WORK-RELATED TRAUMATIC DEATHS OF BRITISH AND AUSTRALIAN SEAFARERS: WHAT ARE THE CAUSES AND HOW CAN THEY BE PREVENTED?

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Dr Claire Mayhew visited the Seafarers International Research Centre while on sabbatical in early 1999. She has been involved in Occupational Health and Safety (OHS) research and teaching in Australia for a number of years, both as an academic and in a government research/policy capacity. Claire has published widely in Australian and international OHS journals, and has a number of monographs on OHS. In February 1999 she co-edited *Occupational Health and Safety In Australia: Industry, Public Sector and Small Business,* which was published by Allen and Unwin. Over the last six years she has developed a particular interest in the OHS status of precariously employed workers in a range of occupations. In this paper she argues that seafarers are part of the international precarious labour force, and their poor OHS reflects this.

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SUMMARY

Substantive empirical research on the Occupational Health and Safety (OHS) status of seafarers is limited. In this paper the link between the OHS of seafarers and the precariousness of their employment is explored. Precarious or 'contingent' workers are usually defined as those who are hired on a short-term contract, are contractors or sub-contractors, self-employed or work in micro small businesses, are casual or itinerant workers, or are part-time. Across the industrialised world, precarious labour has been found to have poorer OHS indices than 'standard' employees. The reasons for this have been found to be complex, and include economic and time pressures, limited labour market bargaining power, restricted access to OHS advice and prevention strategies, as well as regulatory framework difficulties. While traumatic fatalities at work are the most extreme outcome in an environment where the OHS of seafarers is not prioritised, injuries, illnesses and excessive fatigue are also common.

This paper specifically focuses on traumatic fatalities amongst seafarers in two countries: Britain and Australia, and concentrates attention on the UK situation. The study was based on interrogation of coronial mortality records. First, in Britain the Office for National Statistics collates mortality data for the whole nation; causes of 'non-natural' death for seafaring occupations were accessed for the periods 1989-1992, and 1982-1984. Narrative data from coronial records over 1993 to 1997 were also interrogated. Seafarers, fishing workers, and officers (includes pilots) were able to be reliably separated out. Second, Australian traumatic death data were accessed from the second Work-Related Fatalities study which also covered the period 1989-1992; some limited data for 1982-1984 were also available. The major findings were:

- in both countries the dead workers were overwhelmingly male.
- the dead British seafarers were older than the Australians, perhaps reflecting the ageing workforce.

- the major cause of death for Britain seafarers was suicide, and this was undoubtedly linked with excessive fatigue. The mechanisms used were most commonly hanging/strangulation/suffocation, use of a solid or liquid substance, and inhalation of a domestic or other gas.
- Other deaths of British seafarers were associated with vehicle incidents (on docks, on journeys, and 'elsewhere'), water transportation incidents (collisions, explosions, and 'crushed between vessels' etc.). On-board ship, older British seafarers frequently died as a result of falls on stairs (rarely on ladders).
- There was a significant improvement in drowning deaths amongst British seafarers over the period 1982-1984 to 1989-1992. It is believed that this resulted from structural changes in the British fishing fleet with fewer, but larger, vessels now operating.
- The major cause of death for Australian seafarers was drowning (68%). Many deaths occurred during poor weather while fishing activities were in progress, and where life jackets were not worn. Smaller boats were probably higher risk.
- In both Britain and Australia in-port deaths were common, and often associated with inebriated seafarers transversing gangways during off-duty hours.

Prevention strategies recommended include:

- the development and implementation of comprehensive Occupational Health and Safety Management Systems, based on Risk Assessment and Control principles. These systems have been widely adopted on land, but have not yet been implemented in seafaring, let alone the fishing fleet. There is a potential for OHS legislative instruments to assist with this process.
- Objective evidence of the links between hours of labour, shiftwork schedules, recuperation time/quality, fatigue indicators - and suicide - are urgently needed. Remedial strategies can then be implemented.
- The disincentives to on-going use of lifejackets during working activities on fishing vessels need investigation. Re-design may be needed.

- Finally, upgraded wharf/ship gangways and barriers would assist all parties in meeting their OHS Duty-of-Care legal obligations when vessels are in port.

INTRODUCTION AND BACKGROUND

Substantive empirical data on the Occupational Health and Safety (OHS) status of seafarers is limited. While general working conditions faced by the labour force employed in the range of seafaring industry sub-groups have recently become the subject of attention by researchers, assessment of OHS indices and prevention programs are in their infancy. As in many other industries, competitive globalisation pressures significantly influence the working lives of seafarers. As a result of market pressures on an increasingly internationalised labour force, payment levels and conditions vary markedly between workers from different nation states. Those with limited bargaining power are paid minimal wages and work under poor conditions; those demanding improved conditions can be priced out of the labour market - except where they have specific skills/qualifications which are in short supply. It will be argued in this paper that these underlying economic pressures also affect the probability and severity of OHS threats.

The work experiences of seafarers and fishing workers are quite different in terms of technical demands, the economic basis of their industries, and their social/family life patterns are distinct. Seafarers as a whole are a mobile workforce in terms of their inevitable geographical moves, and also because they are usually precariously employed. The length of contract usually ranges from 8 to 14 months and hence they are clearly part of the (international) precarious labour force. In all, the global seafarer labour force has been estimated at 1.5 million workers (Lane 1999:85). Fishing workers who are self-employed may have more stable employment in geographical location terms, but their income is likely to be highly erratic. Fishing workers tend to more frequently operate out of a particular port, although their work is seasonal and has been subject to major restructuring. In fact, the British fishing fleet has declined significantly over the past two decades, partly through restrictions on quotas, access limitations through territorial waters, and dwindling stocks. Thus fishing workers are also clearly part of the precarious labour force. There is very little movement between seafarer and fishing

groups. The only sectors between which there appears to be some employment mobility is seafarers (and particularly shipping officers) who may move to long-distance ferry and pilotage work, often for family lifestyle reasons. Ferry and pilotage workers are usually based in one port and can return to their homes at night, or at least every other night. However such work is also usually on a short-term contract basis, and hence these workers are also precariously employed.

One area related to OHS in which there has been considerable recent attention paid is the safety of vessels; for example examination of the relationship between 'flags of convenience' (FOC) registration and ship integrity in the maritime industry. Couper (1998:34) has estimated that 32% of vessels, and over 50% of gross world tonnage, are registered under FOC's, with labour predominantly supplied by the Philippines, Indonesia, India, China and Russia respectively. Some FOC registered ships have become the subject of growing international concern - with the International Transport Workers Federation (ITF) at the forefront of the campaign against poor pay and conditions awarded. Conditions appear to be particularly poor for workers from developing nations (Hill 1998:22-24). One consequence of the growth of FOC's is that nation states with 'tougher' requirements may outsource many risky operations which are expensive to adequately control, and retain maritime operations which are lower risk. For example, passenger transport may be retained and cargo shipments 'flagged out' (see Roberts 1998b:46). As in so many other industries, the competition for maritime contracts has been found to be associated with increased risks:

> *'Many flag states, port states, classification societies, operators, charterers and other parties insisted on high standards and acted in a responsible manner. Others appeared to adopt an approach which sought to maximise short term returns, even at the expense of lives, cargoes, the marine environment and their own reputations ...*

> *ultimately derive from a fundamental lack of respect for human life'* (see HRSCCTMR 1998:6).

Thus while the relationship between 'flags of convenience' and vessel integrity have begun to be assessed (see HRSCTCI report), substantive empirical data on the OHS of the labour force are lacking. The international legal framework is complex, particularly in relation to workers' OHS.

The OHS Legal and Policy Framework

Ships at sea, and when in port, are normally considered to be covered by the laws of the nation state of the flag flown on the ship. Importantly, because a ship is accorded a nationality, those on board live under the law of the nation state of the flag flown, and offences on board are covered by the legislative framework and provisions of that country (see Gaskell *et al* 1997:19). However international law and standard practices are constantly changing. For example, European Community (EC) Directives have had a major impact on the OHS regulatory framework under which many occupational groups work in Europe, and are slowly leading to greater uniformity across member states (EC 1993:93/104/EC). Thus while there appears to be a simple coverage of all British land-based workers by the *Health and Safety at Work Act* of 1974, membership of the European Community (EC), the Single European Act of 1987 (esp. Article 118a), the signing of the Treaty of European Union at Maastricht in early 1992, and the subsequent EC Framework Directives have had a significant impact. For example, EC Directives underpinned the UK *Management of Health and Safety at Work Regulations* of 1992 (commonly known as the 'six pack') (Smith and Thomas 1996:672,688,690). The importance of EC Directives has been upheld in common law decisions, as have the vicarious liability responsibilities of employers (see Hill 1998:465-466,474; Pitt 1997:382-283).

In the *United Kingdom*, the minister for the Department of Environment, Transport and The Regions holds ministerial responsibility across all division sections that cover the OHS of British seafarers and fishing workers. The Health and Safety Commission has OHS policy responsibility, and its Executive holds inspectorate responsibilities for British industry, mining, stevedoring and off-shore work (e.g. oil drilling) with statute breach penalties currently up to £20,000 and/or six months imprisonment (Selwyn 1998:489-490). The OHS of British workers in the stevedoring, dredging, vessels within territorial waters and North Sea oil rigs, and fishing industries comes under the umbrella of the *Health and Safety at Work Act* (1974) (commonly known as the Robens-based model), although specific regulations elucidate the general philosophical intent and provide more detailed practical guidance. There are specific regulations for gangplanks in the *Docks Regulations* (1988) which provide guidance for specific hazards and risks on both maritime and fishing vessels (e.g. Regulation 7 covers safe access/egress - which is enforced by the Port authorities, the HSE, and the Marine Coastguard Agency). The HSE also produces Guidelines for OHS in dock operations, prevention of falls into holds, safe systems of work etc., as well as the 'six pack' (which applies to docks); all of which work in conjunction with the *Merchant Shipping* act. The HSE enforces the Act and Regulations in dock areas and on dredges; the normal reporting requirements for serious injuries and 'dangerous occurrences' through RIDDOR apply, and HSE Inspectors issue Improvement and Prohibition notices and initiate prosecutions e.g. a mobile crane which overturned on one dock was investigated by the HSE.

For British seafarers, pilots and fishing workers there are specific provisions in:

- the *Merchant Shipping Act* of 1995;
- the *Merchant Shipping and Fishing Vessels (Health and Safety at Work) (Employment of Young Persons) Regulations* of 1998 (No. 2411);
- the *Loading and Unloading of Fishing Vessels Regulations 1988*;
- the *Merchant Shipping Means of Access Regulations* (1988);

- the *Merchant Shipping: Safe Movement on Board Ships Regulations* of 1998; and the earlier *Merchant Shipping (Health and Safety: General Duties) Regulations* of 1984 (and the 1998 amendments relating to manual handling in fishing vessels - no. 2765, and in other vessels - no. 2857) (Hill 1998:466).
- Over time these legal instruments are moving the OHS approach away from a focus which is not unlike the old 'Factories and Shops' acts which predated the Robens model, and towards a process/outcomes/performance standard such as that enshrined in the *Health and Safety at Work Act.*
- The *Merchant Shipping* act and regulations are enforced by the Marine and Coastguard Agency (MCA) which has statutory powers that apply to all British registered ships and any vessel that enters UK waters; they visit ships in port very regularly.
- Many of the provisions followed the UK ratification of the ILO *Merchant Shipping (Minimum Standards) Convention* of 1976 which came into force on 28/11/81 (cited Gaskell *et al* 1997:123,157).
- Workers' compensation coverage for all British workers in the event of loss of life is framed within the provisions of the *Fatal Accidents Act* of 1976*;* and in the event of an injury or illness arising from work through the *Social Security Act 1975* ss. 50-78 (Hill 1998:286; Gaskell *et al* 1997:123,157). (Many maritime requirements are similar to those in the *Health and Safety at Work Act*, and the powers of Inspectors are also similar.)
- The *Merchant Shipping Act* of 1995 (s.271) and the *Merchant Shipping (Safety Officials and Reporting of Accidents and Dangerous Occurrences) Regulations* of 1982 require investigation of major incidents, the appointment of a safety officer (with the Master having primary responsibility), and the election of safety representatives on board most British seagoing ships (Hill 1998:459,466,470; Gaskell *et al* 1997:99/100). The safety officer must also report to the Dept. of Transport (Gaskell ibid).

- Throughout all UK OHS provisions runs the right of workers to be involved in decisions that affect their OHS status.
- Similarly there are rights for members of the public which protect their OHS, which are usually spelled out in duty-of-care provisions. The safety requirements for passenger vessels were significantly tightened as a result of historical disasters such as the sinking of the *Titanic*, and more recently the *Herald of Free Enterprise* and *Estonia* ferry disasters (Hill 1998:476-477).
- Further, there are powers of inspection and for detention of ships that do not abide by the Regulations (otherwise unsafe vessels might leave) - and these requirements also apply to non-British ships in a UK port (although the flag state must be notified) (Gaskell *et al* 1997:99).
- The *shipping* industry is defined by regulation as vessels of 100 gross tonnes or more. Fishing trawlers, pleasure craft and smaller merchant vessels are not usually considered to be part of the 'shipping' industry.

In spite of these extensive requirements, it appears that there are several 'grey' areas where OHS legislative enforcement is problematic, for example, OHS requirements for safe gangplanks to smaller-scale fishing vessels.

In *Australia*, workers in the shipping and offshore industries are covered by the Commonwealth of Australia *Occupational Health and Safety (Maritime Industry) Act 1993*. The Seafarers Safety, Rehabilitation and Compensation Authority (Seacare Authority) holds regulatory responsibility for broad OHS policy, and the Australian Maritime Safety Authority (AMSA) performs the OHS inspectorate function. The OHS authority on land is separate. In each of the states and territories the local inspectorate has on-shore OHS responsibility for stevedoring and other work on docks and wharves as well as other work sites, for example, in Queensland the Division of Workplace Health and Safety (DETIR) enforces the *Workplace Health and Safety Act* (1995). In each state and territory there is a principal Act, Regulations, and Codes of

Practice/Advisory standards with Risk Assessment and Control a primary tool for prevention. (The OHS legislative framework in each state is fundamentally based on the British Robens model.) Responsibility for seafaring groups at Commonwealth level is currently held by the Minister for Employment, Workplace Relations and Small Business, who also includes the National Occupational Health and Safety Commission (NOHSC) within his portfolio. (NOHSC has no regulatory powers and its function is to co-ordinate national OHS efforts, develop regulatory instruments, conduct a limited research function, and operate as a forum for the state and territory authorities.) At present the NOHSC and Seacare/AMSA OHS functions are quite separate, and only at Labour Ministers Council meetings do regular formal contacts occur between Seacare and NOHSC. (Labour Ministers Council meetings include all state and federal ministers for labour - who usually also hold the OHS portfolios.) Close links are also maintained with transport departments. In sum, legislative coverage of the different seafaring sub-groups is relatively similar in Britain and Australia.

It is clear that the maritime (and to a lesser extent the fishing fleet) workforces frequently work in international waters and visit the ports of other countries regularly. Inevitably international bodies developed an interest in their working conditions and OHS. The foremost international body concerned with OHS is the International Labour Office (ILO) which was founded in 1919 as a specialised League of Nations (now United Nations) agency. The ILO is tripartite and has developed over 50 Conventions and Recommendations that cover seafarers and fishing workers; many of which were developed at the ILO 74th (maritime) session in 1987, and include repatriation, health protection and medical care, and welfare at sea and in port (see bibliography). The ILO also has a Joint Maritime Commission which is made up of representatives of employers and labour only. The principal ILO Convention for seafarers is number 147, and ILO Convention No. 137 (1973) addresses cargo handling on docks. The International Maritime Organisation (IMO) was set up in 1956 as a specialised agency (also under the United Nations), and covers navigation, ship design and equipment, load lines,

communications, search and rescue, carriage of dangerous goods, fire safety, training and certification, responsibilities of flag states etc. The IMO is of increasing importance and is enhancing its regulatory role through the development of international maritime conventions which, when accepted by nation states, become part of national law. But, enforcement of compliance remains elusive - and the IMO has had very limited impact on the smaller fishing industry. European port workers' unions affiliated to the International Transport Workers' Federation have also produced the *European Port Workers' Charter* (cited Turnbull *et al* 1992:245-246). On a less formal, but in a perhaps more important *practical* sense, the seamen's' missions provide a range of support services to seamen and fishing workers across the world. In Britain these include: The Apostleship of the Sea (Catholic), The UK and International Sailors Society (Protestant), and The Missions to Seamen (Anglican), although in practice most centres are run on an ecumenical and even secular basis.

The Hazards and Risks in Seafaring and Fishing, and Amongst Other Groups of Precarious Workers

Just as there are wide variations in patterns of hazard and risk exposure across occupations, patterns of injury and mortality inevitably differ between different sub-sectors. For example injury patterns vary for workers on roll on/roll off vessels compared with those on container transport, or those in ferry services work between the continent and Britain. Another potential risk is associated with the use of traditional coastal vessels that have been upgraded and adapted for use in transport between EU states - vessels that were not primarily designed for the conduct of work tasks in heavy seas although their structural integrity may be adequate.

The fishing industry generally is a hard and uncompromising one. Vessels are usually small, space is restricted, workers are exposed to the elements in bad weather, and tasks which involve the use of mechanised equipment continue throughout hours of darkness. Because staffing levels are minimal, the ability of others to rapidly react to

situations requiring rescue or assistance - e.g. overboard crew - may be limited. The nature of deep-sea fishing for British workers has also changed markedly over the last two decades with overall numbers in the fishing fleet decreasing - but the *size* of vessels has increased. It is logical therefore to assume that there would have been alterations in mortality patterns e.g. if drownings were concentrated amongst those working in smaller vessels.

The work tasks and risks are quite different again for pilots. The level of risk associated with their job tasks can be determined by the condition of rope ladders hung from vessels they are trying to board, whether ships are positioned safely for them to climb up on board, prevailing weather conditions during boarding and berthing, and even the extent to which the Captain can speak English and communicate effectively (pers. comm. Lane 16/4/99).

The seafarer and fishing workers in Australia include those who work on fishing vessels; are involved in the transportation of goods, livestock and people; employed in maritime tasks such as pilot services or on-board ship maintenance; work in jobs which require diving (e.g. pearl farming or tourist operations); or are engaged in a range of other seafaring and inland waterway tasks. Some work in the northern tropical waters where cyclones and coral reefs are common, and others in the colder southern ocean where high seas and gales present an endemic risk. That is, the tasks and the environment of Australian seafaring groups vary enormously - and hence the hazards and risks also vary. Risk reduction initiatives therefore have to be individually tailored to reduce specific risk factors.

Some parallels can be drawn between underlying factors that impact on the OHS of seafarers, fishing workers, and pilots and the structural pressures/arrangements that have led to particular types of OHS risks for land-based precarious labour. Land-based precarious labour has been found to be associated with: diminished labour market

power, downsizing of the labour force with voluntary and forced redundancies, covert and overt intimidation of vulnerable workers (which is also probably occurring in FOC vessels), employment in an increasingly de-regulated OHS work environment similar to that found over a century ago, a 'conspiracy of silence' about the degradation of working conditions, a breakdown in OHS regulatory effectiveness through complicated and attenuated chains of responsibility, and underlying economic pressures which propel the rationalisation of labour hire costs (see Mayhew and Quinlan 1999; Mayhew and Quinlan 1998).

Precarious workers generally have poorer OHS indices than do standard permanent-contract workers. While the evidence is fragmentary in some occupational groups, it is substantial in others, and the patterns are consistent across different countries. Comparative fatality studies of standard employees/outsourced labour provide the most stark and unequivocal evidence (see van Waarden *et al* 1997:48-52). In the UK, the Health and Safety Commission (HSC 1994) found that while agriculture and construction accounted for about 30% of self-employed workers in 1992/93, these two industries accounted for just over 70% of all work-related fatalities - industries characterised by self-employment and precarious labour. In Finland, a study of serious and fatal work-related injuries concluded that: *'Accident risk was significantly greater for subcontractors than for main contractors ... Subcontracting increased the accident risk one and a half times ...'* (Salminen *et al* 1993:353). That is, more complex vertical chains of responsibility are associated with increased risk. In the US, the National Census of Fatal Occupational Injuries in 1994 showed a significantly higher incidence of fatalities amongst self-employed workers: while construction workers were only 5% of the private labour force, they accounted for 15% of total fatalities (cited Weeks and McVittie 1995:395. See also Blank *et al* 1995; Rebitzer 1995; Rousseau and Libuser 1997). In Australia, outsourcing has been linked with poorer OHS through three causal factors: economic pressures, on-site disorganisation, and diminished effectiveness of regulatory controls (Mayhew 1997; Mayhew and Quinlan 1997 and

1998; Mayhew *et al* 1996). Economic pressures were fundamentally important because with increased competition for contracts, those who did the 'right thing' in OHS could be economically penalised if their tender prices were higher than those who ignored OHS. That is, the chill wind of the unregulated market operates as a whip on OHS status.

For seafarers and fishing workers, precarious employment may result in minimal wage/income levels, extended hours of labour, or gross underpayment. For land-based precarious labour who attempt to improve their conditions, one result is movement of production from higher wage countries to developing nations (e.g. in manufacturing). In one sense the OHS of seafarers is even less protected: while the development of OHS management systems which focus on precarious labour are in their infancy on land, the debate about the utility of management systems has barely commenced amongst seafarers, Protection and Indemnity Insurance companies, and maritime regulation authorities. That is, what has been called the 'third wave' of OHS regulatory policy has yet to be applied to the sea (detailed prescribed laws; outcome-focused self-regulatory systems; and finally specific Risk Assessment and Control requirements - see Johnstone 1998).

In sum, it is argued that the global seafarer labour market epitomises the mechanisms by which worker OHS protections that have been built up over the past century have been lost, particularly amongst precarious labour from developing countries such as the Philippines. Lane (1998) has stated:

> *'Modern seafarers working in FOC regimes have no access to state institutions processes capable of offering redress in cases of abuse. The states in question have threadbare or empty maritime codes in respect of labour, have no regulatory institutions, no corps of officials*

> *and no political need to develop them. Their state regimes are also geographically and politically inaccessible'* (Lane 1998:9).

Nonetheless, the loss of OHS protection has been recognised, and mechanisms are developing to redress the degradation of work amongst this international precarious labour force group, with the ITF leading the charge. As Turnbull *et al* (1992:226) have said:

> *'The concentration and internationalisation of capital is receiving further boosts from the Single European Market, and from the opening up of Eastern Europe to capitalist firms. These tendencies are likely to make international solidarity action a more pressing issue for trade unionists than it has been in the past'*.

Fatality Patterns Amongst British and Australian Seafarers and Fishing Workers

Collated data from death certificates offer an avenue by which some general patterns in causes of death may be identified. Official British mortality records have identified an excess of deaths from water transport 'accidents' amongst seafarers, and highlighted that figures collated for fishing workers may be an underestimate (Drever 1995:72,73). In a study of occupational fatalities, Roberts (1998a:21) calculated that 74 British *merchant* seafarers lost their lives over the fifteen year period 1981-1995. Notably, while 15% of these dead British seafarers lost their lives through occupational injuries or maritime disasters, the figure was 40% for those on foreign-flagged ships (Roberts 1998a). Of singular importance, size of vessel appears to be inversely related to mortality probability even in the merchant fleet: *'In the British fleet, the masters, officers and cadets who suffered fatal occupational accidents were usually serving in relatively small merchant vessels ...'* (Roberts 1988a:24). Thus, by implication, smaller-scale fishing vessels may not only be in more 'grey' areas of OHS regulatory

coverage (see earlier discussion), but also at increased risk. Roberts (1998b:37) calculated a fatality incidence of 10.6 per 10,000 person years for British fishing workers, and 1.5 for seafarers over the 1990-95 period. He concluded that: *'... the mortality rate for fishermen is between three and four times that for merchant seamen'* (Roberts 1998b:45).

Driscoll *et al* (1999) estimated an incidence of 86 per 100,000 person years for the Australian *fishing* industry as a whole, and 117 per 100,000 for fishing as an occupation. This was the second-highest of any occupational group. In the earlier WRFS1, 47 commercial fishing workers died over the three-year period 1982-1984 out of an average population of around 10-11,000; this represented a risk eighteen times that of the average (Driscoll *et al* 1994:613). The authors estimated an incidence of 14.3 per 10,000 person years for Australian fishing workers (i.e. 0.14% per year) (Driscoll *et al* 1994:612). It was not possible to calculate incidence for seafarers.

It was decided that a study was needed which specifically focused on *traumatic deaths* among all seafaring sub-groups. This study was conducted over British and Australian seafarers for the four year period 1989 to 1992 and included fatality data for fishing workers, seafarers, pilots, officers and other related sub-groups. Fatal illnesses were not interrogated (unlike the Roberts 1998a study). As will be shown later, this examination of the patterns of work-related fatalities was able to pinpoint key variables associated with the deaths of many British and Australian workers at sea, in port, and in waterways. When specific features associated with these deaths are clearly identified, prevention interventions can be more tightly targeted. This type of analysis is complicated as both seafarers and fishing workers tend not to work for the whole year, the 'at risk' working population figures are usually estimates only, and particular sub-groups cannot always be separated out from the total workforce engaged in sea and inland waterways work. Thus the calculation of fatality incidence rates are usually 'guesstimates'.

METHODOLOGY

This paper is primarily based on interrogation of two coronial record data bases, one from Britain and the other from Australia. The British data were provided by the Office for National Statistics (ONS) which collates mortality and population census information for the whole nation. The Australian data (which was used as the basis for comparisons) primarily came from the Second Work-Related Fatality study (WRFS2) which had just been concluded by staff at the National Occupational Health and Safety Commission (NOHSC). Importantly, both were *national* coronial records - and not just deaths of workers who were covered by workers' compensation insurance. Unfortunately, accurate British denominator data on exposed workforce populations could not be accessed for each year under study to calculate the incidence of fatalities - and even the published census data does not clearly separate out all sub-groups of the seafaring workforce. Similarly the exact exposed seafaring and fishing labour force population numbers in Australia were unknown, and varied marginally from year to year. In the end, it was decided to concentrate on numerator data from three sub-groups which could be reliably separated out in the British data: ship and hovercraft officers (which includes pilots), seafarers, and fishing workers. The Australian data were then 'matched' as far as was possible. The denominator data (i.e. exposed workforce numbers) were estimated from the most reliable information available: the British 1991 census, and from Australian population data utilised for other studies in the industry. A limited number of interviews were also conducted in the UK with seafarer chaplaincy staff, port workers engaged in various tasks, and current and ex-seafarers. Field observations were conducted in a British port.

United Kingdom: a special print run was ordered from the Office for National Statistics for all 'non-natural' causes of death for seafaring occupations registered on the ONS data base for the four-year period 1989 to 1992; this included deaths of British

nationals, and non-UK nationals working on British registered ships. Deaths of non-British nationals on non-UK ships within British territorial waters were not included (pers. comm. C. Chantler ONS, 26/3/99). The 'non-natural' death classifications excluded diseases and other longer-latency conditions. The time period of 1989-92 was chosen to directly match that of the available Australian data. Data for the earlier three year period 1982-1984 were also ordered and some comparisons made with the limited Australian data available for the same time period. Only since 1993 has British coronial narrative data been readily available. Narrative data from the period 1993-97 were also obtained and interrogated; this provided identification of the contexts, working situations and tasks being undertaken at the time when non-natural fatalities occurred. (No Australian narrative data was available covering this very recent time period).

All the British ONS data provided was already coded into three sub-groups: ship and hovercraft officers, seafarers, and fishing workers. Pilots were included in the ship and hovercraft officer category.

In the British data, the types of traumatic work-related fatalities were coded according to the International Classification of Diseases (ICD) codes (WHO 1978). Unfortunately the British ONS coding system had some occupational limitations: (a) for 1989-1990 the Classification of Occupations 1980 codes were used, but for 1991-1992 the ONS Codes were used; (b) in the component code covering Captain (fishing), Master Mariner (fishing), and Owner (fishing vessel), seafarers were not able to be separated out from 'Other managers in farming, horticulture, forestry and fishing nec' over 1991-92. It was decided to exclude all 'Other manager ...' British fatalities for this two year period. (c) Royal Navy staff could not be separated out from either officers or other ranks in the army or airforce. Hence all UK defence force staff were excluded from analysis. (This means that for Navy and 'Other managers...', comparisons between British and Australian data are inappropriate.) These limitations mean that the British deaths discussed below understate the true total. (d) Further, the British data had an 'at work status' code, but there were many fatality cases where no code number had been

inserted and many others where the code for 'no information available' was entered. (e) Finally, the British data base included those who suicided, whereas the Australian WRFS2 specifically excluded all suicides (see discussion below).

Australia: the Australian WRFS2 involved examination of coronial files for all traumatic work-related deaths in Australia over the four-year period 1989 to 1992 inclusive. This study was conducted by the NOHSC under the direction of Dr Tim Driscoll. In early 1999 the overall WRFS2 report was first published, and detailed industry-sector papers will follow in due course. Unpublished data (quantitative and qualitative) on traumatic deaths of seafaring sub-groups were extracted from the WRFS2 data base for analysis and comparison with British seafarer and fishing worker data. In total there were 94 deaths of workers who were working at sea or in waterways recorded in the WRFS2 over the period 1989 to 1992. Some limited contrasts with the earlier WRFS1 study were also possible. This earlier study - the WRFS1 - covered coronial fatality records over the three year period 1982-1984 inclusive. In this earlier study, the deaths of fishing workers (not seafarers as a whole) had already been extracted for analysis (Driscoll *et al* 1994.) Both studies included all fatally injured workers, as distinct from just workers' compensation claims-based records. (Amongst the deaths of seafaring sub-groups recorded in the WRFS2, one was aged 8. Because he was under the legal working age and was recorded as 'not working' at the time of death, his data have been removed from all further analysis in this paper.)

Thus the comparative basis to the data, and the trends identified in this paper, are indicative only, and cannot be interpreted as definitive numbers.

Because of the sensitive nature of this comparative study, out of concern for the families of the dead seafarers and fishing workers, and to abide by ethical guidelines, individually identifiable data have been suppressed. While the suppression of individual/company data is to be expected in studies of this nature, there is an unfortunate consequence in that particularly risky activities cannot be highlighted unless there are significant numbers

of dead workers identified. Thus in many discussions and tables in this paper, sub-groups have been combined e.g. all Australian diver deaths have been combined, including those working in the pearl industry, tourist dive boat charter, and navy divers. Direct quotations taken from the coronial records have not been sourced. The ports in Britain on which field observations were conducted have not been named; nor have the chaplaincy, seafarer or OHS staff interviewed.

FINDINGS

Extent of Problem

United Kingdom: there were 243 seafarer deaths identified in the ONS data for seafaring groups over the four year period 1989 to 1992 (55 were ship and hovercraft officers, 130 seafarers, and 58 fishing workers; that is, an average of around 61 per year.) The 1991 census data indicated that there were 32,100 seafarers and 66,000 fishing workers in the industry (DOE 1991:GB1, GB5).

Using these numerator and denominator numbers as an annual baseline, there was an *approximate annual fatality incidence indicated of 0.001% for British seafarers and 0.0002% for fishing workers*.

During the earlier three year period 1982 to 1984 inclusive there were 249 deaths amongst the different seafaring sub-groups i.e. an average of 83 per year. That is, over time there has been a significant decline in the annual *number* of deaths in Britain. One interpretation is that the decline may have resulted from changes in the profile of the British seafaring and fishing fleets e.g. a decreased number of fishing vessels but an increased size in the remaining vessels (as discussed earlier).

In the *Australian* WRFS2 there was a total of 94 deaths of adult seafarers/fishing workers recorded over the four-year period 1989 to 1992 i.e. an average of 23.5 per year. This total included fishing workers, those engaged in the coastal and international transport of goods by sea (including livestock), pearl farmers, defence force personnel engaged in various activities at sea, passenger and dive charter businesses, maritime services and a few others who worked in specialised activities. (Of these 94, six were involved with diving activities as part of their job e.g. some fishermen had to dive for abalone. These diving-related deaths have been retained within this study, although no comparable fishing deaths could be identified in the British data.) Patel and Wickramatillake (1999) identified that there was an annual average of 6,427 registered Australian seafarers working each year during the WRFS2 period. However the number of workers in the exposed fishing population is unknown. Since at least 59% of the fatalities recorded in the WRFS2 were engaged in fishing or fishing-related activities, around 40% were likely to be in the seafarer subgroup.

Using the Patel and Wickramatillake figures for the seafaring sub-group as a baseline, the *Australian approximate annual fatality incidence for the seafarer sub-group is 0.15%*, which is considerably higher than that for the comparable British sub-group. A fatality incidence for the fishing sub-group could not be calculated from the available data.

Many of the WRFS2 workers drowned, although in two cases it was uncertain whether the seafarers had been taken by a shark or had drowned. The WRFS2 authors identified that the fishing industry as a whole, and fishing as an occupation, had the second highest rate of traumatic death of all industries/occupations over the study period (Driscoll *et al* 1999). Work on trawlers, the tending of lobster or crayfish pots and work in smaller vessels were identified as higher risk activities. Overall, however, there was a slight improvement in the number of traumatic deaths of Australian fishing workers over the period 1982-84 to 1989-92.

Gender

In both Britain and Australia the dead seafarers were overwhelmingly male. This is not surprising given the few women workers in these jobs. For example, Zhao (1998:14) identified that only 7.6% of seafarers from seven European countries were female. Females were even less common in the industry in Australia (see Parker *et al* 1997:32, 34).

Of the 243 dead seafarer deaths recorded for Britain over the four year study period 1989 to 1992, all were male. Of the 249 British deaths over the three year period 1982 to 1984, 247 were male and 2 were female.

Of the 94 Australian seafarer deaths recorded over 1989 to 1992, 91 were male and 3 were female (one was a cook/steward and two were deckhands).

Relationship of Age to Traumatic Deaths of British and Australian Seafarers

Amongst the 243 British seafarer deaths recorded for the period 1989 to 1992, there was a wide range of ages, with many over 45 years. Ages were available for all 243 deaths, with the average age at death 43 years; the oldest was aged 74 and the youngest 16. For the 249 British deaths recorded over the three year period 1982 to 1984, the average age at death was 43 years; the oldest was aged 74 and the youngest two were 17.

Of the 94 seafarer deaths recorded in the Australian WRFS2, only one did not have his age recorded. The average age at death was 37 years; the oldest was aged 76 and the youngest were two boys aged 16. The age distribution of fatalities was not available for the earlier 1982 to 1984 period.

Table 1 Age at time of traumatic death of British and Australian seafarers and fishing workers

	British 1989-1992 (4 years) (n=243)	British 1982-1984 (3 years) (n=249)	Australian 1989-1992 (4 years) (n=94)
16-24	12.7%	17.7%	21.3%
25-34	20.2%	17.0%	28.7%
35-44	23.9%	22.1%	20.2%
45-54	17.7%	15.7%	15.9%
55-64	14.0%	17.3%	11.7%
65-74	12.3%	11.2%	1.1%
unknown	-	-	1.1%
average	43.2 years	42.9 years	37 years

The most notable finding was that Australian seafarers and fishing workers tended to die at a younger age than did the British. Second, few British seafarers/fishing workers died at a very young age.

The low numbers for specific causes of death in particular occupational sub-groups at certain age groups meant that only grouped data could be displayed. All COD information from these three sub-groups was combined for the age/fatality comparisons in order to protect the anonymity of individuals.

The 1989-1992 British data were examined. British drownings during 1989-1992 were concentrated amongst the 16-24, 25-34, and 35-44 age groups (69.6%). This distribution may well represent labour force exposures at particular ages, but in the absence of accurate population sub-group data this cannot be unequivocally stated. Fatal injuries associated with use of motorised vehicles were most common amongst the 16-24 (30.5%) and 65-74 (22.2%) age groups. In contrast, fatal falls were concentrated amongst seafarers and fishing workers in the 45-54, 55-64, and 65-74

age groups (81.5% of all fatal falls). There are a number of possible explanations for these variations: (a) job tasks may differ at different ages (i.e. variations in exposure to risk); and (b) the probability of survival may be lower at older age groups (holding level of severity constant) e.g. younger workers may survive major falls more readily than older people. The available data was not able to identify these factors. There were very few suicides in the 16-24 age group, and most were aged between 25 to 44 (54.3%). (It is important to remember that suicides for all sub-groups *were* included in the British, but *not* in the Australian data.) During the earlier 1982-84 period, drownings occurred at all age groups, and the only marked pattern was that fatal vehicle incidents were concentrated amongst the 16-24 age group amongst seafarers and fishing workers - but not ship and hovercraft officers (48.7% of all fatal vehicle incidents to seafarers and fishing workers).

The 1989-1992 Australian data were examined. The drownings occurred at all age groups, although more commonly under age 54 with the 16-24 and 25-34 age groups at greatest risk. Most fatal injuries/lacerations occurred to those in the 16-24 age group. Fatal falls were not mentioned, although they may have occurred and been recorded as, for example, a 'gross craniocerebral injury'. (Fatalities from use of vehicles were not recorded in the Australian data.) This pattern of fatalities is at variance with the exposed workforce population: one survey of 5,080 seafarers found that 80% of respondents were aged between 30 to 60, with 14% under age 30 (Parker *et al* 1997:1,32-33,114). That is, younger seafarers may be, proportionately, at increased risk.

British and Australian Seafarers and Fishing Workers: Fatality Variations by Occupational Sub-groups

United Kingdom: the occupational codes attached to the ONS records allowed for clear separation of three sub-groups: ship and hovercraft officers, seafarers, and fishing workers. Pilots were not able to be separated out from ship and hovercraft officers.

Table 2 Occupation at time of traumatic death of British seafarers and fishing workers

	British 1989-1992 (4 years) (n=243)	British 1982-1984 (3 years) (n=249)
ship and hovercraft officers	22.6%	20.1%
seafarers	53.5%	57.0%
fishing workers	23.9%	23.3%

Table 2 shows that over the two time periods studied, increased proportions of ship and hovercraft officers and fishing workers (slight increase), and a decreased proportion of seafarers, died from a traumatic injury event at work. Nevertheless, seafarers accounted for more than half of all traumatic deaths over both time periods. The *industrial sub-group* of employment of the dead British seafaring sub-groups was not available for either the 1989-1992 or 1982-1984 study periods.

For the *Australian* data an occupational text was provided for each coronial record. However, these occupational descriptors provided did not always correspond to the Australian Standard Classification of Occupations (ASCO) codes.

Table 3 Occupation at time of traumatic death of Australian seafarers and fishing workers, 1989-1992 (n=94)

deckhand	23.4%	cook/assistant steward	2.1%
fisherman/crew on fishing boat/trawler	19.1%	research scientist/officers	2.1%
seaman/able seaman/navy seaman/launch driver	12.8%	hydrographer	1.1%
skipper/master/captain/owner/ marine pilot	1.7%	medical pract./specialist	1.1%
ship officer/engineer	6.4%	wharf worker	1.1%
diver/off-shore diver/pearl farmer or trainee	6.4%	other	2.1%
boiler stoker/boilermaker/ship carpenter	3.2%	not working	4.2%
coxswain/bosun	3.2%		

An industry text was also provided in the Australian coronial records which allowed for identification of the industry of employment of the 94 dead Australians. However, the

industry descriptors provided did not always correspond to the Australian and New Zealand Standard Industrial Classification (ANZSIC) codes.

Table 4 Industry of employment at time of traumatic death of Australian seafarers and fishing workers, 1989-1992 (n=94)

cray/rock lobster fishing	14.9%	prawn & scallop fishing	1.1%
ocean/sea and coastal fishing/vessel nec	13.8%	dive charter boat	1.1%
prawn fishing/trawling	11.7%	international passenger liner	1.1%
international shipping/transport of goods	10.6%	tuna fishing	1.1%
scallop trawling	5.3%	trochus shell fishing	1.1%
livestock carrier - national/international	5.3%	abalone diving	1.1%
coastal/inland shipping/water transport	5.3%	fishing - lake	1.1%
maritime/pilot service	3.2%	fishing - orange roughy	1.1%
shark fishing	3.2%	stevedoring industry	1.1%
pearl farming	3.2%	boilermaking	1.1%
national parks and wildlife service	2.1%	electricity and water authority	1.1%
Australian Defence Forces	2.1%	other	1.1%
health/community services	2.1%	not working	4.2%

Causes of Traumatic Deaths of British Seafarers and Fishing Workers

The causes of death (COD) were coded on the ONS files according to the International Classification of Diseases rules (as discussed above). One immediate problem identified during analysis was that drowning could be coded under a number of different codes e.g. as an accident to watercraft causing submersion (including drowning) (code E830), other accidental submersion or drowning in water transport (E832), accidental drowning or submersion (E910), suicide by submersion/drowning (E954), assault by submersion (E964), or submersion which was undetermined whether accidentally or purposely inflicted (E984). For other causes of death there were also a number of possible variations e.g. falls included those on stairs, from high places or on the same level. The rule established for this paper was that the major cause of death coded was utilised, and each case was subsequently re-examined and a breakdown of secondary causes

examined (see detailed discussions below Table 5). In the few cases where the COD was unclear, the fatal injury event was coded with 'other' fatality events.

The deaths were separated out by both occupational sub-group and cause of death. (The ship and hovercraft officers have been coded simply as 'officers' in the table below.) In the table below, the raw number of deaths by cause have been provided, with totals also given as a percentage distribution.

Table 5 Causes of death for dead seafarers and fishing workers in Britain, 1989-1992 (n=243)

	suicide	other & undetermined	other	vehicle	water trans.	falls	drowning	total
officers	12	9	5	8	11	7	3	55 (22.6%)
seafarers	24	24	25	19	14	18	6	130 (53.5%)
fishing	11	11	9	9	11	2	5	58 (23.9%)
total	47	44	39	36	36	27	14	243
	(19.3%)	(18.1%)	(16%)	(14.8%)	(14.8%)	(11.11%)	(5.8%)	

The most common cause of death was suicide (19.3%), followed by 'other and undetermined if accidentally or purposefully inflicted' (18.1%), 'other' causes (16%), motor vehicle crashes/off-road MVA's/other vehicle crashes (14.8%), water transportation incidents (14.8%), falls (11.11%), and drowning (5.8%). A breakdown and discussion of each of these seven areas is provided separately below and narrative extracts from coronial files are provided that illuminate the risk factors. These citations were taken directly from the ONS mortality records for seafaring sub-groups after 1993 (when qualitative data was first entered in the UK), and from the Australian WRFS2. (Individual people/ship name/place/location identifiers have been removed.)

(a) *Suicide:* as can be seen in the table above, the largest cause of traumatic work-related fatalities amongst the British seafaring sub-groups was suicide. These suicides were separated out by both occupational sub-group and mechanism used for suicide. Of

the 47 suicides listed over the period 1989 to 1992, 51.1% were seafarers (n=24), 25.5% ship and hovercraft officers (n=12), and 23.4% were fishing workers (n=11). That is, seafarers were most at risk of suicide. The mechanisms utilised were: hanging, strangulation or suffocation (36.2%), use of domestic or other gases (23.4%), use of a solid or liquid substance (19.1%), and the remainder deliberately drowned, used firearms or explosives, jumped from a high place, or utilised some other means. Couper (1996:58) has also cited a three fold increase in suicide amongst seafarers, as compared to the general population. Knowledge about the most at-risk groups and mechanisms utilised means that preventive strategies can be more tightly targeted to reduce the approximate 12 suicides recorded per year. However the causes of suicide are likely to be complex, and hence causative factors leading up to the event are difficult to unequivocally identify. For example, in the early 1990's there was a significant economic downturn in the UK economy resulting from a fall in commodity prices which led to a fall in house prices, with many people having 'negative equity' in their recently purchased homes. Many seafarers and fishing workers who had previously had a higher secure income could have been caught in this spiral and may have become very depressed.

Levels of fatigue and exhaustion are probably closely linked with depression and suicide tendencies. The prevalence of fatigue is likely to vary across the different sub-groups, and from one country/region to another. For example, fishing activities are likely to be intense for many hours when a substantial catch is being hauled in, workers on rig supply vessels may work intensely over some long shifts, maritime and ferry vessels servicing European ports may have very short turn-around times which means extended hours of labour, and Masters of maritime vessels may be continually 'on call'. Further, with significantly reduced in-port times, seafarers may well have increased cargo handling responsibilities and reduced recreational time off on-shore. The AMSA (1997:6) study of stress and fatigue amongst Australian seafarers does identify factors which could potentially contribute to suicide, as well as recommending some useful preventive

strategies e.g. fatigue reduction through improved shift scheduling, better home/ship communication mechanisms, and sleep improvement initiatives. The evidence on suicides recorded in the official British ONS mortality data shown in this paper is in stark contrast with the Roberts study which stated: *'During the six year study period no conclusive evidence of a single fisherman having committed suicide ... By contrast, five merchant seafarers were found to have committed suicide ...'* (Roberts 1998b:43). The Roberts study was based on notifications to the Registrar General for Shipping and Seamen and Marine Accident Investigation Bureau official reports over the five-year period 1990-95. In contrast, this study was based on official ONS mortality records. While the findings from the two very separate studies largely concur in other respects, suicide records are distinctively different. No simple explanation for this difference is apparent. The narrative data on a coronial record elucidates one suicide mechanism that was chosen:

> *'Cook-Able Bodied Seaman (a) cardiorespiratory arrest due to ... (b) Inhalation of petroleum vapour. Verdict: the deceased took his own life'.*

(b) *Undetermined:* the second largest category of cause of death was fatalities where the coroner was unable to determine whether the deaths were accidental or purposeful. These fatalities were frequently coded so that a further description was discernible. The 44 'other and undetermined' causes of death included: injury by other and unspecified means (43.2%), submersion or drowning (22.7%), poisoning by solid or liquid substances (18.2%), falling from high place (9.1%), poisoning by other gases (4.5%), and hanging, strangulation or suffocation (2.3%). Of the 44 fatal 'other and undetermined' fatal incidents listed for the period 1989 to 1992, 54.5% were seafarers, 25% were fishing workers, and 20.4% ship and hovercraft officers. That is, once again, seafarers were the highest risk group.

> *'Fisherman; I(a) severe multiple injuries; verdict: open'.*

'Seaman; bronchopneumonia, cardiac and renal failure, burns. Verdict open'.

'Merchant Seaman; Drowning; Verdict: Open verdict'.

'Merchant Seaman; 1a. Head injury (traumatic intracerebral haemorrhage associated with a fractured skull; verdict: Open Verdict'.

These open verdicts would undoubtedly have added to the pain of relatives, friends and colleagues. As a result relatives and friends may grieve and wonder. The 'unknown' verdicts also usually do little to help identify appropriate Risk Control strategies.

(c) *Other:* the third largest category was 'other' causes which were collated through amalgamation of all the other causes coded under the ICD classification system, and which included: accidental poisoning by drugs (20.5%), injured by fire or explosive materials (17.9%), machinery-related incidents (12.8% - which included mechanical suffocation, struck by object, caught between objects, struck by machinery etc.), cold injury, cataclysmic environmental events (10.2%), accidental poisoning by other solid or liquid substances, methanol poisoning (10.2%), other and unspecified, late effect of operation (7.7%), air and rail transport (7.7%), poisoning by motor vehicle exhaust or other gases (5.1%), homicide (5.1%), and electric current (2.6%). Again, seafarers outnumbered all other groups. Of the 39 fatal 'other' causes listed for the period 1989 to 1992, 64.1% were seafarers, 23.1% were fishing workers, and 12.8% were ship and hovercraft officers. Once again the Roberts (1998b:47) study found a slightly different distribution, but he illuminated high-risk tasks: '... *whilst the seafarers suffered a wide variety of fatal accidents, a majority of all fishermen died through*

operations involving the shooting-out or hauling-in of netting ...'. This observation was supported by narrative data in coronial records:

> *'Fisherman; drowning. Verdict: accidental death ... the deceased was aboard the fishing vessel ... which was fishing about 70 miles south west of ... while shooting one of the nets the deceased was entangled in a rope and pulled over board'.*

(d) *Motorised vehicle crashes:* the fourth highest COD category for British seafarers was motor vehicle crashes/off-road and other vehicle crashes; all of which have been abbreviated as 'vehicle incidents' in this paper. Again these were separated out by occupational sub-group. There was a significant difference between seafarers on the one hand, and officers and fishing workers on the other. Of the 36 fatal vehicle incidents listed for the period 1989 to 1992, 52.8% were seafarers, 25% were fishing workers, and 22.2% ship and hovercraft officers. The circumstances under which seafarers and fishing workers would regularly drive motorised vehicles during the course of their work are not clear (both fishing workers and seafarers had fatalities coded as 'at work'). However seafarers do have to walk through the working environment of stevedores and are therefore exposed to many of the hazards and risks associated with the use of forklifts and mobile cranes. This environment varies across ports, particularly in that some English-speaking countries drive on the left hand side of the road (Britain and Australia), and others on the right-hand side (USA and Canada); thus pedestrians may 'look the wrong way' to avoid oncoming traffic. Another important consideration is that fishing workers are likely to be utilising much smaller ports to seamen; and even when they do operate from the same port, fishing workers are likely to utilise facilities away from cargo handling and container transportation equipment. This variation in exposure to hazardous transportation equipment may explain the lower proportion of 'vehicle' deaths amongst fishing workers. Fully 26 of the 36 (72.2%) of these vehicle incident deaths were coded as 'elsewhere', 8.3% on the way to or from work, 5.5% had no

information, and 13.9% were coded as at work. Because of the large proportion of 'elsewhere' codings, it was not possible to unequivocally separate fatalities at workplaces from those during recreational time. While it cannot be automatically assumed that the majority of 'elsewhere' fatal events occurred in personal time, the large proportion coded as 'elsewhere' (which may include incidents during non-work time spent at sea or on-shore), means that conclusive opinions about the causes of fatal vehicle incidents cannot be made on the basis of the quantitative information available. However, the transcripts collated by the ONS since 1993 do indicate some causative factors, and an extract from a coroners file is provided below. Overall, the use of motorised vehicles (or being near them) has to be seen as a major risk category for seafarers. (See earlier discussion on relationship between fatal vehicle incidents and age group.)

> *'Accidental death. Riding a motor cycle the deceased collided with a partly loaded rubbish skip which had been placed on the carriageway of the road'.*

(e) *Water transport incidents:* the fifth largest COD category was water transportation incidents which accounted for 36 British fatalities. These fatal incidents resulted in deaths from drowning (44.4%), explosion/fire/burning (22.2%), 'other and unspecified e.g. crushed or poisoned' (13.9%), machinery incidents (8.3%), fall from one level to another (8.3%), and watercraft incidents which caused other injuries e.g. crushed between ships (2.8%). Of the 36 fatal water transportation incidents listed for the period 1989 to 1992, 38.9% occurred to seafarers, 30.5% were ship and hovercraft officers, and 30.5% were fishing workers.

> *'... in the evening deceased was being ferried to his ship in river ... when the boat was blown from the rope ladder and drifted away. His body was found washed up the next day'.*

(f) *Falls* were the sixth largest COD category, of which falls on stairs accounted for 55.5%, unspecified falls for 29.6%, fall from a building (7.4%), falls from a ladder or scaffolding (3.7%), and 'other' falls for 3.7%. Of the 27 fatal falls recorded over the period 1989 to 1992, 66.7% occurred to seafarers, 25.9% were ship and hovercraft officers, and 7.4% were fishing workers. That is, seafarers were at greatest risk. There are a number of potential explanations: seafarers frequently work on unstable platforms, in rough weather, and the larger the vessel, the greater the potential distance to fall. Similarly pilots (contained within the officers category) regularly cross from one vessel to another and climb ladders onto ships; hence falls may be an endemic risk of their jobs. In contrast, fishing vessels tend to be more compact and the space for equipment more confined - hence trip-related injuries could be expected to be more common amongst fishing workers.

The number of fatal falls amongst older workers on stairs was notable (see also age discussions above), and is probably due to a combination of factors: (a) stair traffic is much more frequent on a vessel as compared to a house; (b) many people using the stairs will be carrying items and therefore grip ability is reduced, e.g. a steward taking tea from the galley to an officer on deck must climb/descend stairs; (c) reaction time and reflexes are slowed when people are fatigued (and seafarers are often fatigued); (d) stair traffic is not reduced in bad weather; (d) while most seafarers will be performing similar tasks, older and more experienced workers would be more likely to be doing more complicated tasks; and (e) older workers are less able to adapt their circadian rhythm to shift and night work. Thus more fatal falls (and other injuries linked with attention/accuracy) could be anticipated amongst older fatigued shiftworking seafarers. While useful, the available narrative data was not able to identify whether standard or spiral stairways were more frequently associated with fatal falls.

'Deceased climbing stairs to bridge of vessel of which he was a crew member ... fell from top to bottom due to heavy roll of 20-30 deg'.

'Pleasure boat proprietor ... deceased was working on his pleasure boat ... and while climbing down the metal ladder from the wheel house missed his footing and fell'.

(g) *Drowning* was not listed as the primary COD of very many of the British fatalities over the period 1989 to 1992 (n=14). However, many other drowning deaths were entered under 'water transportation' (i.e. 16 out of 36 had a secondary coding as possible drowning), 'other and undetermined' categories (10 possible out of 44), 'suicide' (2 out of 47), and 'other' causes such as drownings associated with cataclysmic events (e.g. cyclones) accounted for a further 4 out of 39. That is, when all drowning/immersion/submersion deaths coded under all ICD categories are collated, a total of 46 of the 243 deaths (18.9%) were due to drowning. It was also clear from the narrative data in coronial records that submersion is often so sudden that there is insufficient time for emergency procedures to be implemented.

'The deceased together with a companion was fishing on board his trawler the ... They experienced difficulties when the net became loaded with mud. They tried to raise the net to clear it but whilst attempting this manoeuvre the weight of the net caused a shift in the centre of gravity of the boat which capsized and both men were thrown into the water. They were picked up by another boat and later transferred to ... was found to be dead on arrival at ...'.

'The deceased was a bargemaster working on sea defences in ... At about 22.20 hours, he fell into the sea and was drowned. He was not wearing a life jacket. Attempts to rescue failed until he was pulled from

the sea semi-conscious, but died on the way to hospital. Attempts at re-susitation (sic) *failed'.*

Conditions which led to the higher drowning risk for fishing workers were also elucidated by Roberts: *'In many cases the trawlers sank within minutes, or even seconds of a collision, a net becoming snagged or heavy seas swamping the vessel. There was sometimes insufficient time for radio contact to be made or for distress signals to be sent out, or even for a life-raft to be inflated or launched'* (Roberts 1998b:41). The apparent lack of use of life jackets (and buoyancy aids) is discussed below in Section 4: Prevention strategies.

Changes Over Time in Causes of Death of British Seafarers and Fishing Workers

The causes of the 249 British deaths over the earlier three year period 1982 to 1984 were also interrogated, and were compared with the patterns found for later years (as discussed above). In the table below, the 1982 to 1984 deaths are collated; but no detailed analysis or second-level descriptions of causes of deaths were undertaken because the data are between 15 to 17 years old.

Table 6 Cause of death for dead seafarers and fishing workers in Britain, 1982-1984 (n=249)

	suicide	other & undetermined	other	vehicle	water trans.	falls	drowning	total
officers	10	1	7	13	3	5	10	49 (19.7%)
seafarers	28	16	17	30	3	17	31	142 (57%)
fishing	8	2	6	6	5	3	28	58 (23.3%)
total	46 (18.5%)	19 (7.6%)	30 (12%)	49 (19.7%)	11 (4.4%)	25 (10%)	69 (27.7%)	249

In comparing the 1982-1984 data (Table 6) with that from 1989-1992 (Table 5), some changes are apparent. First, there has been an overall decrease in the number of

traumatic deaths at work each year. (In the four year period 1989-1992 there were 243 deaths; in the three year period 1982-84 there were 249 deaths.) Second, over time, a smaller proportion of the traumatic deaths has occurred to seafarers but a larger proportion to ship and hovercraft officers (although seafarers are still, by far, the largest group). Third, over time, there has been a decrease in the proportion of deaths caused through drowning; this has been a marked improvement. (One possible reason for the diminished number of drowning deaths was the increased size of fishing vessels in the British fleet between the two time periods - see earlier discussion.) Fourth, a smaller proportion of the deaths were caused by motorised vehicle incidents in the more recent time period. However, deaths through suicide and water transport incidents have not improved, and these two caused a significant proportion of the traumatic deaths at work in 1989-1993. The rapid increase in the number and proportion of deaths through water transportation incidents is of particular concern, and pilots may have been at increased risk.

Causes of Traumatic Deaths of Australian Seafarers and Fishing Workers

The Australian fatality data provided both occupational and industrial sub-group identifiers. These data are provided separately below, and then a general discussion follows, based on both occupational and industry patterns.

The *occupational* categories utilised in the WRFS2 were collapsed in order to protect anonymity and to allow more direct comparisons with the British data. Skipper and officer codes have been combined under ‘officer’; the deckhands, seamen, coxswains, crewmen and divers have been collated together as ‘seafarers’; all those engaged in fishing activities have been listed as fishermen; and the ‘wharfie’, boilermaker, cook/steward, researcher, hydrographer, medico, other, and ‘not working’ fatalities have been listed under ‘other’. All deaths caused by immersion were listed under ‘drowning’, as have those coded as probable drownings. On three occasions more than one COD was provided e.g. the coronial records stated the COD for one officer at

autopsy was 'drowning plus multiple injuries', and two divers had their COD listed as carbon monoxide poisoning with immersion. In each case where the report gave more than one cause of death, the primary cause was utilised in construction of the table below. Similarly in two other cases, while the primary COD provided was drowning or immersion, there was a secondary comment that the person may have been taken by a shark; these fatalities were coded as drownings. (With global warming, increased shark numbers around British waters can be anticipated.) Fatal craniocerebral, neck and spinal injuries have been listed as head injuries. Carbon monoxide and hypoxia have all been listed as asphyxia. The final column in the table lists those deaths where no post mortem was done, usually because there was no body available for examination.

Table 7 Cause of death by occupation for seafarers and fishing workers in Australia, 1989-1992 (n=94)

	drowning	head injury	electrical	burns	multiple injuries	asphyxia	other injury	no PM	total
officer	14	1	-	-	-	2	-	-	17 (18.1%)
seafarer	27	5	-	1	4	4	1	1	43 (45.7%)
fishermen	15	1	-	-	-	1	1	-	18 (19.1%)
other	8	-	1	1	1	1	1	3	16 (17.0%)
total	64	7	1	2	5	8	3	4	94
	(68.1%)	(7.4%)	(1.1%)	(2.1%)	(5.3%)	(8.5%)	(3.2%)	(4.2%)	

Similarly variations by *industry* of employment of Australian seafarers were collapsed. (Industry group was not available in the British ONS data.) International transport of goods and passengers, livestock transportation, and coastal transport have been collated together under the title 'transport'. The industry title 'fishing' used in the table below includes: cray, rock lobster, shark, prawn, tuna, abalone, scallop, orange-roughy, trochus shell, and pearl fishing/farming/trawling at sea and (in one case) in a lake. The Maritime industry listing in this table includes stevedores, boilermakers, electricity and water authority personnel because they were at sea when the fatal event occurred. The 'other' category includes health and community service workers, two Defence force personnel, one in the diving charter business, and those not working at the time of death.

As with the occupational groups shown in previous tables, all deaths caused by immersion were listed under 'drowning', carbon monoxide and hypoxia were listed under asphyxia, and all craniocerebral injuries and neck and spinal injuries were coded as 'head' injuries.

Table 8 Cause of death by industry of employment for seafarers and fishing workers in Australia, 1989-1992 (n=94)

	drowning	head	electrical	burns	multiple	asphyxia	other	no PM	total
fishing	44	3	-	-	1	4	1	1	54 (57.4%)
transport	10	1	-	2	3	3	2	-	21 (22.3%)
maritime	3	1	1	-	1	-	-	-	6 (6.4%)
parks & wild	2	-	-	-	-	-	-	-	2 (2.1%)
other	5	2	-	-	-	2	-	2	11 (11.7%)
total	64	7	1	2	5	9	3	3	94
	(68.1%)	(7.4%)	(1.1%)	(2.1%)	(5.3%)	(9.6%)	(3.2%)	(3.2%)	

By examining the above two tables, two high-risk factors for seafaring sub-groups in Australia become obvious. First, fishing is clearly the most dangerous of the tasks examined, and workers are at high risk of drowning. The extent is clarified when industry as well as occupation is considered. The second high-risk category is work practices that result in head injuries, and those that lead to asphyxia amongst seafarers (in particular). These risk factors could also be identified in the qualitative data entered on British coronial records. (Fishing tasks involve similar equipment and processes, and require similar staff activities and movements, in most developed countries.)

> *'Deckhand; fishing vessel; a. laceration of brain, b. head injury; verdict accident. ... The deceased who was working on a fishing trawler was assisting bringing the nets and beams on board. He was responsible for hooking the beam that supports two iron shoes (one at each end) to the trawler. when the accident happened. The tube was not slotted into its secure position. The deceased secured the tube by using the top hole*

instead of the bottom hole first. Unfortunately, the tube swung towards the deceased and the shoe struck him on the left side of the face. Because he was standing in the wrong position the shoe pushed him into another structure and he became squashed'.

'Ships master; asphyxia and intoxication by hydrocarbon gases; verdict an accident. When anchored in the sea off the coast near ... following venting off procedures on the starboard slop tank he climbed down to the bottom of the tank without breathing apparatus, was overcome by hydrocarbon gases and slipped or fell into the oil slurry'.

Blood Alcohol Levels

No comprehensive data on blood alcohol levels of dead British seafarers were available. However, the Roberts (1998a:47) report into merchant seafarers did identify that: *'Many of the off-duty accidents* (sic) *and drowning involved inebriated seafarers returning to their small, berthed, cargo vessels after drinking in public houses ashore. Access to these vessels was sometimes hazardous on account of insecure gangways and ladders lying perilously steep, or even hanging vertically from the sides of vessels, as a result of tidal fluctuations.'* (Ladders are unlikely except with the smallest of fishing vessels.) Further, official British mortality records have identified male seafarers as a group with high mortality from alcohol-related diseases (Drever 1995:72).

Blood alcohol levels were available for 11 of the 94 dead Australian seafarers. (Across the Australian workforce as a whole, raised blood alcohol probably contributed to around 4% of all the traumatic work-related fatalities recorded in WRFS2 - see Driscoll *et al* 1999.) For 40 (43%) deaths, no blood was taken for analysis, and for another 43 (45.7%) blood alcohol levels were deemed 'not relevant'. Of the 11 from whom blood

for alcohol content analysis was taken, 7 had drowned, two had had fatal head/neck injuries, and two died from smoke/gas inhalation. All were male with an average age of 42.4 years. It is notable that the blood alcohol levels (where available) ranged from 0.335g/100ml to 0.014g/100ml with many very high readings (0.335, 0.332, 0.330, 0.236, 0.200, 0.142, 0.130, 0.041, 0.033, 0.018, 0.014). As a comparative guideline, the legal driving blood alcohol level in most Australian states is 0.05g/100ml and in Britain it is 0.08. While detailed text descriptions were not available for all cases, a number of dead seafarers with high levels of blood alcohol had been on board a docked ship or were negotiating return to ship from a jetty when their fatal injury/drowning event occurred.

> *'The boat was anchored in port and the deceased went to a local hotel for a few drinks. Upon returning to the ship it appears that he went to his cabin, where later an empty bottle of scotch was found. He was not seen alive again, being pulled from the water the next morning after a tug boat skipper noticed the body floating in the water ... no history or suggestion of depression and it appears most likely that the deceased accidentally fell the 20 metres or so overboard whilst heavily intoxicated. The deceased's blood alcohol was 0.335 g/100ml'.*

> *'Fisherman; fishing; drowning; verdict - accident. The deceased was found at the foot of rocks ... He had tumbled, having consumed alcohol, down to that level at a location unknown and died from drowning, his body being found at 07.35am ... pronounced life extinct at 08.10 am that day'.*

It is important to remember that there are a number of potential contributory factors to traumatic deaths where blood alcohol content is raised, including tide level and changes, whether vessels are deeply laden or near empty, high variability in the quality of gangway

construction (although Regulations should ensure minimal standards), and the potential for wash from other speeding boats to affect the vessel (very unlikely except with the smallest of vessels).

Comparison Between British and Australian Seafarers and Fishing Workers

Workers in the different occupational sub-groups were exposed to quite different risk factors. In attempting to compare fatality patterns it is logical to consider only occupational groups that are counted in both countries (seafarers and fishing workers). Similarly it is important to compare only those causes of death that are collated in both countries (i.e. suicides and fatal vehicle incidents are not appropriate for comparative purposes as they were not included in the Australian data supplied for this study). Thus in this next table the COD for British and Australian seafarers and fishing workers only are included. Suicides and fatal injuries from vehicle crashes have been removed from the British data - although some UK vehicle fatalities *did* happen at work in these two occupational sub-groups). All drowning deaths for British and Australian seafarers and fishing workers have been included.

The British 'major injury' category included those originally coded as caused by machinery incidents, under the 'other and unspecified (e.g. crushed, poisoned)' code, falls, explosion/fire/burning, water transportation incidents causing other injuries e.g. crushed between ships, machinery, electric current, and injuries cause by air or rail transport. The British asphyxia deaths include those caused through poisoning by motor vehicle exhausts, accidental strangulation, and poisoning by other gases. Poisoning through liquid or solid substances, injuries caused through undetermined circumstances where there was no qualifying data, accidental poisoning by drugs, homicides etc. were coded under 'other'. The data have been recoded according to actual bodily injury leading to death e.g. a fall which resulted in a major laceration which led to death has been classed as a major injury/laceration. In the Australian data, a death that resulted

from a fall into the water and where the body was *'... munched by the propellers'* was coded as a major injury. In other Australian cases, in order to improve comparability, the allocation of COD to a particular factor was made through consulting occupational and industry codes as well as the qualitative information available.

In Australia, 43 seafarers and 18 fishing workers died. In the British data 87 (+ 24 suicides + 19 vehicle crash) seafarers, and 38 (+ 11 suicides + 9 vehicle crash) fishing workers had a traumatic work-related injury during the period under study. In the table below, the actual number of deaths is given as well as the percentage as a proportion of all fatalities (seafarers and fishing workers only). It is important to note that the numbers are very low in some COD categories, and so apparent trends should be interpreted with caution.

Table 9 Causes of deaths: British versus Australian seafarers and fishing workers

	drowning	major injury or laceration	asphyxia	other	total number
UK					
seafarers	20 (23%)	39 (44.8%)	2 (2.3%)	26 (29.9%)	87
fishing	17 (44.7%)	7 (18.4%)	1 (2.6%)	13 (34.2%)	38
Australia					
seafarers	27 (62.8%)	11 (25.6%)	4 (9.3%)	1 (2.3%)	43
fishing	15 (83.3%)	1 (5.5%)	1 (5.5%)	1 (5.5%)	18

From the above table it is clear that the major COD of British seafarers and fishing workers are quite different to those in Australia. For example, British *seafarer* deaths are more commonly from a major injury/laceration, 'other' causes, and drowning respectively. For British *fishing* workers, drowning is the major COD. In contrast, drowning deaths are, proportionately, much more common in Australia (especially amongst fishing workers). As a result of these different COD patterns, the risk control strategies will differ in each country.

RISK MANAGEMENT PREVENTION STRATEGIES

The management systems approach to OHS has now spread across most larger companies on-shore, and is increasingly common through *de facto* adoption by smaller firms and self-employed workers (e.g. through contract clauses). Further, legal *requirements* for implementation of an OHSMS have been introduced in some Scandinavian countries (known there as 'Internal Control' requirements). Yet the OHS management systems debate has barely started to affect the OHS of seafaring sub-groups, and does not as yet appear in the policy or scientific literature for them. For example, regulatory requirements for OHSMS in seafaring and fishing have yet to be drafted and enacted. The history of land-based OHS preventive efforts indicates that the introduction of OHSMS for seafarers may be inevitable, and indeed an early call for their introduction has just appeared in *Lloyds List* (Grey 21/4/99:5). Thus it is probable that the OHS management systems approach will be progressively implemented across seafaring and fishing organisations.

The first stages in the Risk Management process are usually known as Risk Identification and Risk Assessment. The qualitative data in coronial files are likely to useful in this early stage as they provide direct clues about the circumstances under which fatalities frequently occur. The next phase is usually known as Risk Control or Risk Management. The appropriate risk control strategies are not only likely to be different for the different sub-groups (e.g. seafarers versus fishing workers), but also to vary between larger versus smaller vessels. For example, when the risk factors are known, a Risk Control preventive strategy could begin with the widespread dissemination of industry sub-group-specific Risk Assessment and Control checklists. In any comprehensive Risk Management strategy, evaluation of the intervention chosen, and feedback, are also needed.

High risk areas should be prioritised, and the primary and contributing factors to deaths in each sub-group identified in order to fine-tune appropriate risk control strategies. In Britain, particular attention needs to be paid to prevention of falls (especially on stairs for seafarers - but not fishing workers), and the inhalation or absorption of solid and liquid substances which are hazardous to health. (UK prevention strategies need first to examine why there are so many suicides - which may also be common in Australia, but which were not collated in the WRFS2.) The following coronial file narrative data extracts provide fairly basic examples where formal *enforced* OHSMS would have significantly reduced the likelihood of a fatality:

> *'While cleaning an empty benzene tank on board ship he accidentally incurred a fatal overdose of benzene'.*

> *'Seaman/deckhand; multiple injuries; verdict accidental death. The vessel had taken on board a walkway. Because of the calm weather it was considered unnecessary to secure same. Whilst the vessel was at sea and arriving into port this walkway fell and trapped two deckhands underneath it. The deceased died from his injuries'.*

> *'The deceased went into a hatch opening to get a broom. He was overcome by fumes which had been produced by a car ... and collapsed to the bottom of the ship's hold, fracturing his skull'* and in the same incident *'while the mate of ... he went into a hatch opening to render assistance to a crew member who had collapsed into the ship's hold. He too, was overcome by carbon dioxide fumes and died'.*

Thus the introduction of OHSMS with detailed Risk Identification, Risk Assessment. and Risk Control provisions (and their enforcement), may reduce the number of fatalities. However, it is important to remember that OHSMS are not always a success,

and the possibility for paper-based sham systems exists. The beginning stages of a Risk Management approach can be seen in the examples provided below, which have been separated by causes of death.

(a) *Drowning* deaths provide a stark contrast between the two nation states and between the different occupational sub-groups. There were far fewer drownings amongst the British workers than amongst the Australians (notwithstanding the probability that a greater proportion of the Australian workforce could swim). There are a number of potential explanations for this difference: (a) job tasks may be somewhat different in the colder northern seas than in the warmer southern oceans with the more hazardous activities being more common in Australia (e.g. cray fishing is more common); or (b) OHS protective strategies may have become far more entrenched and enforced more stringently in British seafaring and fishing operations. (For example, Roberts (1998b:42) cites the case of a fishing trawler owner who was jailed on six counts of manslaughter following the loss of six lives on a vessel without a valid safety certificate and without a qualified skipper.) (c) OHS induction training may be far more cursory in Australia in contrast to more comprehensive programs in Britain; or (d) the implementation of OHS protective strategies (including enforced wearing of life jackets in poor weather) may be more rigorously enforced in Britain than in Australia; or (e) the Australian seafaring sub-groups may work in far smaller vessels which are at much greater risk from bad weather than do the UK workers; or (f) improved weather and sea temperatures in Australia may encourage more recreational swimming in off-duty hours there.

Australian prevention efforts need to be directed to preventing the drowning of those working in (probably smaller-size) fishing vessels. The available evidence indicates that fishing workers are at far greater risk than are seafarers in Australia, and the size of vessel may be an important factor related to drowning deaths in poor weather. One Risk Management approach is to ensure ease of access to, and compliance with the

wearing of, flotation devices - particularly in poor weather. Specific attention will need to be directed to why flotation devices are not being worn by fishing workers and seafarers (e.g. are they difficult to work in, stored in inaccessible places, uncomfortable to sleep in etc?). This problem was identified some time ago by Driscoll *et al* (1994:615) who warned:

> *'Rough weather was therefore the only early warning of increased risk ... important to have flotation devices placed near work stations -for example, the wheel house-for ready access in an emergency, and to encourage use of the newer inflatable life jackets, which may be suitable for use during normal work when worn while inflated ... The need for the development of flexible, durable, and buoyant clothing, and personal flotation devices that can be worn for prolonged periods of bad weather and that have only minimal interference with working activities has been noted ...'.*

It is, again, important to note that the proportion of British deaths caused by drowning diminished substantially over the two time period studied: 1982-84 to 1989-92. As discussed earlier, anecdotal evidence has indicated that the number of fishing vessels decreased, but boat sizes increased, in the British fishing fleet over this time period. It is possible that Australian drownings could be reduced if similar intervention strategies were implemented, or if there were incentives to use/purchase larger vessels. The provision of detailed risk probabilities associated with the size of vessels, and accurate and readily understood Risk Assessment and Control advice for the fishing industry is urgently needed.

> *'The deceased was the skipper of ... which sank on ... about 10 miles off.... The boat was later refloated and his body was discovered in the sleeping area of the trawler'.*

'... working aboard a fishing vessel which capsized off ... The vessel had recently had a section of its stern buoyancy tank removed and the adverse weather conditions caused flooding'.

'Fisherman; 1 a. drowning; verdict accidental death; deceased found dead tangled in his fishing nets'.

The evidence presented earlier also indicated that the drowned seafarers in Australia were much younger than those in Britain. This age distribution difference suggests that OHS prevention strategies currently used in Australia might not be as effective amongst younger age groups as for older workers, sufficiently comprehensive, appropriate, on-going, enforced, or supported by suitable equipment. (The increased number of deaths amongst younger workers in Australia may also be due to a younger exposed workforce, but in the absence of detailed labour force data this cannot be ascertained.) One frequently overlooked factor is that risks associated with leisure-time activities on board a vessel are quite different to the risks of the same activity carried out on land. Further, when the workers are not on duty, they may feel more relaxed and take chances that they would normally refuse to face - and Masters may not enforce rules so stringently.

'Boatman; drowning misadventure. After consuming a quantity of beer during the day, deceased went out with ... others in a small boat on lake ... and, after sharing a half bottle of whisky, decided to swim to the shore. He got into difficulties and disappeared under the water and drowned'.

'Sea captain; drowning; verdict accident. Deceased with his ... son was sailing ... the boat was hit by a huge wave, and the deceased was thrown into the water'.

'The deceased was taking part in a boat race when the boat capsized during a sudden thunder storm'.

(b) *Water transport incidents* were very common amongst the British ship and hovercraft officers (this category would have included a number of pilots). It was also noted that in the Australian data some volunteer workers had died - presumably during the rescue of others in danger at sea. The water transport incidents frequently resulted in drownings, collisions between two vessels or wharf and ship, fire/explosions, and falls. The lack of secure enclosure within and at the edges of the vessel, and inadequate or inappropriately stored equipment were associated with some traumatic fatalities. Thus a Risk Control approach could concentrate attention on physical barriers and safe systems of work.

'... body was not found but evidence suggests the deceased was 'munched' by the propellers ...'.

'In the evening deceased was being ferried back to his ship on river ... when the boat was blown from rope ladder and drifted away. His body was found washed up ...'.

'The deceased was found wedged between boulders ... The deceased was an experienced fisherman who went out to sea in a friend's boat in which the gear was incorrectly stowed and this, together with the inclement weather, caused the boat to sink'

(c) *Vehicle crash incidents:* the number of motorised vehicle incidents amongst seafarers was higher than expected. One high risk factor was identified through the British data: young seafarers were at particularly high risk (as were those over age 65), both at work and 'elsewhere' (whatever that means). This pattern is not unlike that of young car drivers on the road. It is likely that similar preventive strategies to the road death reduction campaigns may be of use e.g. enforcing speed restrictions. An OHS management system which controlled seafarers walking through areas where stevedores were working with forklifts and mobile cranes may also have reduced fatalities e.g. marked safe walking lanes. The qualitative coronial data could indicate other potentially useful risk control measures associated with mechanised equipment. Nevertheless, some fatal crashes undoubtedly occurred away from docks, although the details provided did not allow for clear identification of whether the person was on his/her way to or from work, or whether fatigue played a role.

> *'Sea captain, merchant service; injuries to the neck and spinal cord; verdict accident ... the deceased was on a motorcycle when he failed to negotiate a blind left-hand bend and collided with a minibus travelling in the opposite direction'.*

(d) *Suicide* deaths formed a substantial proportion of the total British seafarer deaths, although all three sub-groups studied had a number recorded (notably workers under age 25 infrequently suicided).

> '*A Trawler Skipper; hanging; killed himself*'.

> *'Fisherman; ... salicylate poisoning. Verdict took his own life'.*

Fatigue has been consistently cited as a contributing factor to diminished productivity, long-term ill-health, and reduced attention/accuracy. By its very nature, work in the

seafaring and fishing sectors require shiftwork and extended hours of labour. More recently, seafarers have occasionally been required to assist with the completion of tasks which were previously performed by stevedores. These extended duties have grown as a result of the short turn-around times in ports (which also reduce on-shore recreation time), have added to the work burden of seafarers, and contributed to the cumulative sleep deficit and exhaustion of workers. In this paper it was suggested that factors that contribute to the fatigue, isolation, depression and poor health status of seafaring groups as a whole, might also be linked with suicide. Inevitably fatigue consequences spill over outside the workplace.

> *'In the early hours of ... the deceased was driving home to ... for some reason, probably fatigue, he lost control and mounted the nearside and crashed into a stanchion and sustained atrocious and fatal injuries'.*

Risk Control intervention strategies, modelled on the recommendations of the AMSA 'fatigue' study, would be useful starting points in the quest to reduce the incidence of both fatigue and suicide amongst the seafaring sub-groups (see Parker *et al* 1997).

(e) *Falls:* the number of deaths of seafarers in Britain from falls was of concern. Falls were most commonly associated with stairs or from an unspecified situation. The age distribution was quite marked, with older workers over-represented. Prevention strategies may require on-site investigations of contributory factors such as: prevailing weather conditions at time of fatal falls, standard design and fittings of hand rails/grips along stair wells, relationship between stair steepness and fatalities, access/egress conditions at time of fatalities, and narrative data interrogations in order to identify speed of ascent/descent at time of incident, or whether spiral or standard stairs were more commonly associated with fatalities. (Insufficient information about fatal falls was available in the Australian WRFS2 data to identify any risk differences.) Redesign of

work processes in high risk situations is then suggested e.g. enforced use of safety harnesses when working in or on lifeboats.

'Petty officer, merchant navy; 1a. ruptured thoracic aorta; b. deceleration injury; verdict accidental death ... he fell to the deck below which he was working on a starboard side lifeboat aboard the ferry... on its crossing from ... to ... in a position east south east of ..'.

'Ships engineer; (a) cerebral contusion and haemorrhage, (b) fractured skull; verdict accidental death. The deceased fell down stairs with fatal consequences'.

'The deceased was chief engineer on board ... a foreign ship, when he was found collapsed with a head injury consistent with a fall and having consumed a quantity of alcohol'.

(f) *Major traumatic injuries* were common amongst younger seafarers in both Britain and Australia. Factors contributing to the level of risk may have included: increased exposure of younger workers to more hazardous tasks and risky working situations as compared with older workers, inadequate induction and supervision, work intensification, shorter turn-around times in European ports with only brief periods between at sea (contributing to increased levels of fatigue), and/or equipment or maintenance variations.

'The deceased sustained a head injury from a lobster pot while fishing with fatal consequences'.

'Ensanguination due to lacerated femoral artery & vein & fractured femur and pelvis'.

'Fisherman ... blunt facial injury'.

Amongst fishing workers, in particular, a Risk Control strategy based on 'hierarchy of control' principles could include installation of more protective covers for moving equipment, and greater use of 'dead men's handles' to reduce the possibility of people having their clothes caught in fishing net winches and being drawn in.

(g) *In-Port deaths* were very common in both countries, with workers both on and off-duty at the time of the fatal incident. Excessive alcohol intake played a contributing part to many of these deaths, although only for a few dead Australian workers were blood alcohol levels available. Roberts (1998a:26) also found an excess of deaths amongst off-duty British seamen who had consumed alcohol, for example: *'... accidentally falling into a dock when returning to a berthed vessel from ashore; usually from the gangway or access ladder, or from the quay-side'.*

> *'Merchant Seaman; asphyxia; carbon monoxide poisoning; verdict accidental death. The deceased had been ashore. He returned to his ship and as previously intimated started to prepare some chips. From investigations it would seem that the chip pan overheated causing the oil to catch fire'.*

> *Merchant Seaman. Inhalation of products of combustion; sustained following a fire. Verdict accidental ... deceased was involved in a fire on a ship. He was conveyed to a hospital where he died a short time later'.*

It is important to note that because the ship is a home as well as a workplace, the OHS Acts (which are alike and have similar rights and responsibilities) still apply after working tasks finish for the day/night (see earlier discussions on page 12-15). It is of particular

import to note that the Robens-based general 'Duty of Care' requires provision of a safe *place* as well as a safe *process* of conducting operations (although in the case of the Australian States and Territories quite different Acts may apply at each end of the gangplank), and covers both workers and others on-site. The perceived complexity of the Australian OHS legislation may add to the confusion about the relative responsibilities of the different parties (on shore, at sea and while in port - particularly on smaller vessels). In the case of the UK, similar provisions have been picked up at the dock, on the gangplank, and on board. Because of the overlapping nature of the HSE, Dock and Maritime Acts and Regulations, there is probably far less chance of confusion in British ports.

Because risks may be perceived to be much greater while at sea facing the elements, OHS while in-port may receive less attention, and Risk Assessment and Control procedures may not be undertaken except in a rudimentary fashion. Limited attention may therefore be paid to Risk Assessment and Control while ships are in-port, and when workers are on leave but still living on board. A common theme found in many coronial files on in-port traumatic deaths was that safe access/egress facilities and barriers around the gangplank were lacking.

Given the Duty of Care enshrined in all Robens-based OHS and Maritime legislation (with primary responsibility allocated to owner/managers and the Captain/Master), appropriate Risk Management controls would have to consider safe access and egress between wharf and ship for the *known* contributing risk factor of inebriation while off-duty. Further, the principles of forseeability, preventability, practicability, reasonableness, and a known link between event and outcome would probably make a common law test case outcome difficult for an employer to challenge - although contributory negligence might limit damages. Nonetheless, many companies have already introduced alcohol restriction/ prohibition policies with stringent penalties for non-compliance. Over time these controls are likely to be progressively extended.

Thus it may be that alcohol-related fatalities will diminish as more vessels and companies integrate alcohol restriction policies into comprehensive OHS Management Systems.

> *'The deceased fell into the water whilst attempting to secure the accommodation ladder to motor vessel'.*

> *'Deceased had just set foot on board a 30 ft launch that was tied up at a wharf. A wash from another vessel caused the boat to rock and the top of the boat's cabin hit the wharf. The deceased apparently had his head squashed between the wharf and the cabin of the boat. Deceased then fell in the water ... would have died instantly'.*

> *'Deceased was found dead having fallen from the sea wall approximately 8' and struck his head rendering him unconscious. He had been drinking the previous day and at the time of death had 100mg alcohol/blood'.*

(h) *OHS training and certification enforcement*

Education and training is limited for many seafaring sub-groups, and OHS induction is likely to be similarly inadequate (see Lane 1997:111, 117). Inadequate training is commonly found amongst precarious labour in a range of other industry and occupational sectors. Where labour turnover is high, tasks are semi or unskilled, and only a short-term appointment is made, investment in OHS training or education is frequently interpreted as a cost rather than a benefit, and investment in non-mandatory training of all sorts trimmed. Anecdotal stories have been told about young Australian workers appointed to their first job being asked to watch a 1/2 hour video on OHS as the vessel steamed out to sea - the sole induction/training provided about all aspects of their job. Because precarious labour is normally not employed/appointed at decision-making level (or even decision-influencing level), the ability of these workers to affect work processes that impact on their OHS status is also severely circumscribed.

Comprehensive OHSMS always include training and re-training provisions. Some coronial file data that point to inadequate training, induction and supervision are re-produced below:

> *'He died from barotrauma due to retention of excess air in the lungs when ascending within a diving training tank'.*

> *'Was electrocuted whilst working with electrical equipment on board a fishing trawler'.*

> *'Deceased was last seen working from a tressle over the side of a ship in ... docks, although when found he was wearing a safety harness but it would appear that it had not been attached to any anchor point'.*

CONCLUSION

This study set out to compare the causes of death of British and Australian seafarers and fishing workers. This task involved examination of the official records based on coronial reports, as well as participant observation and semi-structured face-to-face interviews with chaplaincy, port and current and ex seafarers. This process elucidated factors associated with traumatic fatalities. However there were difficulties in comparing the two data bases, and only occupational subgroups and COD categories that were similar provided valid comparisons. For example, only in the British data were suicides detailed. The qualitative data provided in the coronial files pointed to high-risk situations.

- Suicide was the most common cause of death for the British sub-groups studied, and was particularly common amongst seafarers. However, it cannot be supposed that

suicides are uncommon amongst Australian seafarers and fishing workers - we simply do not know as they were not included in the WRFS2. The questions that need to be answered are (a) why do so many seafarers and fishing workers suicide; and (b) how can these suicides best be prevented?

- The relationship between fatigue and traumatic fatalities and suicides amongst seafarers and fishing workers is an area which urgently needs assessment.
- The *occupational* sub-group with most deaths in both Britain and Australia was seafarers.
- The Australian *industry* sub-group with most deaths was fishing.
- Given the number of drowning deaths in Australia, it appears that lifejackets/floatation devices are either: (a) not being worn; (b) are inadequately designed; (c) are uncomfortable to wear or limit activities/movements; (d) are stored in places that make them difficult to access quickly; and/or (e) their use is not being enforced by owners/skippers.
- The association of very high blood alcohol levels with a number of in-port deaths indicates that requirements for more robust wharf/gangplank/ ship and vessel perimeter barriers are needed. In addition, there may be scope for enhancement of advice provision about safe drinking levels, and the design and implementation of other Risk Management strategies.
- OHS induction and training appears to be minimal, with participatory mechanisms enshrined in the Robens-based OHS acts in both countries apparently given little, if any, attention.
- The precarious nature of employment in seafaring and fishing is undoubtedly an underlying factor associated with traumatic fatalities. The limited ability of precarious labour to redress risks associated with their jobs has been noted in a range of other occupations across both industrialised and industrialising countries. Evidence to date suggests the underlying pressures are no less acute amongst those who work at sea (see Lane 1997). Workers from developing countries (who may be even more precariously employed than British and Australian seafarers and fishing workers) are

likely to have even poorer OHS (see Roberts 1998a). It is argued that the internationalisation of hazards and risks, coupled with the diminished labour market power of seafarers and fishing workers, intensifies OHS risks.

- The international regulatory basis for protection of the OHS of seafarers is probably inadequate and difficult to enforce. Enforcement is likely to be a major OHS challenge in the future. Lessons may be learnt from recent land-based OHS legislative innovations.
- The potential for OHSMS to be developed and implemented by major shipping owners and insurers has yet to be realised and applied to the seafaring and fishing industries. However this Risk Management approach offers a potentially useful strategy to reduce fatalities.

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