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ABSTRACT

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A literature review (Räisänen 2012) and an inquiry of Nordic maritime occupational accident statistics (Räisänen 2013) have been carried out at Turku University of Applied Sciences. This report is a condensed summary of the two, aimed at outlining benchmarking possibilities and inducing discussion on maritime occupational statistics.

The risk of injury and death due to occupational accidents is in the order of magnitude ten times higher for seafarers than for general population on land. The typical accidents are slips, trips and falls while moving around in the ship. Further, the most dangerous types of operation are mooring, engine maintenance at sea, handling of heavy or unwieldy items, working at height and entry into enclosed spaces. There are significant problems in collecting comparable maritime occupational accident data worldwide, but reliable information is necessary for rational improvement of safety of seafarers by benchmarking. Many maritime authorities publish maritime occupational accident data, but the comparisons and benchmarking are difficult between nations for several reasons. Differences are typical in

- definitions of occupational accidents
- the number of persons and time at risk on-board
- sizes and types of ships included in each statistics
- incentives for reporting of the accidents.

A case study of the statistics of four Nordic countries was carried out, and the details of the accident reporting were inquired for each country. A joint method of occupational accident statistics was proposed for the Nordic

countries and further recommended for international use. It was proposed that

1. occupational accident frequencies for statistics could be extracted from insurance company case data instead of on-board reporting
2. risk exposure could be based on true on-board manning positions data and 24 hours per day
3. accident rates (LTIF) could be calculated per million exposure hours, as this information can be obtained directly from true manning data.

In the discussions during the research, further research topics have come up. Insurance cases may not be an optimal way of reporting accidents if the conditions between nations differ. Concentrating reporting in serious cases may cause losing the information concerning near misses. The size of some national accident databases is currently so small that there are problems of obtaining a critical mass in number of reports for reliably evaluating statistics and relevant analyses nationally, which could be solved by an international approach.

The project was funded by the European Union's European Regional Development Fund, the Regional Council of Päijät-Häme, Turku University of Applied Sciences and the participants from the industry.

TIIVISTELMÄ

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Merenkulun työturvallisuustilastot tulevaisuudessa
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Turun ammattikorkeakoulussa tehtiin kirjallisuuskatsaus (Räisänen 2012) ja tutkimus Pohjoismaisten työturvallisuustilastojen käytöstä merenkulussa (Räisänen 2013), Tämä raportti on näiden yhteenveto, ja sen tarkoituksena on esittää tilastojen käyttömahdollisuuksia vertaisarvioinneissa ja herättää keskustelua jatkotoimenpiteistä.

Merenkulussa työntekijän loukkaantumisen ja kuoleman riski ovat suuruusluokaltaan noin kymmenkertaisia verrattuna samanlaiseen populaatioon maissa. Tyypilliset onnettomuudet liittyvät liukastumisiin, kaatumisiin ja putoamisiin laivalla liikuttaessa. Vaarallisimpia työtehtäviä ovat laivan kiinnittäminen laituriin, koneen huoltotyöt merellä, painavien tai muuten hankalien lastien käsittely, työt korkeissa paikoissa ja suljettuihin tiloihin meneminen. Maailmanlaajuisesti yhteensopivan tilastoaineiston kerääminen on vaikeata, sillä lähteet voivat olla hyvin vaihtelevia laadultaan tai niitä ei ole lainkaan. Monet valtiot keräävät tilastotietoa, mutta vertailut ja vertaisarvioinnit voivat olla vaikeita. Erot ovat tyypillisiä mm. seuraavissa seikoissa:

- työturvallisuusonnettomuuden määritelmät
- todellinen miehitysmäärä ja riskille altistusaika laivalla
- tilastoihin sisätyvien laivojen koko ja tyyppi
- onnettomuusraportoinnin kannustimet.

Asiasta julkaistua aineistoa arvioitiin Turun ammattikorkeakoulussa. Yhteisiä tekijöitä ja aineiston yhteiskäytön mahdollisuuksia tutkittiin neljän Pohjoismaan tilastojen ja onnettomuusraportoinnin avulla. Keskinäisiin vertailuihin perustuvaa yhteistä menetelmää, jossa yhdistyvät käytännöllisyys

ja riittävä tarkkuus, voitaisiin laajentaa myös kansainväliseen käyttöön. Ehdotettiin, että vertailtaisiin

1. onnettomuusdataa, joka saataisiin vakuutuskorvaustiedosta laivojen raportoinnin sijaan
2. riskille altistumisaika laskettaisiin todellisista miehitystietoista ja riskialtistumisesta 24 h vuorokaudessa
3. onnettomuustaajuudet (LTIF) laskettaisiin miljoonaa altistumistuntia kohden, sillä tämä tieto saadaan suoraan todellisista miehitystiedoista.

Projektin aikana viranomaisilta ja tutkijoilta saatiin arvokkaita kommentteja, joiden toivotaan johtavan uuteen tutkimukseen ja keskusteluun siitä, miten raportointia ja tilastoja pitäisi kehittää tulevaisuudessa. Vakuutustapausten tutkinta voi olla vaikeaa, sillä kansalliset erot voivat olla suuria. Jos raportoinnissa keskitytään vakavien tapausten tilastointiin, “läheltä piti”-tapausten tarjoama tieto voidaan menettää. Joidenkin kansallisten tietokantojen koko on tällä hetkellä niin pieni, että niiden tilastollinen merkitys on kyseenalainen. Ongelma voitaisiin ratkaista ehdotetulla kansainvälisellä yhteistyöllä.

Projektin rahoittivat Euroopan Unionin Euroopan aluekehitysrahasto, Päijät-Hämeen liitto, Turun ammattikorkeakoulu ja alan toimijat.

CONTENTS

ABBREVIATION

DMA	Danish Maritime Authority
LTI	Lost Time Injury (or Incident)
LTIF	Lost Time Injury Frequency
NMA	Norwegian Maritime Authority, also NMD (D from Directorate)
OCIMF	Oil Companies International Marine Forum
OGP	International Association of Oil & Gas Producers
OSHA	Occupational Safety and Health Administration
STA	Swedish Transport Agency
TRC	Total Recordable Case
TRCF	Total Recordable Case Frequency
TRI	Total Recordable Injury

1 INTRODUCTION

This report is a compendium of two recent publications on maritime occupational safety and its statistics (Räisänen 2012 & Räisänen 2013). The publications have been merged and condensed to produce a short summary of the main topics. In Räisänen (2012) the data found in literature was reviewed and some new findings were added, and in Räisänen (2013) possibilities of producing compatible statistics were discussed. The case of four Nordic countries was studied in some detail. The literature shows that seafaring is a relatively dangerous occupation: the increase in the risk of death is in the order of magnitude ten times higher than for general population on land (Roberts 2008). Naturally, statistical data on the phenomenon has been published in many countries, but worldwide comparisons are difficult. In related studies of safety on-board by the author (Räisänen 2009, 2010, 2012 & 2013), it was proposed that especially safety benchmarking could be useful for improvements, and the possibilities were presented as a proposed joint method of occupational accident statistics (Räisänen 2012). In this publication, these past reports are summarised and some additional comments are presented.

The publications were produced in project CAFE, which was funded by the EU, the Regional Council of Päijät-Häme, Turku University of Applied Sciences and participants from the industry.

2 FACTORS RELATING TO OCCUPATIONAL ACCIDENTS ON-BOARD AND THEIR REPORTING

For the research of occupational accidents on-board, various information sources are available. Information is produced internally in shipping companies, but, depending on the severity of the accident, also by outside stakeholders such as flag state administrations, insurers, rescue agencies and medical authorities. Typically, the availability of official data correlates with the severity of the accident. Many definitions exist related to occupational injuries and accidents in the maritime community. Usually, the definition of an accident is related to the severity its consequences. For example, Nielsen and Panayides (2005, p. 155) define the term ”Occupational accident” as ”work related accident occurring at the place of work, suffered by a seafarer which results in death or personal injury.” Similarly, the oil industry (Oil companies international marine forum OCIMF 1997, International Association of Oil & Gas Producers OGP 2010) defines fatalities, accidents that produce disabilities and cases where workdays are lost due to incidents as Lost Time Injuries (LTI). Other, broader definitions, TRC, (Total Recordable Case, OCIMF 1997) or TRI (Total Recordable Injury, OGP 2011) are also used in oil transport. They include the LTIs but also a number of smaller injuries and other medical cases. Further, a measure for the time at risk for the personnel is needed. Typically, these metrics are related to man-years on-board (e.g. Roberts and Williams 2007, p. 39), hours of presence on-board (e.g. OCIMF 1997), performed working hours on-board (e.g. Danish Maritime Authority 2009, p. 15) per ship per year (Nielsen 2002) or number of active seafarers in occupation (Swedish Transport Agency 2010, p. 10).

2.1 FATALITIES

Despite the mandatory identification of hazards and avoidance of risks, fatal accidents do occur on-board. They have been studied in several sets of statistics. Nielsen (2002) refers to occupational accidents as the cause of 10–16 % of all deaths on-board, and Roberts (2008) reported of fatal maritime accidents of almost a century for the British merchant shipping. The conclusion was that the fatality rate per seafarer-years has gone down considerably, similarly as in

land-based occupations. The least improvement was found for deck occupations. Fatalities in shipping disasters, like sinking, have been reduced, as have off-duty fatalities, drowning in docks and deaths in cargo handling (e.g. Bloor 2008). In recent decades current rate has been typically 10 to 100 fatalities per 100,000 seafarer-years. In recent years, the occupational mortality rate for seafarers was from 11 (Denmark) to 12 (UK) times higher than for the general workforce (Nielsen 2002; Roberts 2008, p. 135; Roberts & Williams 2007, p. 8; Hansen et al. 2002, p. 85). Roberts and Williams (2007) also made comparisons with other industries, and the fatality rate of shipping was about 3 times higher than in the construction industry and about 9 times higher than in manufacturing. They have compiled an extensive summary of fatalities at sea, in which comparisons were presented for 18 different flag states, some with several sets of data. The summary table of their data was presented also in Räisänen (2012).

Roberts and Williams found that comparison between different studies is often affected by differences in criteria, such as the definition of a fatal accident and the metric for the amount of time for seafarers at risk. From the studies, it can be seen that the fatalities are relatively rare for many flag states. Unfortunately, the published statistics are not fully compatible with each other.

2.2 INJURY IN OCCUPATIONAL ACCIDENTS

Based on accident data analysis, Bailey et al. (2010) list some common injury types for seafarers:

- strain, sprain or twist
- striking injury
- break or fracture
- bruising
- cut or piercing injury
- crush or trap injury
- a foreign object in the eye or body.

Jensen et al. (2004, p. 548) found with a questionnaire study in 11 countries that during the latest tour of duty, 9 % of all seafarers were injured, and 4 % had an injury with at least 1 day of incapacity. Related information about injuries has been obtained from the medical emergency contacts of ships as well as physicians ashore. It was found that violence related to 5% of the injuries, and falls and slips to 44%. In 58% of the cases, the seafarer was off work for at least one day or more. In their study on seafarer hospitalisations, Hansen et al. (2005) found that ratings and officers of small ships were particularly at risk for injury.

2.3 MOST HAZARDOUS WORK TASKS

From several studies, it can be summarised that moving around ships causes many injuries. Roughly half of the injuries were due to slip, trip and fall (STF injuries, e.g. Jensen et al. 2005; Bailey et al. 2010; NMA 2010, p. 9). These are listed below with some other important causes of injury on-board:

- slips, trips or falls on the same level
- falls from a height
- hit by moving (includes flying / falling) object
- handling, lifting or carrying
- drowning / lack of oxygen / overcome by fumes
- exposure to, or contact with, a harmful substance
- struck against something fixed or stationary.

An interesting matter is also looking at which work tasks are hazardous. Bailey et al. (2010) report the following:

- mooring operations
- engine maintenance at sea
- manual handling of heavy or unwieldy items
- working at height
- entry into enclosed space
- working near open hatches or tanks
- crane operations
- use of ladders or gangways
- working over the side.

In their precise treatise on vessels with the Danish flag, Hansen et al. (2002) conclude that ”working on deck made up almost half of all notified accidents, half of the accidents causing permanent disability, and half of the fatal accidents”, and refer to especially mooring operations, cargo handling, lashing work and operating hatches. They also note that moving around on-board caused about 10% of the notified accidents, but more than one fifth of the serious accidents that caused permanent disability. They report that about half of the moving-related accidents occurred on ladders and stairs. The situation may be different

for passenger vessels. Dahl et al. (2008) reports that the hotel crew had a higher accident rate than the marine crew. Food preparation was obviously dangerous, as the most common accident location (30%) was found to be the galley.

2.4 NATIONALITY AND AGE

Hansen et al. (2008) have confirmed that the differences between the nationalities of merchant seafarers can be considerable, and that mariners from South East Asia have significantly lower accident rates compared with the seafarers from Western Europe. Their analysis is based on several types of information, originating from a period of one year. They used quantitative and qualitative information on occupational accidents on Danish merchant ships and found that the average rate was 84 accidents per 1,000 years aboard. The accident rate of East European seafarers was 88% and South East Asians 22–38% of the incidence rate of the West European seafarers. Further, in a recent study, the fatality rates among British subjects were found to be higher than for other nationalities (Roberts 2008). Hansen et al. (2002) found that an age of over 45 years was a risk factor for permanent disability after accidents.

2.5 PROBLEMS WITH STATISTICS AND REPORTING

Nielsen (2001, 2002) refers to problems in obtaining reliable statistics on maritime occupational accidents: many of the flag states do not produce relevant statistics, and there exists significant under-reporting in the available statistics of occupational accidents at sea. Further, Nielsen and Panayides (2005) refer to their worldwide survey when reporting difficulties of obtaining compatible data from several flag administrations. In an analysis of incident data obtained from 16 maritime administrations and two shipping companies, Bailey et al. (2010) found that only six of the administration datasets were suitable for mutual comparison.

Another type of problem is the large variations in reporting on-board the ships. Oltedal and McArthur (2010) strived to identify the factors determining the reporting frequency of incidents and accidents in Norwegian controlled merchant ships by surveys on 76 vessels. They found that enhanced safety related training, a trusting and open relationship among the crew, safety-oriented ship management, pro-active risk identification activities and feedback on reported events were all significant for higher reporting frequency. In contrast, demand for efficiency and the lack of attention to safety from shore personnel indicated lower reporting frequency. Not unexpected, they found that bulk and dry cargo vessels to have significantly lower reporting frequency than liquid bulk carriers. It has also been found that incomplete and even falsified working hour documentation due to excessive workload is possible (Ellis 2005, p. 105). Ellis

(2007) also comments on the collection of data on all accidents and incidents in maritime business that the sources ”are generally found to be localised, poor in coverage, and/or to contain only very basic data”. Possible contributing factors can be issues such as employment continuation and social pressure on-board (e.g. Ellis et al. 2009).

3 METRICS OF MARITIME OCCUPATIONAL SAFETY

For comparisons of occupational safety, reliable metrics are needed internationally, nationally and in shipping companies, but they are currently difficult to find in some branches of shipping. Some sources and methods of analysis are discussed below.

3.1 SOURCES OF DATA

There is lack of comprehensive worldwide statistics of loss of life at sea (Nielsen & Panayides 2005, p. 149) and even less is available occupational injuries (Bailey et al. 2010). The source types of data vary, but the most common are based on accidents that are reported to authorities or insurance companies (e.g. Hansen et al. 2002). The sources were discussed in some detail in Räisänen (2012). It was found that there are good examples of good benchmarking data specifically in the oil and gas industry, which has been collecting accident data (e.g. Hudson 2001). A similar system is endorsed for the marine transport by the Oil Companies International Marine Forum, which also collects statistics for their members.

3.2 NORMALISATION

In addition to physical and organizational risk factors, the number of accidents on-board is related to the number of the seafarers and their time at risk. These have been used to enable comparisons between differently sized seafarer populations. The normalisation is usually carried out by dividing the number of occurrences with a measure that is related to the time at risk for the population at hand to obtain a ”frequency” or ”rate” for the occurrences. For example, the number of accident cases can be normalised by dividing the numbers with the time at risk of the personnel, typically per million work hours (OCIMF 1997). For all branches of shipping, the time at risk may not be similarly available for occupational safety statistics, and the number of active seafarers in industry (e.g. Swedish Transport Agency 2010), the number of ships, the number of ship-years (e.g. Nielsen 1999, p.128, Roberts & Williams 2007, p. 37) or the number of worker years (e.g. Roberts & Williams 2007 p. 28) have been used. The choice of factors used for normalisation seems to depend mostly on the availability of data, but also on the ease of processing. Roberts and Williams (2007) present fatalities as a

rate per 100,000 seafarer years, using the number of people employed yearly by the industry as reference. If the number of crew is not known, the statistics can be calculated per ship-years. Also other possibilities are available, such as rates per 1,000 ship-years at risk (e.g. Roberts & Williams 2007, p. 37). For fatalities, Standard Mortality Ratio can be used to compare fatalities among populations, i.e. between seafarers and the corresponding male population on land.

In the calculations, the assumption how many hours a person is at risk affects the results considerably. A common and easy alternative for exposure hours per day is 24 hours, which is also easy to calculate when manning and the yearly days in operation for a ship are known. With this normalisation for shipping of oil, the typical accident (LTI) rates are around one per million exposure hours. For instance tankers and supply vessels of A.P. Moller-Maersk Group (2011), respectively, have had approximately this rate. The standard achieved in maritime oil transport can be used as an attainable target for other forms of shipping. Further, the system of maritime oil transport, where the normalisation is based 24 hours of exposure per day and the rates are calculated per million exposure hours, seems to be the easiest suitable solution also for other shipping companies and flag states, which could obtain this data relatively easily. Therefore, the explication of existing data from shipping industry sources in a compatible form is a useful research topic for the future.

4 CURRENT PRACTICES OF ACCIDENT REPORTING IN FOUR NORDIC COUNTRIES

The differences between societal and business environments in Nordic countries are relatively small, and therefore it was tested in the research if comparisons of occupational safety data were possible between the countries. All the four Nordic countries that participated publish information about the occupational accidents. In Sweden (Swedish Transport Agency 2011), Norway (Norwegian Maritime Authority 2010, 2011) and Denmark (Danish Maritime Authority 2009, 2011) the publisher is the national maritime authority. In Finland, the Statistics Finland and the Finnish Occupational Health and Safety Administration (Finnish OSHA 2010, 2011) publish statistics based on the Statutory Accident Insurance (aka Federation of Accident Insurance Institutions, TVL) data.

The statistics were found to differ not only because the structure of the maritime industry and the types of traffic and ships varies, but also the format and coverage of the statistics varies. These are described briefly below.

The Danish reporting concerned accidents that the ships are obliged to report to the Danish Maritime Authority. The comparisons were presented as accidents per million work hours. The graphs showed that during the years there had been generally a positive development in accidents. Interesting questions that arose are the effects of details of reporting systems and ways of counting the work hours.

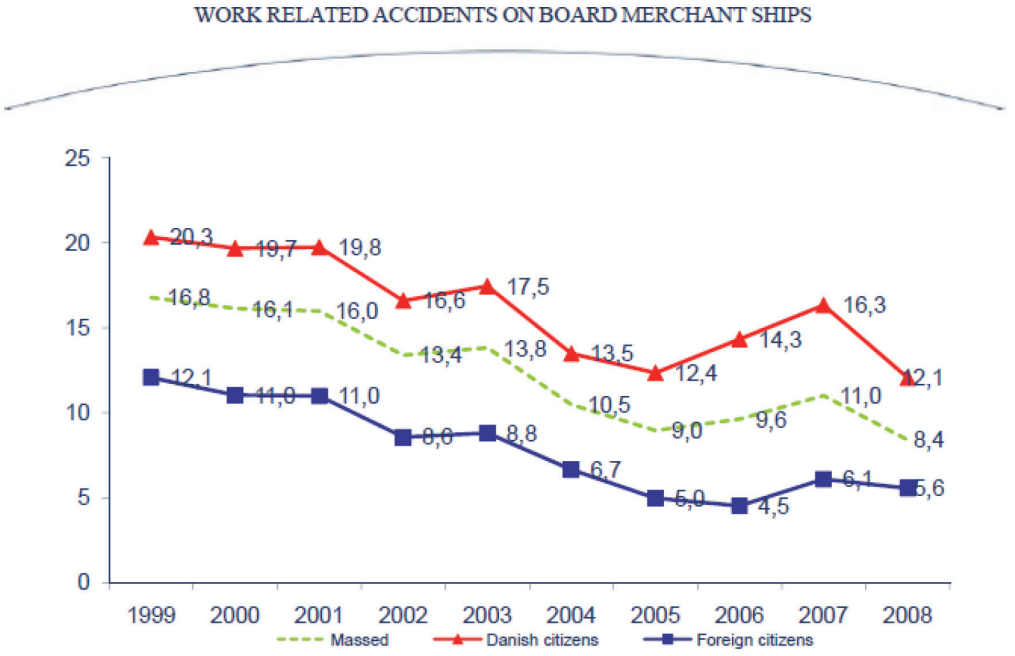


FIGURE 1. *Published data on reportable accidents of Danish International Register (Danish Maritime Authority 2009).*

The Danish system can be used as a generic benchmark by shipping companies, but more detailed information about ship types and traffic could be useful.

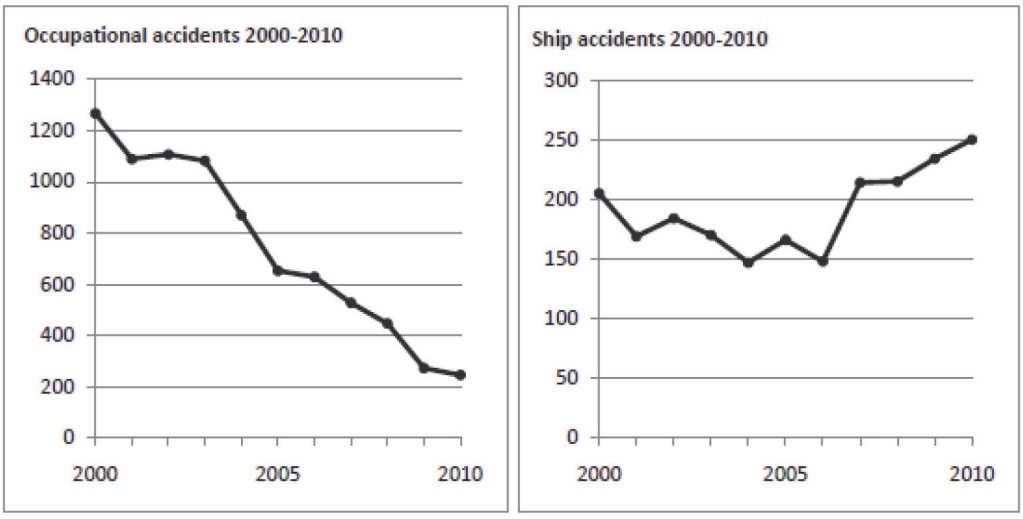
The Finnish reporting system was based on insurance company case data for the number of accidents and the actual payroll hours that the companies are obliged by law to report to the private insurance companies. They forward their data to the Federation of Accident Insurance Institutions, which provides joint data to the authorities. The authorities can provide detailed datasets, e.g. comparisons between years, by request. For the public, only general statistics on maritime occupational accidents were presented.

Vuosi	TOIMIALA (2)	Vahinkojen lkm	Työtunnit(1000 h)	Taajuus
2005	43 Erikoistunut rakennustoiminta	9023	97353	92,7
2005	45 M.ajoneuvojen ja -pyörien tukku-ja v.kauppa	2692	56619	47,5
2005	46 Tukkukauppa (pl. m.ajon. ja mp. kauppa)	3452	141659	24,4
2005	47 Vähittäiskauppa (pl. m.ajon. ja mp. kauppa)	5229	199844	26,2
2005	49 Maaliikenne ja putkijohtokuljetus	5929	96264	61,6
2005	50 Vesiliikenne	582	17106	34,0
2005	51 Ilmaliikenne	373	11501	32,4
2005	52 Varastointi ja liikennettä palveleva toim.	1584	42263	37,5
2005	53 Posti- ja kuriiritoiminta	1843	36604	50,3
2005	55 Majoitus	465	19637	23,7
2005	56 Ravitsemistoiminta	2491	70078	35,5
2005	58 Kustannustoiminta	373	31143	12,0
2005	59 Elokuva-, video- ja televisio-ohjelmatuot.	136	4359	31,2
2005	60 Radio- ja televisiotoiminta	.	.	.
2005	61 Televiestintä	319	31595	10,1
2005	62 Ohjelmistot, konsultointi ja s.liitt. toim.	211	57559	3,7

FIGURE 2. *An example of the Finnish reporting of yearly occupational accident rate from insurance data and salaried hours (Vahinkojen lkm = All accidents, 50 Vesiliikenne = Waterborne traffic, Taajuus = frequency) (Finnish Occupational Safety and Health Administration. 2010).*

The above example of Finnish reporting provided the number of accidents, working hours and the accident rate per million hours. Also office personnel are included in the statistics. Making conclusions of the Finnish data for instance on yearly development was more difficult than from the other statistics, but the possibility of obtaining specialised reporting may compensate for this shortcoming. For shipping companies, using Finnish data as a benchmark may not be accurate enough, as the effects of traffic and ship type as well as the inclusion of office staff may obscure the results. Also the relatively small number of ships in the Finnish merchant fleet may reduce the predictive power of more detailed analyses.

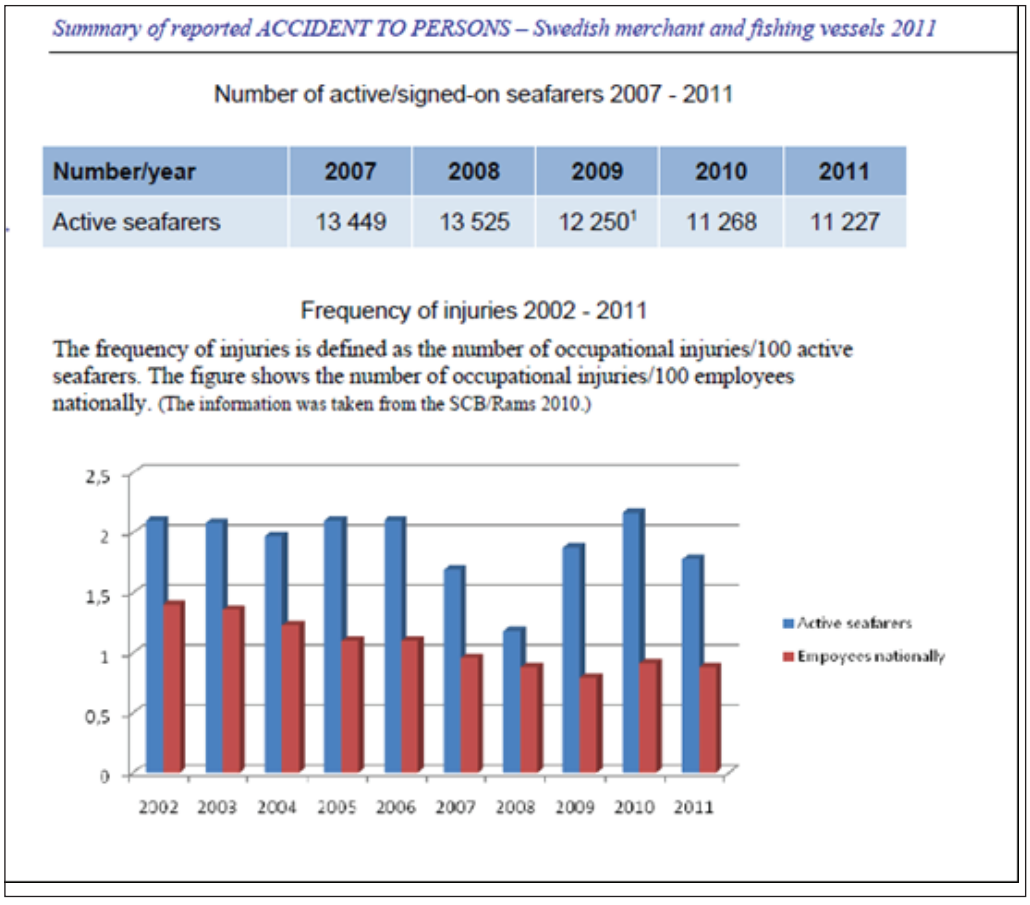
In Norway, the occupational accidents on-board are to be reported by the shipping companies to the Norwegian Maritime Authority (NMA). The graphs were published as direct numbers of occupational accidents, and they showed a decreasing trend. As there was no information attached about the number of persons at risk, the curves could be used for comparisons of Norwegian national trends, but they were less useful as benchmarks for shipping companies. More details on ship and traffic types in the statistics could benefit the shipping



companies in their safety development. For this, time at risk would be needed in the published data.

FIGURE 3. *Occupational accidents in the Norwegian publication (NMD 2010). Corresponding data is published also in Norwegian (NMA 2011).*

The Swedish statistics were comprised of accidents that are reported to the Authority and the numbers of seamen that were in active duty according to the



national Seafarer's Register. The data was output as number of accidents per 100 persons on active duty.

FIGURE 4. *Frequency of injuries in the Swedish public report (Swedish Transport Agency 2011).*

The Swedish trends for accidents were less well defined than those reported in Denmark and Norway. The sudden drop of the rate to about half in 2008 in the above graph may refer to changes in reporting practices in addition to improvements in safety. The "occupational injury" graph above also included the occupational illnesses as per definition "Occupational injuries mean accidents and sicknesses, which are the result of injurious influence at work" (STA 2011). The time at risk as well as ship and traffic types could be discerned more, although such sub-grouping might increase the scatter of data for each group due to relatively small numbers of cases. With Nordic co-operation, however, the amount of data in such sub-groups could be increased. Further, more specific reports on injuries can be ordered from Swedish Work Environment Authority.

From the previous graphs it can be seen that comparing occupational safety in Nordic countries is currently difficult. Further, changes of crew nationality on board will most likely change the number of accidents (Hansen et al. 2008) and the reporting practices may change as well (Pedersen 2012). In the following, some factors that attribute to the differences are discussed.

4.1 REPORTING PRACTICES OF OCCUPATIONAL ACCIDENTS

In the Danish reporting, occupational accidents relate to all employment at sea, which have to be reported to the Danish Maritime Authority, regardless of the causes and including the marine accidents. If an accident is fatal, the accident is only registered as a fatal accident. There are two categories of accidents of which serious work-related accidents include accidents resulting in fractures, loss of a limb or injuries on large parts of the body. The other category is "work-related accidents" that cover the rest. There is also a category of "not reportable accidents", which includes the accidents with less than one day absence.

In Finland, the official statistics are based on the broad definition of waterborne traffic, and include the office personnel as well. All accidents that result in claims to insurance companies are reported. Fatalities and injuries due to maritime accidents are included in the statistics.

In the Norwegian publications, occupational accidents relate to people who carry out work on board, but also others, such as passengers and pilots, are included separately. Injuries due to marine accidents are not included in the statistics. Similarly injuries to people on board foreign ships in Norwegian waters are included in principle, but in practice very few accidents are reported and recorded. Some reporting occurs though, mainly from tankers. In Norway,

to improve the focus on more serious cases, the reporting requirement for the smallest incidents was dropped in 2005 (Pedersen 2012).

For the Swedish publication, the definition of occupational injury is wider than in the other countries as it also covers occupational illnesses. The coverage and effects to Nordic comparisons could be checked. The Swedish system has been subject to change, and reporting practices are under development.

4.2 SIZES AND TYPES OF SHIPS AND TRAFFIC AREAS IN STATISTICS

The composition of fleets and the traffic vary considerably in the Nordic countries. For example, the coastal traffic in Norway is much more extensive than in the other countries, and also fishing vessels are included in the general statistics. However, there are matching ship types and traffic patterns in the data of all countries.

4.3 TIME AT RISK

The personnel are at risk the whole time they are on board although they may have assigned work hours and free periods. Naturally, the risk varies based on their activities. From the statistical perspective, instead of the actual time at risk, an assumption is used. The selection of the estimation method by the authorities is probably based on the availability of suitable data.

5 SUMMARY TABLE OF THE NORDIC PUBLIC REPORTING

In the following table, the situation in the continental Nordic countries is summarised. The most important issue that affects the results are the reporting practices. As reporting from ships is known to be subject to fluctuations, automatic reporting from insurance cases may produce the least variation of results. As all the nations have good electronic databases of accidents, improvements by Nordic co-operation could be rather easy. Further, all the nations gather more extensive data than they publish, and it was found that there is a good potential for joint development. More research on compatibility of insurance reporting was found to be necessary, though.

TABLE 1. *Summary of reporting in Nordic countries.*

	Denmark	Finland	Norway	Sweden
Authority in charge	Maritime authority	Ministry of Social Affairs	Maritime authority	Maritime authority
Authority which collects the statistics	Maritime authority	Federation of Accident Insurance Institutions	Maritime authority	Maritime authority
Reporting practices	Compulsory reporting of shipping companies	Automatically from insurance claims	Compulsory reporting of shipping companies	Compulsory reporting of shipping companies
Time at risk	Per million hours, based on 10 hours on-board per day, Also per 1000 crew-members is used	Per million salaried hours	Not used in publication	Per 100 active seafarers
Sizes and types of ships in statistics	All waterborne traffic under Danish and DIS flags, excl. fishing	All waterborne traffic under Finnish flag, excl. fishing	All waterborne traffic under NIS and Norwegian flags, incl. fishing and some foreign ships in Norwegian waters	All waterborne traffic under Swedish flag
Are office personnel included	No	Yes	No	No
How well are the current publications suitable for benchmarking by the shipping companies	Useful for generic benchmarking, but ship size, traffic type and ship type could be included	Publicized analyses are less useful than the specific reports that can be requested	Could be made more useful by including time at risk, ship size, traffic type and ship type	Could be made more useful by including ship size, traffic type and ship type
Are there instructions how the publications could be used for benchmarking by the shipping companies	Currently not	Currently not	Currently not	Currently not

6 CONCLUSION AND COMMENTS

Seafarers' risks of accidental injury and death are in the order of ten times higher than the risks of comparative population on land. The typical accident modes are slips, trips and falls while moving around the ship, which account roughly for about half of the accidents. In general, the most dangerous types of operation are mooring operations, engine maintenance at sea, handling of heavy or unwieldy items, working at height, and entry into enclosed spaces. There are differences between nationalities; typically mariners from South East Asia have significantly lower accident rates compared with seafarers from Western Europe.

There are significant problems in collecting comparable data worldwide as the sources are very variable or non-existent. However, it is known that comparable statistics can be produced if there is an incentive, of which the oil transport is an example.

The reporting practices currently differ in the Nordic countries. In Norway, Sweden, and Denmark, the statistics are composed of accidents reports that are collected from the ships, but in Finland the accident information comes from the insurance companies, and it is based on recorded insurance cases. Of the statistics that are based on ships' reporting to maritime authorities, it is known that the actual number of accidents is higher than reported (DMA 2011, NMD 2010, Ellis et al 2009). Use of compensation data from insurance companies for statistics could be considered, as the input could show less variation, and reduced amount of reporting could ease the workload on board. It is proposed that such reporting could be extended to other nations as well. Some insight was obtained about the situation in Estonia, where the Labour Inspectorate is responsible for the supervision over occupational health and safety (EMSA 2013). According to Avi (2013) and Vaikmets (2013), there are a few registered occupational accidents in Estonian maritime traffic compared to other countries. The explanation might be underreporting, which is currently being addressed. In the future, there should be a possibility of drawing up comparable occupational accident statistics.

Based on the findings in Nordic countries, it would be interesting to extend the research on further nations. The following is proposed as the lowest common denominator: a system where the true manning of the ships would be used, and the time at risk would be calculated as 24 hours per manning position – according to the system that is common in oil transportation today. This could produce a sufficiently accurate reference of Lost Time Incident Frequency (LTIF) for occupational accidents as

$$LTIF = \frac{Number\ of\ insurance\ cases \times 1000.000}{No.of\ manning\ positions \times 24 \times 365}$$

This could serve as benchmark for shipping companies who could easily calculate their own status with their internal information. It should be noted that the number of seafarers on board (true manning) that the shipping companies use is often larger than the minimum safe manning that is recorded by the maritime authorities. This could introduce a bias for the data unless true manning is obtained. The effort required from the authorities for extracting and recording the true average yearly manning of ships should be rather small, though. The proposed system would provide a simple model for comparisons, and there would be no limitation of providing additional information nationally, such as near misses. In countries where more detailed data is available for the authorities, joint benchmark for a couple of ship and traffic types, such as ferry operations, ro-ro traffic and tanker shipping could be formed. It is proposed also that the benchmark should be limited in ship size to remove the variation caused by accidents on smallest vessels. A practical border could be 3000 GT, for example, as currently in Denmark.

Some valuable comments to the above suggestions were received from the authorities and researchers, which can serve as seeds for future research. The comments are summarised below, and it is hoped that they would also spur some further discussion on how to develop reporting and statistics. Hansen (2010–2013) expressed concern that insurance cases may not be an optimal way of reporting accidents. Based on his research, accidents of foreign seafarers, for many reasons, may be different in regard of insurance than the accidents of natives of Nordic countries. He also stated that in Denmark, the same notifications from ships are used for both the statistics of the maritime authorities and the insurance company. These kinds of combined procedures solve much of the reporting problems and could be used as a model for other countries. Berntsen (2013) commented that although for reducing the problem of underreporting of accidents insurance data might be useful, some might lead to a reduced number of samples as only serious enough cases warrant an insurance claim and near misses are lost from reporting. The proposal of using the "safe manning" of the vessels has been criticised as the actual number of crew might be considerably different, and actual manning should be strived for. The national differences in what kind of information is collected in insurance cases and what costs are included should be looked into. Regarding the current size of national accident databases, Sandberg (2013) pointed out that there are currently problems of obtaining a critical mass in number of reports for reliably evaluating statistics and relevant analyses nationally.

In conclusion, it is hoped that the discussion on reporting maritime occupational safety would continue and that international benchmarking would became available to all shipping companies for their development efforts.

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