

## The Occupational Health Perspective in the Context of Marine Science

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The ocean is not only a living space for biological organisms but provides a work environment for several occupations such as seafarers, fishers, professional divers and workers on off shore oil rigs. While occupational marine hazards have been addressed in the occupational health literature, these issues have rarely been addressed in the context of marine science. Occupational health research and practice, specifically from a public health perspective, can add an important angle to marine sciences.

Occupational health is concerned with the promotion and maintenance of physical, mental and social well-being of workers and the prevention of health problems due to hazardous working conditions. Historically occupational health research and practice have been closely connected with the discipline of public health. Both disciplines use epidemiological methods to generate scientific knowledge and utilize evidence-based practice with focus on the prevention of disease in larger populations rather than the treatment of ill individuals. In line with public health, occupational health generates solutions that go beyond treatment of individuals. It uses the organized efforts of society to generate structures in society that support health. In the context of occupational health, these endeavors resulted in the development and implementation of health and safety standards, policies and legislation, education and training and workplace health promotion programmers.

As documented by the scientific literature, the working conditions in a marine environment are very specific and often include exposure to harsh weather and involve extensive physical workload and highly hazardous conditions. For example, commercial fishing has been described as one of the most dangerous occupations worldwide with very high occupational accident and injuries rates [1]. In many countries, fishers show the highest fatal accident rates when compared to other occupational groups. According to the United States official accident statistics, during 2000 to 2010, an annual average of 46 deaths occurred in fishers and related fishing workers (124 deaths per 100,000 workers) compared with 4 in 100,000 workers among all US workers [2]. Similar European statistics were produced [1,3]. However fatal accident statistics only reveal the tip of the iceberg with many non-fatal occupational injuries, illnesses and diseases not being reported or not being systematically documented.

The scientific occupational health literature describes a range of causal factors leading to occupational accidents, injuries and work-related illnesses in those working on ships. These include environmental hazards created either by nature (e.g. typhoons, storms and heavy gales, exposure to harsh weather) or by technological processes (e.g. excessive noise, vibration), the use of unseaworthy vessels, heavy physical work, the increased spread of communicable diseases due to crowded living conditions on board and health and safety dangers associated with piracy [4]. More recently also psychosocial work factors on ships have come to the fore of international research. Typically psychosocial work hazards include high work load, prolonged work in isolation away from home, shift work and long working hours with limited resources for recreation and associated mental health problems, substance abuse, disturbed sleeping patterns, fatigue and poor life style habits [4,5]. Psychosocial hazards do not only create a burden on mental and physical health but may also contribute to accidents and injuries due to exhaustion and

fatigue. In addition, chronic conditions such as cardiovascular disease linked to obesity and associated with poor life style on board and lack of recreational facilities provide further opportunities for workplace health promotion [6].

Certainly we cannot change harsh weather conditions or ocean waves and currents. While fishing and other marine occupations are inherently hazardous occupations, research shows that incidence rates and hazard types vary internationally and by time pointing towards ecological, cultural, social, technical and regulatory conditions that impact on risk within this environment [7].

Several technological, social, work organizational and regulatory approaches have been recently developed to prevent or manage some of the marine work hazards and improve marine occupational safety. Technical solutions include the design and maintenance of the vessel, engineering of reliable hatch and door monitoring systems, and the development of reliable and comfortable personal flotation devices. The provision of basic seamanship and regular marine health and safety education and training may increase awareness of marine health and safety issues, may lead to favorable crew attitude and health and safety behaviors and may support efficient management of hazardous working conditions onboard. The implementation of work organization measures with working time limitations may help to limit human error caused by fatigue and exhaustion. In 2006 the Maritime Labor Convention was adopted by a special international Labor conference of the International Labor Organization setting out decent and safe working and living conditions on board including appropriate health care for seafarers [8]. This convention has been ratified by 46 member states up to date. However most of the world's estimated 36 million fishermen are in developing countries and have hardly benefited from these achievements, often going to sea with small unsafe craft with little or no training, no safety equipment and limited access to reliable weather forecasts.

Only a concerted action in research and application that goes beyond national boundaries and that involves the collaboration of different scientific disciplines can be successful in making occupational health and safety a priority in this highly globalized work environment. In addition, such strategies may also be useful in reducing the chance of human error and unsafe practices leading to marine disasters with

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high negative impact on the marine environment such as oil and hazardous materials spillages. The collaboration of marine scientists with occupational and public health professionals, engineers, work psychologists, policy developers and many others is necessary to make work for those working in a marine environment safer and healthier.

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