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## RESEARCH ARTICLE

### Identification of Work-related Diseases in Small-scale Fishermen in Batam Island, Indonesia

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#### Abstract:

##### Background:

Small-scale fishermen's work activities are carried out in a marine environment which has the potential to cause certain work-related diseases. AIMS: This study aims to identify the incidence of work-related diseases among small-scale fishermen in Batam Island, Indonesia.

##### Methods:

This study used both quantitative and qualitative approaches involving 119 small-scale fishermen. Data was collected through questionnaires, observations, documentation, interviews, focus group discussions, and secondary data collection.

##### Results:

The results showed that all small-scale fishermen complained of diseases caused by threats in the chemical, physical, biological, psychological, and ergonomic factors group.

##### Conclusion:

Most fishermen complained about colds, fever, stings, blisters, skin allergies, and eye disorders/myopia. Most complaints were obtained from small-scale fishermen over 40 years old, especially the ones with smoking habits. Identification of work-related diseases was required to prevent and control the health problems that could endanger small-scale fishermen's health and productivity.

**Keywords:** Fisheries, Health problems, Small-scale fishermen, Work-related diseases, Working environment, Myopia.

#### Article History

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## 1. INTRODUCTION

There are 90% of fishermen work in small-scale fishery industries, and 97% of small-scale fishermen found in less developed countries [1, 2]. Likewise, small-scale fishermen still dominate the capture fishery business in Indonesia. Only 15% of fisheries in Indonesia were categorized as large-scale fisheries, while the rest about 85%, are included in small-scale fishing [3]. The protection of small-scale fisheries needs to be guaranteed by the state. The Food and Agriculture Organization (FAO) has established guidelines for protecting small-scale fisheries, especially in terms of occupational health aspects. Small-scale capture fisheries are among the most dangerous occupations, with high threat and danger [4]. Fishing activities can be exposed to two potential hazards:

dangers to worker safety and health [5, 6].

The work of small-scale fishermen requires a strong physique due to the manual tools involved and unfavorable conditions, such as wet and slippery deck floors on moving boats [7]. The work-related disease can also originate from a working environment, *i.e.*, weather. Hot weather conditions can pose a risk of dehydration, skin burning, fatigue, dizziness, and visual disturbances or glare. On the opposite, cold or rainy weather can cause fever, colds, flu, and coughing. Fishermen can work long hours in varied weather conditions. Fishermen exposed to full-body vibrations and extreme weather, such as cold, heat, and wind, can experience certain health problems [8]. Moreover, working at sea with such a high risk does cause not only physical health problems but also mental problems [9 - 11].

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Occupational health efforts for fishermen need to be

carried out to avoid the occurrence of work-related diseases. The definition of work-related diseases according to the Presidential Regulation of the Republic of Indonesia No.7 of 2019 concerning Occupational Diseases is a disease caused by work and/or the work environment. Work environmental factors can be distinguished into two types, *i.e.*, natural factors and work factors that potentially cause a risk of death, accidents, injuries, health problems, and diseases for fishermen. Based on the 2018 Basic Health Research (Riskesmas), the highest infectious diseases suffered by fishermen, namely, acute respiratory infection (ARI), pneumonia, pulmonary TB, diarrhea, and malaria, while the highest non-communicable diseases are hypertension, joint pain, emotional disorders, stroke and chronic heart disease (CHD).

The work environment influences fishermen in fishing activities [12]. The work environment is a social, psychological, and physical life that affects work activities. Potential health hazards in the workplace and derived from the work environment are, among others, chemical factors, physical factors, biological factors, ergonomic factors, and psychological factors [13, 14]. According to the Regulation of the Minister of Manpower of the Republic of Indonesia Number 5 of 2018 concerning Occupational Safety and Health of the Work Environment, the work environment is defined as an aspect of hygiene in the workplace that includes physical, chemical, biological, ergonomic and psychological factors in influencing the safety and health of workers. These factors are also found in the fishermen's work environment. Fishermen use boats in the middle of the sea with wet and slippery floor conditions from sea water splashing on the boat. This condition can pose a risk of sprains or fractures due to a fall or slip. While on the ship, 62% of the crew reported declining health performance, for example, musculoskeletal disorders, respiratory diseases, digestive system diseases, and eye- and skin-related diseases [15]. Identification of work-related diseases needs to be carried out to prevent and control health problems that can endanger the health and productivity of fishermen.

Several previous studies have mentioned that the dangers that impact fishermen's health include ergonomics, noise, dehydration, extreme pressure, and cold and hot temperatures [16 - 18]. However, research on the complete identification of work-related diseases in small-scale fishery fishermen is still limited. This study aims to identify the incidence of work-related diseases in small-scale fishermen based on the type of fishermen's work environment consisting of physical, chemical, biological, ergonomic, and psychosocial factors.

## 2. CONCEPTUAL FRAMEWORK

### 2.1. Small-scale Fisheries

The small-scale fisheries sector is concerned with the role of communities, local traditions, and values. Small-scale fishermen are self-employed and usually provide caught fish for direct consumption by their families or communities. Thus, small-scale fisheries support coastal communities' economic and social livelihoods by ensuring food and nutrition safety. Without fishermen as human components, fishery resources

will not have value and benefits regarding social, cultural, economic, and biodiversity [16]. The definition of small-scale fisheries and their scope in several research results show the relationship between various aspects, namely, social, cultural, economic, ecological, health, and governance, as well as regulation, law, and policy [2, 17 - 21].

Characteristics of small-scale fisheries include fisheries management at the household level, fishing without or with fish vessels measuring less than five (gross tonnages (GT), and fishing gear operated only by human labor. This definition combines the attributes of boat size, mechanization of fishing gear, decision-making business units (households), and directed government assistance to poor fishermen prone to social and economic shocks [18]. The term small-scale fisheries have been used to characterize a subsector of fisheries to distinguish it from medium-scale and large-scale fisheries. The Food and Agriculture Organization (FAO) defines small-scale fisheries as traditional fisheries involving fishing households (as opposed to commercial enterprises), using capital and relatively little power, relatively small vessels, short fishing trips, near the coast, and mainly for local consumption [22].

### 2.2. Fisherman's Work Environment

Risks to occupational safety and health are influenced by work environment factors, including the physical environment, work processes, human factors, and economic factors [23, 24]. Occupational environment factors include potential workplace hazards, including aspects of the physical, chemical, ergonomic, biological, and psychosocial environment [13]. Influential factors in the work process are hazardous materials, working procedures, work skills, and the use of machinery [12].

Physical factors are associated with using machinery, equipment, materials, and environmental conditions around the workplace, such as work, climate, noise, vibration, radiation, air pressure, and lighting that cause disturbances and diseases in the workforce. Biological factors are caused by living things, including animals, plants, and their products, as well as microorganisms that can cause occupational diseases. Chemical factors are caused by using chemicals and their derivatives in the workplace, including chemical contaminants in the air, in the form of gases, vapors, and particulates. The ergonomic factor is caused by a mismatch between work facilities, including the working position, work tools, and the lifting load on the workforce. Psychological factors are caused by interpersonal relationships in the workplace, roles, and responsibilities at work. The psychosocial work environment is how the interrelation of the structure of society, the environment of exposure, and the psychological that have a potential impact in terms of well-being and discomfort, for example, job satisfaction, stress, and fatigue [25].

### 2.3. Occupational Diseases

A work-related or occupational disease is caused by work and/or work environment. Fishing fishermen are at risk of occupational diseases related to the work environment. The condition of the marine environment has an impact on health

[26]. The fisherman's work environment, such as exposure to seawater, working posture, and noise from ship engines, can produce health problems such as dermatitis, indigestion, skeletal muscle disorders, hearing loss, dehydration, and acute respiratory distress infections (ARI) [27 - 31]. In the work process, fishermen work outside the building and are directly exposed to sunlight, so fishermen are one of the jobs at risk of cataracts. Outdoor workers are at high risk of prolonged and high exposure to solar ultraviolet radiation, known to cause skin cancer [32, 33]. Research by Laraqui *et al.* [29] found that skin disease prevalence among fishermen was 43%, 27.2%, 9.5%, and 2.5% for respondents who experienced one type, two types, three types, and four types of skin disease, respectively. Skin diseases include skin infections, scabies, and stings of marine life. Percin *et al.* [34] mentioned that humidity, cold weather, and harsh sea conditions could stimulate rheumatism in fishermen.

### 3. METHODOLOGY

#### 3.1. Study Area

The research was conducted on Batam Island, Riau Archipelago Province, Indonesia. Riau Archipelago Province is one of the provinces in Indonesia, with most of its area being an archipelago area, and 95% of the site is the ocean. Its area reaches 8,201.72 km<sup>2</sup> or about 0.43% of the area of Indonesia. Stretching from the Strait of Malacca to the Natuna Sea, Riau Archipelago Province is a strategic area because it borders Singapore, Vietnam, Malaysia, and Cambodia. The population of Riau Archipelago Province was 2,189,653 in 2019, and it is highly concentrated on Batam Island, with about 56.47% or around 1.1 million people.

#### 3.2. Data Collection

This study applied both quantitative and qualitative methods. The quantitative research method is carried out by survey using questionnaires. The qualitative method was a case study method, including observation, in-depth interviews, and focus group discussion (FGD). The questionnaire contains questions including the socioeconomic and demographic data of fishermen: age, education level, ethnicity, income level, length of work, place of residence, employment status, smoking history, and marital status. The interview question list contains complaints of occupational diseases based on work environment factors: physics, chemistry, biology, ergonomics, and psychosocial. Data collection is carried out when fishermen are not at work. Questionnaire filling and interview activities are conducted at fishermen's homes or associations. Data collection was carried out from July to September 2022. The data source in this study was 119 fishermen selected by purposive sampling. A reliability test was carried out to strengthen the questionnaire as one of the instruments. From the test, the alpha is obtained as follows:

The rule in determining the alpha value is if the alpha value > 0.90, then the reliability is perfect. The reliability is high if the alpha value is 0.70 < alpha < 0.90. The reliability is moderate if the alpha value is 0.70 < alpha < 0.5. If the alpha

value is <0.5, then the reliability is low. The test results in Table 1 showed an alpha of 0.504, meaning the questionnaire has moderate reliability.

**Table 1. Reliability statistical test.**

Cronbach's Alpha	N of Items
0.504	6

#### 3.3. Data Analysis

The data collected from the questionnaire results were processed using descriptive statistics. In contrast, the data from the interview was summarized and coded. Then the results were displayed in the form of a table to provide an easy outlook of the types of occupational disease complaints based on the type of work environment. Concerning complaints of occupational diseases, interview data may show some similarities, even from different subdistrict locations, due to similar work environment characteristics, including socioeconomic and natural conditions.

## 4. RESULTS

#### 4.1. Socioeconomy Characteristics

The socioeconomic characteristics of the fisherman's demographic consisted of age, education level, ethnicity, income level, length of employment, working status, smoking history, and marital status (Table 2). Most fishermen, for about 32% of the population, are aged between 56 and 65. Most fishermen's education level is elementary school graduates, with a percentage of 60%. The most numerous fishing tribe is the Malay tribe, with about 92% indigenous tribes. 75% of fishermen have an average monthly income of between 96-160 USD. For about 34% of the population, most fishermen have worked for more than 20 years. 77% of fishermen work full-time, and 23% work part-time. Employment as a fisherman is a hereditary occupation for parents, recognized by 86% of fishermen. Most fishermen, about 83% of the population, had a smoking habit. 90% of fishermen were in married relationships. 87% of fishermen lived near the coastline, and 13% were far from the coast.

#### 4.2. Work-related Diseases based on the Work Environment

Complaints of diseases suffered by fishermen included fever, fatigue, soreness, back and waist pain, colds, flu, stinging, blistering from the spines of fish or marine animals, headaches, eye disorders/myopia, rheumatism, ulcers, skin allergies or hives, sprains and fractures (Table 3). Complaints of diseases suffered by fishermen are the types of diseases that fishermen often experience when doing fisherman work, including being exposed to sea breezes, being exposed to fish spines, holding fish catches for too long or often pulling and lifting nets, exposed to ultraviolet light, and hungry from carrying little food. The most mentioned disease complaints by fishermen are colds, fever, stinging or blisters, skin allergies or hives, eye disorders, or myopia.

**Table 2. Socioeconomic characteristics of the small-scale fishermen demographics.**

Variable	Sub-categories	Frequency (n)	Percentage (%)
Age group	Early Adulthood (26–35 Years)	18	15
	Late Adults (36–45 Years)	32	27
	Early Seniors (46–55 Years)	25	21
	Late Seniors (56–65 Years Old)	38	32
	Seniors (> 65 Years Old)	6	5
Education level	Not going to school	12	10
	Elementary school	71	60
	Junior high school	19	16
	High school	17	14
Ethnicity	Malays (indigenous tribes)	109	92
	Non-Malays (migrant tribes)	10	8
Income level	96-160 USD	90	75
	161-224 USD	21	18
	More than 224 USD	8	7
Length of work	5-10 years	27	23
	11-15 years	18	15
	16-20 years	33	28
	More than 20 years	41	34
Working status	Full-time	92	77
	Part-time	27	23
Fisherman profession	Hereditary from the family	102	86
	Does not descend	17	14
Smoking history	Smoke	99	83
	No smoking	20	17
Marital status	Marry	107	90
	Unmarried	7	6
	Widower/Widower	5	4
Residence	Near the coast	103	87
	Not near the coast	16	13

**Table 3. Complaints of work-related diseases in small-scale fishers.**

Complaints of work-related diseases	Frequency (n)	Percentage (%)
Fracture	6	1.76
Sprains	7	2.05
Skin allergies or hives	26	7.62
Indigestion	24	7.04
Rheumatism	13	3.81
Eye disorders	24	7.04
Headache	20	5.87
Stung or scalded by fish or marine animal spines	39	11.44
Flu	14	4.11
Cold	50	14.66
Back and waist pain	34	9.97
Sore	21	6.16
Fatigue	20	5.87
Fever	43	12.61

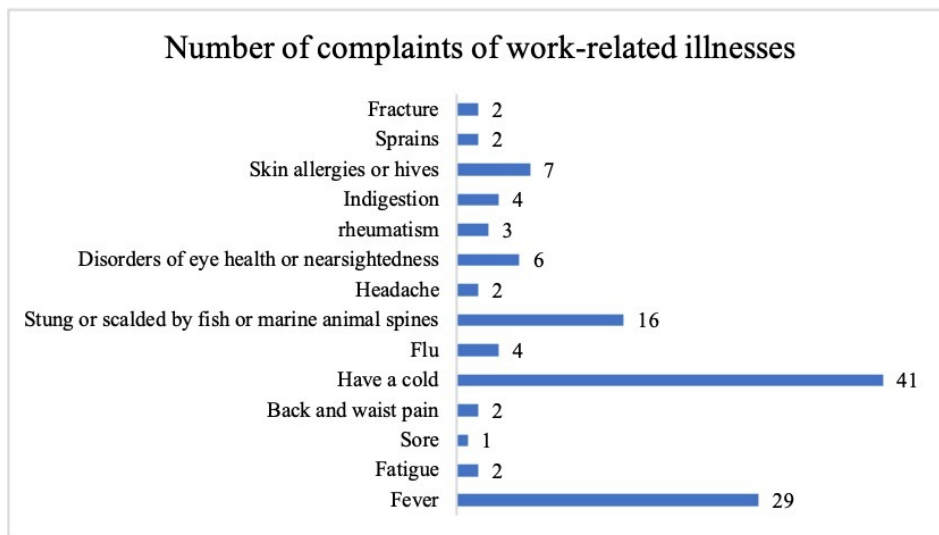


Fig. (1). Number of complaints of work-related illnesses.

Table 4. Identification of work-related diseases by the type of work environment for small-scale fisheries.

Complaints of the Disease	Types of Work Environments	Causes of Occurrence of Complaints
Fractures	Ergonomic	The activity of pulling and lifting fishing nets
Sprains	Ergonomic	The activity of pulling and lifting fishing nets
Skin allergies or hives	Biology, physic, chemical	Holding fish too long or often (Biology); exposed to ultraviolet rays, exposed to seawater, exposed to sea breezes (Physic); exposed to fuel or oil (Chemical)
Ulcer or indigestion	Biology, psychological	Not bringing enough food (Biology); Anxiety about the small amount of income and anxiety about disasters at sea result in stress (Psychological)
Rheumatism	Ergonomic, physic	The activity of attracting and lifting fishing nets (Ergonomic); exposure to ultraviolet rays, sea breeze and seawater (Physic)
Eye disorders or myopia	Physic	Exposure to ultraviolet light
Headache	Physic, biology, chemical, psychological	Hot or scorching weather (Physic); Dehydration due to lack of drinking (Biology); Smell of fuel (Chemical); Anxiety about the small amount of income and anxiety about disasters at sea result in stress (Psychological)
Stung or blistered from fish spines	Biology	Fish barbs or stings
Flu	Physic	Exposed to the sea breeze, seawater, cold weather
Colds	Physic	Exposed to the sea breeze, seawater, cold weather
Back and waist pain	Ergonomic	The activity of pulling and lifting fishing nets
Aches	Ergonomic	The activity of pulling and lifting fishing nets
Fatigue	Physics, biology, ergonomics, psychological	Exposed to the sea breeze, seawater, hot and cold weather, and ultraviolet rays (Physic); Not bringing enough food (Biology); From the activity of pulling and lifting fishing nets (Ergonomic); Anxiety about the small amount of income and anxiety about disasters at sea result in stress (Psychological)
Fever	Physic	Exposed to the sea breeze, seawater, hot and cold weather, ultraviolet rays (Physic)

The type of work environment could be identified according to complaints of occupational diseases in fishermen (Table 4). The working environment consisted of physical, chemical, biological, ergonomic, and psychological factors. Based on Fig. (1), the fisherman's work environment factors consisted of physical, biological, and ergonomic factors. Complaints of diseases related to chemical and psychological factors were not mentioned directly by fishermen. Factors of physics are a type of fisherman's work environment related to the natural or open environment. Fishermen complained about frequent colds and fevers due to sea breeze and seawater

exposure. Biological factors were related to fishermen catching fish influenced by other living things, such as exposure to fish stings and spines. Fishermen also complained about skin allergies and itching. Ergonomic factors were associated with complaints of fatigue, soreness, sprains, and fractures due to pulling and lifting activities that required muscle strength and working posture corresponding to the workload.

5. DISCUSSION

Most fishermen's age was categorized as the elder/late senior, in the range of 56-65 years. Moreover, there were some

fishermen with age over 60 years old. In contrast, the research by Zakaria *et al.* (2022) found that most fishermen age consists of the young age group between the ages of 20-30 years (44%). Most fishermen had more than 20 years of working experience, similar to earlier studies at the Tanji fishing site in West Africa [35]. Fishermen worked full-time and mostly lived near the coastline. The majority of fishermen were the indigenous Malays tribe. Most fishermen's education was an elementary school degree, almost the same as Bangladeshi fishermen's education [36], because fishermen's jobs did not require higher education. Work as a fisherman was considered tradition-related work passed down through generations. However, there were children of fisherman's parents who did not become fishermen because they had upper educational levels at junior and high school and got non-fishermen jobs. Fishermen's educational level can be associated with the occurrence of occupational diseases. Higher education can increase knowledge and behavior of safety and health at work to reduce the risk of occupational diseases. The income level of fishermen was classified as middle to a lower level, which was only enough to meet daily needs. The average fisherman is married and has a family [37]. Amid low income, some fishermen were still addicted to smoking.

Fishermen working outdoors with occupational hazards risks related to ergonomics, physical, and environmental/climate hazards. Muscle stress was a common danger felt by fishermen [35]. There was still a lack of understanding of fishermen's health problems, such as general physical health, mental health, lifestyle, and behavioral factors [38 - 40]. Based on Case *et al.* (2018) research, 90% of small-scale fishermen wrought full-time even though they were no longer youth or had already senior [41].

Complaints of occupational diseases experienced by small-scale fishermen obtained in this study were based on the work environment conditions, including physical factors such as heat and UV exposure during the day [42], cold air during the night, seawater, and wind exposure in the entire day. Biological and ergonomic factors that caused soreness in the back and waist were also found in other studies [43 - 45]. Chemical factors could be in the smell of fuel oil, while the psychological factors could be in the form of anxiety if there is a sea disaster. However, there was no complaint about those chemical and physiological factors due to the absence of respiratory and skin damage felt by small-scale fishermen; and the fishermen's work culture had been passed down through generations, respectively.

In addition to work-related diseases, age factors also influenced fishing performance. Due to the majority of fishermen being categorized as senior to late senior, they might share a similar age, over 40 years old. As they get older, their endurance and physical strength would declined. Smoking habits were unfavorable due to exacerbating fishermen's health problems. Fishermen would not go to sea if they were sick. If the illness continuously occurred, fishermen checked their health at the local community health center. Fishermen work every day because the income earned is daily. Personal protective equipment for small-scale fishermen still needs to be completed and followed by occupational safety and health

standards, such as wearing protective clothing, gloves, head coverings, eyeglass, and shoes.

## CONCLUSION

This research revealed that fishermen's occupational diseases were related to fishermen's work environment conditions, which included physical, biological, chemical, ergonomic, and physiological factors. Occupational diseases were back and waist pain, stings or blisters from fish spines, fatigue, eye problems or low vision, skin allergies or itching, sprains, broken bones, and other generic types of illness, including fever, flu, headaches, colds, rheumatism, and ulcers. A specific threat from the fishermen's work environment is the physical factor influenced by the natural marine environment. Efforts and strategies were needed to increase promotion and prevention to improve the occupational health status of fishermen to be more productive and prosperous through health promotion, occupational safety training, periodic health checks, and empowerment of fishermen groups.

Reducing the risk of occupational diseases in fishermen could be done by providing personal protective equipment in the form of head protection, proper clothing to cover the skin, eyeglasses to reduce UV exposure, and gloves to reduce allergies to itching and stinging by marine life. In addition, fishermen could also provide first aid boxes in their boats to handle the presence of work-related diseases such as dizziness, fever, and flu.

## AUTHORS' CONTRIBUTIONS

Fitri Sari Dewi as a PhD student, has published articles about occupational health and safety issues in general and also working on occupational health and safety for her PhD Dissertation. Fitri Sari Dewi contribution are making the title and outline, guiding discussion, leading the interview, and writing the initial draft report; Haryoto Kusnoputranto contribution are providing critical comments, making the theoretical framework and reviewing the article; Rachmadhi Purwana and Tri Edhi Budhi Soesilo designed the research methods, supervised the research progress and reviewed the article.

## LIST OF ABBREVIATIONS

<b>ARI</b>	=	Acute Respiratory Infections
<b>FAO</b>	=	Food and Agriculture Organization
<b>GT</b>	=	Gross Tonnage

## ETHICAL STATEMENT

This research is part of a doctoral dissertation that is submitted to fulfill one of the requirements for obtaining a Doctorate at University of Indonesia. This study did not involve ethical issues, such as informed consent, permission needs, *etc.*

## CONSENT FOR PUBLICATION

Not applicable.

## STANDARDS OF REPORTING

CORREQ guidelines were followed by the study.

## AVAILABILITY OF DATA AND MATERIALS

The data and supportive information are available within the article.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Declared none.

## REFERENCES

- Bene C, Macfadyen G, Allison EH. Increasing the contribution of small scale fisheries to poverty alleviation and food security. Rome, Italy: Food and Agriculture Organization 2007.
- Vatria B, Wiryawan B, Iyono WES, *et al.* Cluster analysis of smallscale capture fisheries characteristics in Kayong Utara Regency. *Mar Fish* 2019; 10(1): 95-106.
- Rahmi TA, Nurani TW, Wahyuningrum PI. Small-scale capture fisheries business in Sadeng, Special Region of Yogyakarta province. *J Amanisal* 2013; 2(2): 40-5.
- Zakaria MUMA, Paul D, Das R, Bhowmik S, Hoque MS, Mamun AA. Evaluation of occupational health management status and safety issues of the small-scale fisheries sector in Bangladesh. *Int Marit Health* 2022; 73(1): 10-9. [http://dx.doi.org/10.5603/IMH.2022.0002] [PMID: 35380169]
- Dharmawirawan DA, Modjo R. Identification of occupational safety and health on fishing Muroami fishermen. *Kesmas: National Public Health Journal* 2012; 6(4): 185-92. [http://dx.doi.org/10.21109/kesmas.v6i4.98]
- Lucas DL, Case SL. Work-related mortality in the US fishing industry during 2000-2014: New findings based on improved workforce exposure estimates. *Am J Ind Med* 2018; 61(1): 21-31. [http://dx.doi.org/10.1002/ajim.22761] [PMID: 28833290]
- Santiago KM, Louzado-Feliciano P, Baum J, Bakali U, Caban-Martinez AJ. Self-reported and objectively measured occupational exposures, health, and safety concerns among fishermen: A cross-sectional Fishing Industry Safety and Health (FISH) pilot study. *Am J Ind Med* 2021; 64(1): 58-69. [http://dx.doi.org/10.1002/ajim.23198] [PMID: 33155709]
- Hansen HL, Tüchsen F, Hannerz H. Hospitalisations among seafarers on merchant ships. *Occup Environ Med* 2005; 62(3): 145-50. [http://dx.doi.org/10.1136/oem.2004.014779] [PMID: 15723878]
- Kınalı H, Yıldırım U, Toygar A. A quantitative study on the mental health of Turkish seafarers. *Int J Occup Saf Ergon* 2022; 28(4): 2657-67. [http://dx.doi.org/10.1080/10803548.2022.2025726] [PMID: 34989655]
- Dimitrova DN, Blanpain R. Seafarers' rights in the globalized maritime industry. *Zuid-Holland: Kluwer Law International* 2010.
- Jeżewska M, Iversen R. Stress and fatigue at sea *versus* quality of life. *Gdansk*, 11 June 2012. II International Congress on Maritime, Tropical, and Hyperbaric Medicine. Venue: on board "Scandinavia" ferry, Gdansk-Nynashamn-Gdansk. With supporting funding from the ITF Seafarers' Trust. *Int Marit Health Gdansk* 2012; 63(2): 106-15. [PMID: 22972551]
- Alwi MR, Muhammad AH, *et al.* Risk assessment for fishing boats operating in the Makassar Strait. *IOP Conf Ser: Mat Sci Eng* 2020; 875: 012078.
- ILO. Occupational safety and health in the workplace. 2013.
- Uyumsal S, Firat MK, Saka Ş, *et al.* Evaluation of occupational health and safety risk factors in Turkish marine fish hatcheries. *Int J Occup Saf Ergon* 2022; 26: 1-7. [http://dx.doi.org/10.1080/10803548.2022.2057689] [PMID: 35343402]
- Novalbos J, Nogueroles P, Soriguer M, Piniella F. Occupational health in the Andalusian Fisheries Sector. *Occup Med (Lond)* 2008; 58(2): 141-3. [http://dx.doi.org/10.1093/occmed/kqm156] [PMID: 18245787]
- Sudarmo AP, Baskoro MS, Wiryawan B, Wiyono ES, Monintja DR. Small-scale fishing: Fishers decision-making in relation to fishing factors in conserving sustainability of fishing. *Mar Fish* 2016; 4(2): 195-200. [http://dx.doi.org/10.29244/jmf.4.2.195-200]
- McClanahan TR, Castilla JC, White AT, Defeo O. Healing small-scale fisheries by facilitating complex socio-ecological systems. *Rev Fish Biol Fish* 2009; 19(1): 33-47. [http://dx.doi.org/10.1007/s11160-008-9088-8]
- Halim A, Wiryawana B, Loneragan NR, *et al.* Concept of fisheries management rights as a management tool for sustainable fisheries in Indonesia. *Jurnal Kebijakan Perikanan Indonesia* 2017; 9(1): 11-20. [http://dx.doi.org/10.15578/jkpi.9.1.2017.11-20]
- Frawley TH, Finkbeiner EM, Crowder LB. Environmental and institutional degradation in the globalized economy: lessons from small-scale fisheries in the Gulf of California. *Ecol Soc* 2019; 24(1): art7. [http://dx.doi.org/10.5751/ES-10693-240107]
- Nahuelhual L, Saavedra G, Mellado MA, Vergara XV, Vallejos T. A social-ecological trap perspective to explain the emergence and persistence of illegal fishing in small-scale fisheries. *Marit Stud* 2020; 19(1): 105-17. [http://dx.doi.org/10.1007/s40152-019-00154-1]
- Britton E, Domegan C, McHugh P. Accelerating sustainable ocean policy: The dynamics of multiple stakeholder priorities and actions for oceans and human health. *Mar Policy* 2021; 124: 104333. [http://dx.doi.org/10.1016/j.marpol.2020.104333]
- FAO. Food and Agriculture Organization. Guidelines for the routine collection of capture fishery data. Italy (IT): FAO; 1999.
- Zytoon MA. Occupational noise exposure of fishermen aboard small and medium-scale fishing vessels. *Int J Ind Ergon* 2013; 43(6): 487-94. [http://dx.doi.org/10.1016/j.ergon.2012.08.001]
- Wischnitzki E, Amler N, Hiller J, Drexler H. Psychosocial Risk Management in the Teaching Profession: A Systematic Review. *Saf Health Work* 2020; 11(4): 385-96. [http://dx.doi.org/10.1016/j.shaw.2020.09.007] [PMID: 33329904]
- Rugulies R. What is a psychosocial work environment? *Scand J Work Environ Health* 2019; 45(1): 1-6. [http://dx.doi.org/10.5271/sjweh.3792] [PMID: 30643919]
- Short RE, Cox DTC, Ling Tan Y, Bethel A, Eales JF, Garside R. Review of the evidence for oceans and human health relationships in Europe: A systematic map. *Environ Int* 2021; 146(1): 106275. [http://dx.doi.org/10.1016/j.envint.2020.106275] [PMID: 33242730]
- Piniella F, Novalbos JP, Nogueroles PJ. Artisanal fishing in Andalusia (II): Safety and working conditions policy. *Mar Policy* 2008; 32(4): 551-8. [http://dx.doi.org/10.1016/j.marpol.2007.10.005]
- Loddé B, Cros P, Roguedas-Contios AM, *et al.* Occupational contact dermatitis from protein in sea products: who is the most affected, the fisherman or the chef? *J Occup Med Toxicol* 2017; 12(1): 4. [http://dx.doi.org/10.1186/s12995-017-0150-0] [PMID: 28203266]
- Laraqui O, Manar N, Laraqui S, *et al.* Prevalence of skin diseases amongst Moroccan fishermen. *Int Marit Health* 2018; 69(1): 22-7. [http://dx.doi.org/10.5603/IMH.2018.0004] [PMID: 29611610]
- Edwin M, Moore D, Guard D. Dehydration in New Zealand fishing vessel crews. *Saf Sci* 2019; 117(1): 314-9. [http://dx.doi.org/10.1016/j.ssci.2019.04.019]
- Vasakam M R, Shanmugam DP. A study on the Aetiology of skin infections and the prevalence of other skin diseases occurring in commercial fishermen. *Ann Trop Med Public Health* 2020; 23(13): 231-317. [http://dx.doi.org/10.36295/ASRO.2020.231317]
- Modenese A, Ruggieri FP, Bisegna F, *et al.* Occupational exposure to solar UV radiation of a group of fishermen working in the Italian North Adriatic Sea. *Int J Environ Res Public Health* 2019; 16(16): 3001.

- [33] [http://dx.doi.org/10.3390/ijerph16163001] [PMID: 31434335]  
Rydz E, Harper A, Leong B, *et al.* Solar ultraviolet radiation exposure among outdoor workers in Alberta, Canada. *Environ Res* 2020; 189: 109902.
- [34] [http://dx.doi.org/10.1016/j.envres.2020.109902] [PMID: 32980002]  
Percin F, Akyol O, Davas A, Saygi H. Occupational health of Turkish Aegean small-scale fishermen. *Occup Med (Lond)* 2012; 62(2): 148-51.
- [35] [http://dx.doi.org/10.1093/occmed/kqr181] [PMID: 22113895]  
Barrow A, Kongira A, Nget M, *et al.* Epidemiology of occupational hazards and injuries among fishermen at Tanji fishing site in The Gambia: An analytical cross-sectional study design. *Environ Health Insights* 2022; 16: 11786302221088699.
- [36] [http://dx.doi.org/10.1177/11786302221088699] [PMID: 35340563]  
Mazid MA. Development of fisheries in Bangladesh: Plans and strategies for income generation and poverty alleviation. Bangladesh (BD): Momin Offset Press 2002.
- [37] Dey SC, Sarker BS, Saha D, *et al.* Impacts of Banning Period on the Socio-Economic Condition of Hilsa Fishermen of Monpura Island Master's thesis, Bangladesh. *Middle East/J Sci Res* 2015; 23(10): 2478-83.
- [38] Doza S, Bovbjerg VE, Vaughan A, Nahorniak JS, Case S, Kincl LD. Health-related exposures and conditions among US fishermen. *J Agromed* 2022; 27(3): 284-91.  
[http://dx.doi.org/10.1080/1059924X.2021.1944416] [PMID: 34228604]
- [39] Case S, Bovbjerg V, Lucas D, Syron L, Kincl L. Reported traumatic injuries among West Coast Dungeness crab fishermen, 2002–2014. *Int Marit Health* 2015; 66(4): 207-10.  
[http://dx.doi.org/10.5603/IMH.2015.0041] [PMID: 26726891]
- [40] Case SL, Lincoln JM, Lucas DL. Fatal falls overboard in commercial fishing - United States, 2000–2016. *MMWR Morb Mortal Wkly Rep* 2018; 67(16): 465-9.  
[http://dx.doi.org/10.15585/mmwr.mm6716a2] [PMID: 29698380]
- [41] Frantzeskou E, Jensen OC, Linos A. Health status and occupational risk factors in Greek small fisheries workers. *Int Marit Health* 2016; 67(3): 137-43.  
[http://dx.doi.org/10.5603/IMH.2016.0026] [PMID: 27681212]
- [42] Warthan MM, Sewell DS, Marlow RA, Warthan ML, Wagner RF Jr. The economic impact of acute sunburn. *Arch Dermatol* 2003; 139(8): 1003-6.  
[http://dx.doi.org/10.1001/archderm.139.8.1003] [PMID: 12925386]
- [43] Thorvaldsen T, Kongsvik T, Holmen IM, *et al.* Occupational health, safety and work environments in Norwegian fish farming - employee perspective. *Aquaculture* 2020; 524: 735238.  
[http://dx.doi.org/10.1016/j.aquaculture.2020.735238]
- [44] Fry JP, Ceryes CA, Voorhees JM, Barnes NA, Love DC, Barnes ME. Occupational safety and health in U.S. aquaculture: A review. *J Agromed* 2019; 24(4): 405-23.  
[http://dx.doi.org/10.1080/1059924X.2019.1639574] [PMID: 31327304]
- [45] Mitchell RJ, Lystad RP. Occupational injury and disease in the Australian aquaculture industry. *Mar Policy* 2019; 99: 216-22.  
[http://dx.doi.org/10.1016/j.marpol.2018.10.044]

