plus heavy smoking and lack of exercise.

These findings agree with the results of Novalbos et al. [13] about the Andalusian Fisheries Sector. The irregular working hours pattern and the nature of work causing physical and psychological overload probably explains such habits, which are very common among Greek fishermen. According to Brown [14], fatigue is quite possible when working at sea.

The health risk factors studied include being overweight, cardiovascular incidents, dermatological, musculoskeletal, respiratory, hearing, and anxiety problems (Figure 3). These findings are in accordance with the Danish experience [15] as well as with the Polish experience [9]; it is also described in recent bibliography reviews [16]. There is also substantial agreement of the present study with the results of the Turkish experience in occupational health of small-scale fishermen as was recently described in a study of a bigger sample size in which musculoskeletal disorders predominated [17]. Passive smoking effect is another important aspect of the same matter. According to Mastrangelo et al. [18], a long stay at sea is actually associated with the smoking habit, which agrees with the findings of the present study. This is also reported by the Turkish experience [17].

At the end of the day, Greek fishermen, who work mainly in family-based fishing enterprises, form small groups of crew members and they consume large amounts of alcohol combining it with fatty meals,



**Figure 3.** Old Greek fisherman, untwisting a net. His appearance is an excellent example of some important occupational health risks, like increased waist implying body mass index higher than normal, tanned skin after sun exposure, inducing skin aging, and small working surface causing limitation of movements in a small fishing vessel of coastal fisheries

usually fried fish if the daily catch quantity is good enough. Alcohol overuse is common with the Polish experience, but Greek fishermen seem to consume it mostly at the end of working hours, which is quite protective compared with Polish fishermen [7] and agrees with the results of the Turkish study [17].

In deep-sea fishing (i.e. fishing with purse seines and trawlers), there are quite different psycho-social characteristics. The majority of employees are foreign workers who have a more distant relationship with their employer compared with that seen in offshore fishing, but their eating habits are of the same unhealthy type, both for the owners and the employees of the fishing enterprise. The living conditions, especially for employees on deep-sea fishing vessels, are poor. They usually live in a small part of the vessel without adequate ventilation and hygiene, forming an unhealthy environment.

### CONCLUSIONS

This pilot study, despite its weaknesses, provides a current baseline of the major health and safety problems of the Greek fisheries workforce and documentation of the need for prevention and further research. Furthermore, it compares its findings with the international experience, giving a view for quality research evaluation and best implementation of findings in practical use.

The observed adverse health effects are causally related to the pattern of diet, smoking, and exercise, which again relate to the specific working conditions and culture in small-scale fishing. The injury types and anatomical locations relate to the working conditions and

special work characteristics in small-scale fishing in Greece. The above findings are in accordance with the experience from Poland, Denmark, and especially Turkey, where very similar health and working conditions were found, thus confirming the hypothesis of this study.

The risk factors related to the community level, the boat, and the personal level need to be taken in consideration in the prevention programs to obtain healthy, safe, and sustainable work conditions for both age groups. Recommendations:

1. Training programmes need to be implemented in the system of fishing licence acquisition in the country.
2. A constitution of Greek Fishermen's Occupational Medicine Services should be made, which will utilise telemedicine systems [19] and will form a recording system of casualties and disease diagnoses thus forming a "health map" of the fishing workforce in Greece and will enable the design and implementation of effective prevention.
3. Safety measures should be adapted to Greek fleet characteristics, fishing methods, tools, and people's culture.

### KEY POINTS

1. The occupational injury experiences of the sample caused long absences from work and disability.
2. The anatomical locations of the injuries included: hands, side, spine, knee, and ankle structure.
3. The observed health effects included being overweight, cardiovascular incidents, dermatological, musculoskeletal, respiratory, hearing, and anxiety problems, which relate to the specific working conditions and culture in small-scale fishing.
4. The results were similar to studies from the international fisheries experience (Poland, Denmark, and Turkey).

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