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Safety culture aboard fishing vessels

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ABSTRACT

Safety at sea is a serious issue for the commercial fishing industry. Injury and fatality rates are between 25 and 40 times the national average in many European counties, Australia and the USA. A 50-item safety culture questionnaire was developed, using items from published research combined with some original items. The questionnaire was distributed to fishermen who completed the responses. A total of 209 questionnaires were collected. Principal Component Analysis (PCA) revealed nine factors, all with a Cronbach's Alpha higher than 0.68. The factors were tested using ANOVA, *t*-tests, correlations and regression analysis.

The findings indicate significant differences between age groups, vessel types, occupations, and whether or not a close family member is a fisherman. It was also found that the safety attitude of management had a strong influence on a company's safety policy. Fishermen who had sought medical attention during the preceding year as a result of an accident showed a significantly less positive attitude to rules and regulations and had a less positive safety attitude in general. Fishermen who had been involved in a serious accident/incident showed a significantly more positive attitude to rules and regulations.

1. Introduction

1.1. A dangerous occupation

> "*The fishery people are going to take risks, while the fishery is there, bigger risks than the other people. Some people are more successful at it than others, and some people are not taking as big a risk as long as they make a go of it, you know. That's the nature of people, the way I see it*" (*Murray and Dolomount, 1994*).

One of the world's most dangerous occupations is commercial fishing. From a global perspective, the International Labour Organization (ILO) estimates that approximately 24,000 deaths and 24 million non-fatal injuries occur each year in fisheries (NIOSH, 2002). The occupational accident rate in Norway was reported to be 25.38 per 1000 fishermen in 1999/2000 but decreased year by year to 13.93 in 2007/2008 (Table 1/Norwegian Maritime Directorate, 2008).The occupational death rate for Norwegian fisheries workers was on average101 per 100,000 fisherman-years from 1980 to 1989 and recent reports indicate current rates remain at the same level, between 90 and 150 per 100,000 fisherman-years (Bull et al., 2001; Norwegian Maritime Directorate, 2008). High fatality and accident rates are also reported in the UK, Australia, Denmark and the USA (ILO, Bull et al., 2001; Roberts, 2002; Hansen et al., 2008) and extremely high fatality and accident rates are reported in many developing countries, between 3 and 10 times higher than those of countries in Western Europe and North America (Petrusdottir et al., 2001).

There are no standardized accident reporting systems in the maritime domain, so the comparative data have to be treated with some caution because of differences in measurement parameters and statistical groupings. Nevertheless, the numbers describe an occupation that has some of the highest accident and fatality rates in the world.

A safety notice issued on the 20th of May 2008 by the Norwegian Maritime Directorate (2008) indicates that accidents involving personnel on board fishing vessels are considered a serious safety problem by the Norwegian Maritime authorities:

> Accident statistics for occupational accidents show a disturbingly high proportion of accidents involving personnel on board fishing vessels. The degree of seriousness vary, but many incidents involve severe injuries resulting in prolonged sick leave, and in some cases also injury of a permanent character. Most of these types of accidents happen during work on deck or in the hold. The fishermen in the age range 18–29 are overrepresented in the statistics for occupational accidents, which gives rise to additional concern.
>
> It may seem that in some cases, the training routines have failed seriously, risk assessment and safety evaluation of work operations have been inadequate and preventative measures and also supervision of workers with little experience have been inadequate. These are circumstances which represent violations of

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Table 1
Development in number of accidents and the most common reasons for personal accidents among Norwegian fishermen 1999–2008. Source: Norwegian Maritime Directorate (2008)

Type of accident	1999–2000	2001–2002	2003–2004	2005–2006	2007–2008
Falls on board	32%	28%	23%	30%	30%
Trips/knocks/bruises	27%	25%	28%	24%	22%
Hit by object	16%	15%	15%	18%	20%
Accident involving tool	8%	13%	17%	15%	19%
Lifting, carrying	8%	14%	11%	4%	2%
Explosions and fire, electrocution, chemicals, poisoning	6%	3%	3%	5%	3%
Other	3%	2%	3%	4%	4%
Fall overboard	1%	1%	1%	1%	0%
Number of accidents	747	587	510	397	287
Number of accidents per 1000 fisherman-years (main employment)	25.38	21.95	20.67	18.04	13.93

the Regulation concerning the work environment, health and safety of workers on board ship" (Norwegian Maritime Directorate, 2008).

1.2. Fishing vessel accidents in Norway

The fishing industry in Norway is complex, ranging from shipping companies with several trawlers with formal onshore organizations to small, one-person vessels operating in coastal waters

Table 1 shows accident data grouped on the most common causes for personal accidents among Norwegian fishermen between 1999 and 2008 (Norwegian Maritime Directorate, 2008). The three most common causes for non-fatal injuries are 'Falls on board', Trips/knocks/bruises' and 'Hit by object'. The accident trend seems to be positive, showing a decrease in the number of accidents per 1000 fishermen years of nearly 50% from1999/2000 to 2007/2008. The reasons for personal accidents seem to be relative stable over the same time period. The highest injury incidence rates are among the younger workers (Rubenstein et al., 1999). In an analysis of Norwegian statistics, Bull et al. (2001) found that the highest injury rates among fishery workers were in the 20 to29 year old group, decreasing progressively with age over 30 years. Bruises, fractures, cuts and sprains were the most frequent injuries. This finding corresponds well with the safety notice issued by the Norwegian Maritime Directorate (2008) cited above. It has been well documented that age and accident rates are negatively related (probably because older workers have more on-the-job experience and have greater work knowledge, patience, and skills than younger counterparts). Five times as many non-fatal accidents are reported in the medium coastal vessel group than in the small coastal vessel group, while deep sea fishing vessels report 10 times as many accidents (Aasjord, 2007; Norwegian Maritime Directorate, 2008).

Reported fatal accidents in fishery vessels show the opposite trend. When injuries do occur, older workers are usually more severely hurt, and fatalities occur more frequently among older workers. The average age of a Norwegian full time fisherman in 2009 was 46 years but the majority of the fishermen on the smack fleet are over 50. When it comes to fatal accidents Aasjord (2007) found that most of the smack fishermen who suffered fatal accidents were older; mostly in the 40–60 age group. The risk of death in the small coastal vessel group was 280 per 100,000 fisherman-years, which is more than 5 times as high as in the medium coastal group and more than 10 times as high as for the deep sea vessels.

Most fishermen killed on the job drowned or succumbed to hypothermia in the water after a boat sank or capsized, or after they fell overboard. Bad weather and rough seas combined with engine breakdown are often factors. Falls overboard may result from a wave, a trip, and a slippery boat deck, entanglement in fishing equipment or alcohol abuse (Aasjord et al., 2005). Aasjord (2007) analysed fatal fisheries-related accidents for an 11-year period between 1997 and 2007. The number of fatal accidents varied between 4 and 16, with an average of 10 each year. Single-masted smacks are strongly overrepresented in the founding, capsizing, grounding and the falling or pulled overboard accident categories (Aasjord et al., 2005).

1.3. The human factor and the concepts of safety culture and safety climate

In order to formulate effective interventions to improve safety, a comprehensive understanding of both the nature of safety and lack of it is a prerequisite. Analyses of safety among fishermen and fishing vessels should go beyond the direct causes and effects of accidents like sinking, capsizing falls, trips/knocks/bruises or hit by object and take into consideration the human and organizational factors. Many authors claim that the main reason for accidents in the fishing industry is human error, which is said to account for between 75% and 96% of all accidents in the industry (Umberti, 2001; Rothblum, 2000).

The constructs of safety culture and safety climate are closely related to human error and can be used to understand and analyze human error and guide employees and managers in efforts to improve safety. The most widely used definition of 'safety culture' is the one proposed by the Advisory Committee on Safety of Nuclear Installations in 1993 (ACSNI, 1993), and it includes values, attitudes, competencies, behavior and commitment to safety at work. Most definitions of 'safety climate' are normally not as broad as the definition of 'safety culture', but there is considerable overlap between the two concepts, with employees' attitudes towards, and perceptions of, health and safety behavior featuring in both.

Since the mid 1990s the concepts of safety culture and climate have been the subject of an ongoing discussion that is similar to the discussion of organizational climate and culture (Håvold, 2007). Guldenmund (2000) lists 18 different definitions of safety culture and climate in a review paper and concludes that most researchers have defined safety culture or safety climate in their publications to the extent that they wish to explore them.

The present paper presents the view that safety culture and safety climate, broadly defined, can be regarded as a single construct.

1.4. Fishing vessels and regulations

Legislation plays an important role in controlling the design and equipment of fishing vessels and the provision of proper training and working conditions. However, international conventions and other legal instruments, agreements and arrangements having a bearing on those engaged in fishing are difficult to enforce, and safety legislation that is accepted by the merchant fleet as a result of effective enforcement are often met with reluctance in the fish-