Commercial Vessel Fatalities in Victoria 1991-2001

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INTRODUCTION

AIM

The aim of the current study was to identify fatal incidents on commercial vessels in Victoria, Australia between 1991 and 2001. Coronial investigations of the identified fatal incidents were examined in order to highlight potential improvements to safety equipment and procedures, in particular the use of personal flotation devices (PFDs).

DEFINITIONS

According to Marine Safety Victoria (MSV) (formerly the Marine Board of Victoria), commercial vessels are defined as:

"fishing vessel" - a vessel used or intended to be used for catching fish, whales, seals or other living resources of the sea or seabed for profit or reward and includes any such vessel in the course of construction but excludes any vessel:

a. engaged in harvesting or transport of algae or aquatic plants; or
b. that is primarily a carrier or mother vessel.

"trading vessel" - a vessel used or intended to be used for, or in connection with any business or commercial activity and includes (but is not limited to) a vessel used or intended to be used wholly or principally for:

a. carrying passengers or cargo for hire or reward; or
b. providing services to vessels and shipping, whether for reward or otherwise - but does not include a government vessel or a fishing vessel.

The current report investigated both fishing and trading vessel deaths, the differentiation being made between ‘recreational’ and ‘commercial’ in both cases. Commercial vessels were determined to be those where work was being performed for payment (where clear) or as part of a commercial operation/business, rather than for personal gain or recreational purposes. This investigation did not include fatalities involving yachts, regardless of any payment received.

THE CURRENT STATE OF COMMERCIAL FISHING IN AUSTRALIA

The Australian fishing and aquaculture industries are Australia's fifth most valuable rural industry after wool, beef, wheat and dairy, according to the Department of Agriculture, Fisheries, Forestry - Australia (AFFA). Despite having the world's third largest fishing zone area, Australia ranks only about fiftieth in world fisheries production in terms of tonnes of fish landed. However, Australian commercial fishing targets many high-value species resulting in a gross value in 1996-97 of approximately A$1761 million. There are four major areas of fishery activity within Australia's fishing zone, including the northern prawn fishery, the southern bluefin tuna fishery, the south shark fishery, and the south east fishery (multispecies) (Dept. AFFA, 1998).
Recently, legislation was enacted that created a number of Marine Parks and Sanctuaries in coastal waters around Victoria. The Marine National Parks and Marine Sanctuaries Bill was introduced into Parliament in May 2001, before being withdrawn again in June for more consultation. The legislation was released in draft form in April 2002, with the Bill subsequently being passed by Parliament in June 2002.

The implications of the Bill are that 13 marine national parks were established in November 2002, with fishing being prohibited in eight of those marine national parks by that date, subsequent to fishing being prohibited in a further five parks by April 2004. The legislation provides for some degree of compensation to be paid to commercial fishery access licence holders. These documents can be accessed from the Parks Victoria webpage (http://www.parks.vic.gov.au/1bays.cfm).

As changes to environmental and other legislation alters the rules on fishing times, places and other factors, the work of fishing will also change and any OHS improvements will have to keep pace with the nature of work in these industries.

THE ROLE OF THE CORONER

In Australia, unexpected, unnatural, and violent deaths or deaths resulting from accident or injury are required by law to be reported to the Coroner. In Victoria, for example, the legislative requirements for reporting a death are outlined in the Coroner’s Act 1985 (Vic) (the Act). Section 15 (1) states that:

“A coroner has jurisdiction to investigate a death if it appears to the coroner that the death is or may be a reportable death”

where a “reportable death” is defined by Section 3 of the Act as:

“a death:
  a. where the body is in Victoria; or
  b. that occurred in Victoria; or
  c. the cause of which occurred in Victoria; or
  d. of a person who ordinarily resided in Victoria at the time of death:
    being a death:
    e. that appears to have been unexpected, unnatural or violent
       or to have resulted, directly or indirectly, from accident or injury.”

Section 19 of the Act also prescribes that at the conclusion of an investigation into a death, the Coroner must make a finding in relation to the identity of the deceased, how the death occurred and the cause of death. The coroner also has the power to make recommendations on public health and safety issues for the purposes of future prevention of deaths in similar circumstances. In accordance with the Coroner’s Act, all drowning and work-related fatalities, including those involving commercial vessels, are required to be reported to the coroner for investigation.

It should be noted that other States and Territories may have slightly different provisions to the information described above. The reader would need to refer to their particular State and Territories coronial legislation.
LEGAL OBLIGATIONS

All employers within Victoria have a general duty of care under the Occupational Health and Safety (OHS) Act (1985) to "Provide and maintain a working environment that is safe and without risks to health". Other States and Territories within Australia would have similar obligations under their own OHS Acts. The OHS Act within Victoria also specifies similar duties of care for persons other than employees (such as contractors/sub-contractors) and also for the self-employed.

Most equipment on a fishing vessel can be considered to fall under the definition of 'plant'. The National Occupational Health and Safety Commission (NOHSC) document entitled "Plant in the workplace making it safe: a guide to managing risks from plant in the workplace for employers and employees" (NOHSC, 1995) specifically nominates commercial fishing plant such as engines, winches, nets, slipways, freezers etc as coming under the definition of 'plant'. This means that employers also have duties under the Occupational Health And Safety (Plant) Regulations 1995 (Victoria). Section 708 says (in part) that employers must ensure that plant is maintained, so as to eliminate the risk associated with the use of the plant; or if it is not practicable to eliminate the risk, so as to reduce the risk so far as is practicable. Thus, the use of PFDs (and the enforcement of their use by employers and others) can be seen to be a practicable way of reducing the risk of drowning brought about by use of fishing industry plant.

PREVIOUS RESEARCH

Research into Commercial Fishermen and the Wearing of PFDs

The National Occupational Health and Safety Commission (NOHSC) Traumatic work-related fatalities in commercial fishermen in Australia (1994) study investigated all Australian work-related commercial fisherman deaths during 1982 to 1984, finding 47 deaths during this time period. This represented a rate of 143 per 100,000 person years, which was 18 times higher than the fatality incidence for the whole Australian workforce. Sixty-eight (68%) of these cases were drownings, with the majority of deceased persons working on trawlers. Inadequate use of personal flotation devices (PFDs) was associated with many of the fatal incidents.

A more recent study also performed by NOHSC looked at traumatic work-related fatalities in Australia for the period 1989 to 1992. A summary of specific fishing industry deaths published as part of this study showed that 55 persons employed in the fishing industry died in work-related incidents between 1989 and 1992 in Australia (NOHSC 1998). This means that there were 89 deaths per 100,000 workers per year in the fishing industry during this time. This figure is 16 times higher than the all industry rate of 5.5 deaths per 100,000 workers per year.

NOHSC (1998) found that 13 of these deaths were attributable to a crew member or lone fisherman falling overboard and drowning (often in rough weather and heavy seas). Further, the workers were usually not wearing a life jacket. In fact, in 24% of these fatalities, it appears that life jackets were available on board the vessel, but not worn at the time of the incident.

Overseas research also points to the non-wearing of PFDs as a major factor in fishing industry deaths. The National Institute of Occupational Safety and Health (NIOSH) in the
US notes that each year in Alaskan waters, an average of 34 fishing vessels and 24 lives are lost in the commercial fishing industry, which equates to an occupational fatalities rate of 140 per 1000,000 workers per year, 20 times the national average. (NIOSH, 1997). This study, based on National Traumatic Occupational Fatalities (NTOF) surveillance system for 1991 to 1996 found a total of 427 occupational fatalities occurring in Alaska, of which commercial fishermen made up 146 (34%) deaths.

With respect to these 146 commercial fishermen deaths, most (128 or 87%) of the deceased fishermen drowned or were presumed drowned. Of these 128 drowning deaths, 31 deaths (or 21%) were categorised as falling overboard. These were further divided into entanglement in a net or line (9 or 29%), unobserved fall (victim missing from vessel) (8 or 26%), observed fall (8 or 26%), and washed into the water (6 or 19%). More pertinently, of the 128 fishermen who drowned, almost half of them (60 cases or 47%) were not wearing any type of PFD while 12 (9%) were. For the remaining 56 (44%) cases, it is unknown whether they were wearing a PFD or not (NIOSH, 1997).

The report recommends that all fishermen should wear PFDs when on the deck of any vessel (NIOSH, 1997). The authors note that although PFDs might not result in a successful rescue, in cases where the victim is entangled in the gear or not observed falling overboard, that in 45% of the fatal man-overboard cases from 1991 to 1996, the victim was not entangled and was observed falling overboard, therefore should have been floatable and recoverable if the vessel had been adequately prepared for an emergency.

A number of case studies were found from the Fatality Assessment and Control Evaluation (FACE) program undertaken by NIOSH that come to similar conclusions about the usefulness of ensuring that all fishermen have an appropriate personal flotation device on during all times on deck (FACE 9232, FACE AK-95-023, FACE 9214, FACE AK-95-001).

In terms of the usefulness of PFDs in saving lives, a report by NIOSH entitled "Commercial Fishing Fatalities – Alaska, 1991-1992" compared persons who have drowned or are presumed to have drowned with persons who survived incidents in which at least one life was lost. Of those persons reportedly wearing a PFD, seven (58%) of 12 survived and thus were more likely to have survived (odds ratio=8.9 at a confidence interval of 1.7 to 49.0) than those who were not wearing a PFD, of whom six (14%) of 44 survived (NIOSH, 1993).

A NIOSH Alert entitled “Preventing drownings of commercial fishermen” also notes unpublished NIOSH data that suggests that 63% of fishermen wearing PFDs when they jumped or fell into the water survived, whereas only 12% of those without PFDs survived (NIOSH, 1994). This report goes on to examine different types of PFDs with a focus on comfort, applicability to task, their relative protection from hypothermia and their effect on the positioning of the body in the water. The article also offers line drawings of each of the different types.

Similarly, although relating to recreational boating safety, Treser, Trusty and Yang (1997) conducted an investigation into the effectiveness of an educational campaign on PFD usage in King Country, Washington. Observations were conducted for six weeks in spring 1992 to determine the baseline level of PFD usage, prior to the initiation of educational activities. Observations of PFD usage were made at twelve different sites (ten freshwater and two saltwater), three times per week (one weekday and both days
on the weekends for 30 minutes) for boats 16 feet or less. The data collected consisted of time, day, site, weather conditions, water conditions, boat type, age and gender of boaters and whether or not a PFD was worn by each individual.

The educational campaign included a boating safety video for use in elementary schools, a life jacket loaner program for local beaches, community events, fliers, brochures and celebrity sports cards.

In 1994, a follow-up study was conducted in order to gauge the effectiveness of the educational campaign. It was found that PFD usage increased substantially from 19.9% of all boaters in 1992 to 31.3% in 1994. An increase in usage by adults was more significant (14.2% to 24.7%) than by children (68.2% to 70.5%). The findings also reported that use by adolescents and young adults was rare. Treser et al (1997) argue that this was important because this age group had the highest case fatality rate.

The report concluded that there was a definite increase in PFD usage following the educational campaign with every category of data showing some increase between 1992 and 1994. Treser et al (1997) encouraged replication in other settings to confirm these findings. There seems to have been no equivalent education campaign or study in relation to commercial boating safety.

Herrmann and Stormer (1985) conducted an evaluation of 17 life jackets (largely of U.K. and European design) in order to determine the behaviour of such life jackets on unconscious individuals in heavy seas. Herrmann and Stormer (1985) argued that the ability to move in the water is lost quickly due to the effects of hypothermia, exhaustion and injury, which often result in a loss of consciousness. The design of the life jacket therefore becomes important for survival, in particular ensuring that the airway of the immersed individual is kept clear of water (Herrmann and Stormer, 1985).

An immersible dummy was constructed in order to test how likely a person wearing a life jacket drifting exhausted or unconscious in the water would be to drown. The dummy was fitted with an ECG transmitter to send out test data and a sensor in the mouth signaled when the oral cavity flooded (Herrmann and Stormer, 1985). Seas were simulated in a German Navy practice pool at a height of 80cm (Herrmann and Stormer, 1985). The variables used to establish the life-saving function of the life jackets were: flooding frequency; the flooding period of the mouth; and the distance between the mouth and the surface of the water (Herrmann and Stormer, 1985).

It was found that a number of jackets formed water channels on the side and in the chest area, which allowed water to funnel directly up to the face of the dummy. This was also apparent with jackets fitted with buoyant protective collars (Herrmann and Stormer, 1985). Not only was the collar inadequate in protecting the face from waves, but water was also retained in the area around the face (Herrmann and Stormer, 1985). It was also found that the British Royal Navy jacket was the most effective jacket in terms of flooding frequency and flooding time. Herrmann and Stormer (1985) concluded that despite the progress made in life jacket design in recent years, a number of design improvements could be made to some current styles of life jackets in order to increase survival time.

**General OHS Research into Commercial Fishermen from Overseas Agencies**

Drudi (1998), using data from the US Bureau of Labor Statistics for the time period 1992-1996, found between 50-100 fishing fatalities annually, which translates into a rate of
140 fatalities per 100,000 workers engaged in the occupation. By contrast, the fatality rate for all occupations during this time period was 5 fatalities per 100,000 workers. Further, Drudi found that persons engaged in fishing face a risk of suffering a fatal job injury 20-30 times greater than the risk for all occupations.

The age group most at risk in terms of fishing fatalities is the 25-34 year age group, who Drudi (1998) found to have a disproportionately high share of the fatalities during the period. The main hazards they experienced included: falling overboard due to wave action, slipping on wet/icy decks, entanglement in gear, diving, and hypothermia (Drudi, 1998).

Specifically in terms of injuries only, a research application by Corcoran, Hogan, Liaw (1999) notes that commercial fishing also involves repetitive actions (such as pulling nets), carrying heavy loads and awkward positions, leading to the threat of musculoskeletal injuries like back injuries, and other cumulative injuries. [The final research performed as part of this application is unfortunately not able to be sourced at this time].

The Alaska Marine Safety Education Association (AMSEA) also reports on injuries of the eye, noting that the commercial fishing industry leads all industries in Alaska for eye injuries, particularly those caused by being struck by an object (for example lines, crab claws and hooks). The article goes on to suggest some solutions, including the use of “stuck” hooks on longline gear, as it reduces fishers’ contact with hooks as line is played out, and the use of maintenance-free plastic flashers over metal flashers in the troll industry, as well as goggles or safety glasses (preferably with the use of clear, layered, tear off acetate sheets similar to those worn by dirt bike riders) (AMSEA, 1999).

Roberts (2002) conducted an investigation into fatal accident rates of British seafaring and fishing between 1976 and 1995, and compared them with those for other occupations. It was reported that compared with other British workers, fishermen were 52.4 times more likely to have a fatal accident at work and seafarers were 26.2 times more likely (Roberts, 2002). Fatal accident rates in seafaring were 51.6 per 100,000 worker years and fishing was 103.1 per 100,000 worker years (with a confidence interval of 95%) (Roberts, 2002).

Thirty-six percent of British seafaring deaths, 507 of 1405, during period were due to accidents at work, compared with 74% (454 of 616) for fishermen (Roberts, 2002).

Drowning was the most common cause of deaths for both seafaring and fishing, 49% and 87% respectively (Roberts, 2002). Roberts, 2002 contends that the fishing industry in particular is unresponsive to safety measures due to a combination of factors relating to economic pressures and occupational and weather-related hazards. It is concluded that the focus of prevention strategies should be on reducing hazardous working practices such as working in adverse weather and sea conditions (Roberts, 2002).

General OHS Research into Australian Commercial Fishermen

Jeays (1987) assessed safety on prawn trawling vessels operating in Northern Australian fisheries. Boats were graded in terms of their seaworthiness, condition and work systems. Skippers were also queried on recall of accidents. Recommendations were provided in the report for both short and long term safety change in the industry.
Most of the vessels visited during the study had appropriate compulsory safety equipment, but the placement of the equipment was found to be poor in a number of cases (for example, lifejackets being placed under bunks in the forecastle or sleeping area) (Jeays, 1987).

Work systems were found to be largely informal and non-documentated, with a lack of information flow both down and up the lines of management regarding safety matters. There is also no system for cross checking whether requests for safety improvements have been implemented, especially on fleet fishing vessels where skippers and crews may often change between fishing trips (Jeays, 1987).

Skippers tended to only recall accidents if they were major (e.g. broken legs or needing a rescue). Minor injuries were accepted as part of the everyday operation of the vessel, and crew were often expected to seek their own medical treatment upon reaching port. If the injury was serious enough to prevent the crew going back to sea another crew would be employed, and in many cases, the cost of treating the injury was left to the injured party, unless they were covered by a Workers’ Compensation Policy (as is the case in the Northern Territory) (Jeays, 1987).

The study found 13 injuries of an on board nature, plus 16 injuries requiring medical treatment, plus 15 cases of injuries requiring hospital treatment (Jeays, 1987). Across these three types of injuries, deck and trawling accounted for the most injuries (9), followed by mechanical winches (5) and handling trawl gear (5).

The report notes that alcohol is often a big part of leisure activities in the industry (although most skippers stipulate the amount allowed to be consumed in a given period on board the vessel). Time periods after off-vessel breaks proved to be a time of high incidence of injury and accident (Jeays, 1987).

In terms of training, skippers are required to hold a Master Class III (Fishing) Certificate before taking command of a fishing vessel. This involves either a Technical and Further Education College (TAFE) course or similar by the Fishing Industry Training Committee and Shipping Examiners (Jeays, 1987). In most states this involves participation in some form of safety training, however, most commonly this was usually a one day program covering fire fighting, liferafts and general survival (Jeays, 1987).

Crews are usually employed on a casual basis with their payment being a percentage of the profit from the catch (Jeays, 1987). Crews often did not know if they were covered by any form of insurance in regard to accidents, and many appeared to just assume that they were covered (Jeays, 1987).

Recommendations for short term intervention include the development of a crew oriented handbook for distribution to all vessels, carrying general safety information in an easy to understand manner (with illustrations). Further, Jeays (1987) suggests that the last page of such a handbook should provide for signatures of crew, dates and skipper’s initials. Another short term recommendation made is for safety advisors to visit ports where vessels fit-out is being undertaken in order to advise on the improvement of vessel design and operation.
Long term recommendations made include: (1) that all new fishing vessels be required to conform with the Uniform Shipping Laws (USL) Code\(^3\) in construction and safety; (2) that all existing vessels to required to conform with the USL Code in regard to safety equipment; and (3) that all vessels being transferred in ownership be inspected with regard to safety, providing a guarantee of the vessel’s standard in case previous alterations were detrimental to the vessel” safety (Jeays, 1987).

A recent statistical analysis performed by the Monash University Accident Research Centre (MUARC) (2002) using the Victorian Marine Incident Database found 80 marine incidents for the period July 1999 to June 2002. Six of these incidents were deemed to be fatalities. Five of these involved fishing vessels and one an unknown type of vessel.

The report also used Victorian Admitted Episodes Dataset (VAED), a collection of data on hospital in-patient admissions from July 1987 to June 2001. MUARC found 1,726 admissions to Victorian public hospitals for water-transport related injury. Of these, 17 admissions were related to fishing boats (or 8% of total admissions) (MUARC, 2002).

The report also used Victorian Emergency Minimum Dataset (VEMD) data from July 1999 to December 2001 (from 28 Victorian public hospital emergency departments). 676 presentations for marine related incidents. 37% (or 253) of these cases involved ‘boat’ injuries. The report further specified that 7% of these were work related. The report does not explicitly compare these figures, or make any conclusions or recommendations for future prevention work in this area (MUARC, 2002).

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METHODOLOGY

CASE IDENTIFICATION

Relevant cases were identified using a mixture of search types of electronic data collected and stored by the State Coroner's Office (SCO), Victoria. The intention of this mixture of methods used was to overcome data limitations of each of the methods alone. The case identification methods used will be discussed below, with the limitations of each source to be discussed in a later section. These search types included:

1. TOPIC search of electronically stored police report summaries and coronial findings using keywords;
2. SCO Local Case Management System (LCMS) cases selected where incident code = “DRW” (drowning) for period 1999 – 2002;
3. SCO LCMS case selected where manner of death codes = “drowning” or “boat accident” for period 1988 onwards;
4. comparison with deaths reported to Marine Safety Victoria for the period 1990 - 2000;
5. comparison with drowning deaths identified by other researchers for the period 1991-1998; and
6. cross-comparison with the National Coroners Information System for all Australian commercial vessel deaths from July 2000 onwards.

In more detail, these searches involved:

1. Electronic versions of police report summaries (known as “Form 83 circumstances text”) and coronial findings were searched using keywords such as fishermen; commercial fishermen; vessel; professional fishermen; trawler. This search utilised a database called “TOPIC” as it allows for multiple term searching. TOPIC contains data from 1988 onwards, however, it does have some problems with the length of data allowable in each field, and it is not complete for all past cases.

2. When a death is reported to the SCO, it is entered onto the SCO Local Case Management System (LCMS), which dates back to 1989. At the time of being entered, a code is assigned to all cases that relates to the type of incident that has occurred. One such incident code is “DRW” (drowning). All cases coded as drowning from 1999-2001 were selected and police report summaries obtained for each case. These summaries were subsequently interrogated to determine whether inclusion was warranted.

3. An SQL (structured query language) search was used to identify all cases which were coded as “drowning” or “boat accident” using manner of death codes that have been reclassified by a coder at the Victorian Institute of Forensic Medicine (VIFM) for the period 1988 onwards.

4. A list of deaths relating to all vessels was obtained from Marine Safety Victoria for the period 1990 – 2000. This list was then compared with the cases the current study had

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4 TOPIC is maintained by the Victorian Institute of Forensic Medicine (VIFM) for use by Coronerial Services Centre staff.
identified. Further cases were added by searching the SCO TOPIC database by vessel name.

5. A list of drowning deaths was obtained from a research request submitted to the SCO. This list of drowning deaths from 1991 – 1998 was then compared to the cases the current study had identified, and further cases were added by searching the SCO LCMS by coronial case number.

6. Cases from July 2000 to December 2001 were extracted from the National Coroners Information System (NCIS), a national database of all coronial deaths in Australia. Victorian cases were identified for the purposes of verification and other jurisdictions data were identified for the purposes of comparison.

**DATA COLLECTION**

A coronial inquest was held into all the incidents that occurred prior to 1996, and these files were obtained from the Public Records Office (PRO). The remaining files were retrieved from the SCO, including three inquest files.

Once all files were obtained, each case was read and the following information was documented for each case:

- Local Case Number;
- Inquest Number (if relevant);
- Surname (if case was closed);
- Occupation;
- Occupation at the Time of the Incident;
- Years of Experience;
- Qualifications;
- Vessel Information;
- Port;
- Destination;
- Investigation Issues;
- Date and Time of Incident;
- Given Name (if case was closed);
- Related Fatality;
- Age;
- Gender;
- Location when Incident Occurred;
- Weather and Sea Conditions;
- Presence of Procedures;
- Activity;
- Presence of Safety Equipment;
- Why no PFD was Worn;
- Contributing Factors; and
- Notes.

Some data items could not be completed for all cases, either because the information was not contained in the coronial file (denoted as not specified) or the data item was not relevant to the particular case (denoted as not applicable). In all twenty-one cases the coronial investigation had been completed.

**LIMITATIONS OF THE DATA SOURCES**

There are a number of limitations for researchers wishing to identify cases of interest using the current coronial database setup. The main limitation of textual data (stored electronically) is in terms of availability where country cases have traditionally not been added to the electronic database at all due to manpower issues (particularly for pre-2000 data), and which in some cases, can often be truncated due to limitations in the storage capabilities of the databases used. Consistency of terms used is also a problem in identification of cases where different police and different coronial staff may use different terms for the same thing, meaning that search terms have to be chosen with care.
The accuracy of textual content is sometimes also of concern, particularly in terms of the police form 83 circumstances text which is filled out by a variety of police officers within a short period of time after the death has occurred (that is, they often have a paucity of information regarding the circumstances surrounding the event). Using searches based only on textual information, therefore, is not ideal.

Coding of coronial data is also often not designed with research in mind, with the main incident code used to identify cases of interest being not mutually exclusive. That is, cases can be coded only under one incident type code. This might, for example, mean that a commercial vessel death might be coded as either a “DRW” (drowning death), an “IND” (industrial death) or “REP” (reportable death, a case code often used when the circumstances surrounding a death are unclear or there is no relevant code already in existence). Incident codes are also attributed to cases when they are first reported to the SCO, and as more details are known about the case, the code used might become inappropriate. Using codes exclusively to select data would therefore be expected to under-report certain types of deaths.
RESULTS

INCIDENT AND FATALITY FREQUENCY

According to data from the Victorian State Coroner’s Office database\(^5\), sixteen (16) incidents resulting in twenty-one (21) deaths involved commercial vessels in Victorian waters between 1991 and 2001 (see Figure 1).

Twenty (20) of the deceased individuals were working for income at the time of the incident. The remaining death involved a bystander to work on a commercial fishing vessel\(^6\). A map of the Victorian Coastline illustrating the positions of the vessels at the time of incident can be found in Appendix 2.

Fourteen of the twenty-one deaths (66\%) occurred on fishing vessels. These vessels were: cray fishing vessels (6 deaths, 4 incidents); fishing trawlers (5 deaths, 4 incidents); fishing boats (2 deaths); and a squid fishing vessel (1 death). In thirteen of these fourteen deaths, the deceased was employed as a fisherman. A further 6 fatalities (3 incidents) occurred on trading vessels, while the remaining fatality occurred on a vessel normally used for surf rescues during a coastal familiarization tour.

![Incidents and Deaths Involving Commercial Vessels, Victoria, 1991-2001](image)

**Figure 1**
Frequency of Incidents and Deaths on Commercial Vessels, 1991-2001

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\(^5\) According to the Victorian Coroner’s Act (1985), there is a potential for events outside Victoria to be considered ‘reportable’ to the Victorian Coroner (e.g. if the deceased is a Victorian resident the Coroner can investigate). All cases listed, however, did occur in Victorian waters.

\(^6\) ‘Bystander to work’ is any person who has died as a result of work being performed without actively being involved in the work itself.
Data from the National Coroners Information System (NCIS)\(^7\) indicated that there were eight (8) deaths [six (6) incidents] of commercial fishermen between July 2000 and December 2001 in Australian States and Territories other than Victoria. Three (3) of these deaths occurred in New South Wales, three (3) occurred in Tasmania (one incident), and one (1) each occurred in the Northern Territory and South Australia. This number is only an estimate as the NCIS is updated nationally on a daily basis, and some information is not available until the case is completed.

**AGE AND GENDER**

Figure 2 illustrates that in 20 of the 21 deaths (95%), the deceased person was a male. This is not a surprising result given that the fishing industry is male dominated. The mean age of the deceased individuals was 44 years (9 years and 68 years being the minimum and maximum ages). The median age was 47 years and the mode was 51-60 years\(^8\).

![Figure 2: Age and Gender Distribution](image)

**ACTIVITY**

Below is a summary of the activities engaged in by the deceased person at the time of the incident by industry type.

- **Fishing Vessels**
  - bystander       1 death
  - fishing        2 deaths (1 incident)

\(^7\) This data was extracted in January 2003 by Kerryn Mulvenna.

\(^8\) Denominator data for age of workers in the commercial fishing industry was not available.
- retrieving cray pots 5 deaths (3 incidents)
- setting cray pots 1 death
- shooting / setting nets 3 deaths (3 incidents)
- traveling back to port 1 deaths
- trying to catch a shark 1 death

- Trading Vessels
  - unberthing operations 2 deaths (2 incidents)
  - traveling back to port 3 deaths (1 incident)
  - bathing in ship's hospital 1 death

- Other Commercial Vessels
  - coastal familiarization tour 1 death

**USE AND PRESENCE OF SAFETY EQUIPMENT/PROCEDURES**

Table 1 (below) illustrates the presence of safety equipment and use of PFDs by incident, vessel type and cause of death.

**Table 1**
**Presence of Safety Equipment on board Vessels & Use of a PFD by the Deceased**

<table>
<thead>
<tr>
<th>Number of Incidents and Number of Deaths</th>
<th>Presence of Safety Equipment or Procedures</th>
<th>Use of PFDs</th>
<th>Vessel Type</th>
<th>Cause of Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (1)</td>
<td>Not specified</td>
<td>Not specified</td>
<td>Fishing</td>
<td>Drowning</td>
</tr>
<tr>
<td>2 (3)</td>
<td>Yes</td>
<td>No</td>
<td>Trading</td>
<td>Drowning</td>
</tr>
<tr>
<td>3 (1)</td>
<td>Yes</td>
<td>Not Applicable</td>
<td>Trading</td>
<td>Injury</td>
</tr>
<tr>
<td>4 (2)</td>
<td>Yes</td>
<td>No</td>
<td>Fishing</td>
<td>Drowning</td>
</tr>
<tr>
<td>5 (1)</td>
<td>Not specified</td>
<td>Not Applicable (deceased did not enter water)</td>
<td>Fishing</td>
<td>Asphyxia</td>
</tr>
<tr>
<td>6 (1)</td>
<td>Not Applicable</td>
<td>Not Applicable</td>
<td>Trading</td>
<td>Other</td>
</tr>
<tr>
<td>7 (1)</td>
<td>Yes (inadequate)</td>
<td>Not Applicable (deceased did not enter water)</td>
<td>Trading</td>
<td>Injury</td>
</tr>
<tr>
<td>8 (1)</td>
<td>Yes</td>
<td>No</td>
<td>Fishing</td>
<td>Drowning</td>
</tr>
<tr>
<td>9 (1)</td>
<td>No (only present on &quot;mother&quot; vessel)</td>
<td>No</td>
<td>Fishing</td>
<td>Drowning</td>
</tr>
<tr>
<td>10 (1)</td>
<td>Yes</td>
<td>No</td>
<td>Fishing</td>
<td>Drowning</td>
</tr>
<tr>
<td>11 (2)</td>
<td>Yes</td>
<td>1 No and 1 Yes (yes found to be faulty)</td>
<td>Fishing</td>
<td>Drowning</td>
</tr>
<tr>
<td>12 (1)</td>
<td>Yes</td>
<td>Not Applicable (child was under 10 years and was required by law to wear a PFD)</td>
<td>Fishing</td>
<td>Injury</td>
</tr>
<tr>
<td>13 (1)</td>
<td>Yes</td>
<td>Not specified</td>
<td>Fishing</td>
<td>Drowning</td>
</tr>
<tr>
<td>14 (1)</td>
<td>Yes</td>
<td>No</td>
<td>Fishing</td>
<td>Drowning</td>
</tr>
<tr>
<td>15 (2)</td>
<td>Yes</td>
<td>No</td>
<td>Fishing</td>
<td>Drowning</td>
</tr>
<tr>
<td>16 (1)</td>
<td>Yes</td>
<td>No</td>
<td>Other</td>
<td>Drowning</td>
</tr>
</tbody>
</table>
Table 1 illustrates that in thirteen (13) of the sixteen (16) deaths caused by drowning, the deceased was not wearing a PFD. In all but one (1) of these deaths, a PFD was present on board the vessel along with other required safety equipment. In the remaining three (3) deaths, one (1) deceased was wearing a PFD, which was later found to be faulty, and in two (2) deaths it was not specified whether the deceased was wearing a PFD. In the five (5) remaining deaths, wearing a PFD was not applicable to the incident.

In four (4) of the thirteen (13) deaths where a PFD was/should have been available, it was not specified in the coronial file why the deceased did not wear one. Of the nine (9) remaining fatalities, three (3) deaths occurred in the same incident. In this case two of the three men removed their PFDs once they were inside the cabin of the vessel because they perceived them to be too bulky to wear in such a confined space. In statements made in relation to this case it was recommended that an investigation into more suitable PFDs be undertaken. That is, those that are able to be worn without undue restriction of movement, such as devices used by the Royal Australian Navy.

In the remaining six (6) cases where the deceased was not wearing a PFD, five (5) were working as fishermen at the time of the incident. The reasons provided for not wearing PFDs centered on the perceived inability of fishermen to conduct their work while wearing them. It was stated that it was not common practice in the fishing industry to wear PFDs as the styles of jacket made it dangerous to do so. It was also felt that PFDs restricted movement and workers could not complete their duties with them on.

In the remaining case, where a man drowned in waters off Port Campbell when the vessel he was a passenger on capsized during a sightseeing tour, a PFD was not made available to the deceased. At the time of the incident it was felt that a 'buddy system' would be more appropriate in the event of a mishap. This was because standard buoyancy vests or inflated jackets are considered to be hazardous in surf conditions as they do not permit the wearer to dive under waves.

The results indicate that while operators of commercial vessels, in particular fishing vessels, comply with the requirement to carry PFDs on board, they do not comply with recommendations to use/wear them. Witness statements from the incidents outlining reasons why PFDs are not commonly worn, are summarised below.

ATTITUDES/COMMENTS RELATING TO THE USE OF PFDS

Incident 1  
**Circumstances**: Deceased was a deckhand on a fishing trawler, which capsized on its return to Portland. The prime cause of the capsize was that the vessel was being steered on the course with the wind and particularly the sea on the port quarter.

**Use of PFD**: Not specified in file why the deceased did not wear a PFD.


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9 In these five cases the death did not result from a drowning incident and therefore the use of a PFD was not relevant to the investigation.

Incident 2

Circumstances: A pilot launch with two crew left Queenscliff wharf to pick up a sea pilot. On their return trip through Port Phillip Heads the pilot launch was overwhelmed by some unusual condition of the sea beyond the ability of the craft to survive.

Use of PFD: Two of the three deceased individuals were not wearing PFDs at the time of the incident, and these are commonly not worn in the cabin of a pilot launch for reasons of comfort. Deceased 1 [Able Seaman] had a ‘working jacket’ as a personal flotation device for working on deck assisting the pilot and Deceased 2 [Captain] was wearing a coat with automatic inflation capacity when he disembarked from the ship to the Pilot Launch. Neither Deceased 1 nor Deceased 2 were wearing PFDs when recovered and as is often the practice. It is assumed that Deceased 2 either removed his coat or loosened it and Deceased 1 removed his device on both men reaching the comparative safety of the wheelhouse. Deceased 3 [Coxswain] was never recovered so it is unknown whether he was wearing a PFD at the time of the incident.

Comments Made in the Coronerial Investigation:
Coastal lifejackets are by their design bulky and accordingly tend not to be worn unless an emergency exists. It is therefore recommended that an investigation be undertaken to see if more suitable devices able to be worn without undue restriction of movements can be designed. Devices used by the Royal Australian Navy and worn on a belt around the waist may provide a model. [Marine Safety Inspector]

Coroner’s Recommendations:
Marine Safety (then the Marine Board of Victoria) made a number of detailed recommendations, and two of these have already been implemented. These are:

i. The fitting of strengthened glass on all wheelhouse windows, in launches used through the Rip; and

ii. Attention to be given to stiffening and strengthening the landings and wheelhouse in the way of the windows (where appropriate) to avoid any distortion of the windows which could lead to shattering.

These recommendations were made because it was considered that the casualty would not have occurred had the wheelhouse windows remained intact.

Other recommendations concerned structural matters:
- demisting devices to enable the wheelhouse doors to be closed;
- instructions for the doors to be kept closed;
- the fitting of Emergency Position Indicating Radio Beacon (EPIRB) device or radar transponder device to allow position monitoring;
- the wearing of individual flare packs;
- investigation into less restrictive life jackets; and
- safety restraints.

A further recommendation is that if such a Committee is not already in place, it should be constituted and given the task of considering Marine Safety’s suggestions and recommendations, with a view to implementing those considered appropriate.

Marine Safety suggested that a joint pilot/crew safety committee should follow up the suggestions and recommendations. It is hoped that such steps will improve the safety of those whose work is a valuable community service, and that the tragedy which occurred in this case will be less likely to occur again.


Incident 3

Circumstances: Deceased was standing at the rear of a container ship which was leaving the dock. Deceased was standing on the aft mooring station controlling the hold rope winches. As the rope was being winched, it flung up to where the deceased was standing, the loop on the end of the rope landed around the neck of the deceased, lifting him off his feet and overboard.

Use of PFD: Not Applicable (incident on land).


Incident 4

Circumstances: Two cray fishermen drowned when their vessel was struck by a series of large swells 200 metres off Swell Point, Marengo. The seas conditions at the time made it difficult to work pots (cray pots) close in to the shore.

Use of PFD: "Although I have life jackets for the survey, I have never worn one because the current style are cumbersome and also I normally work in close to shore and feel I would rather be able to duck under waves sooner then get thrown onto the rocks. Recently I have obtained a Stormy Seas Inflatable Vest, it is both comfortable and practical to wear, and I put it on every day now before leaving the harbour, because it gives no buoyancy deflated, it would give you a good chance in breaking swells" (Witness Statement 1).

"My opinion of life jackets for professional fishermen is that the current style are not suitable, in fact they would be dangerous to the wearer in the working environment of a fishing boat, you could not get into the cabin on many of the boats with a jacket on. The new style of inflating vests may be an option. As for life jackets helping the deceased's I think you would have found the bodies but they would still be dead" (Witness Statement 2).

"As for life jackets, well they probably would not have been wearing them because the current style are cumbersome, restrict movement and are too hot to wear, even if the law said you must wear them, the
professionals won't because the current style are not suitable, it would be a waste of a law. Perhaps, life jackets may have helped the deceased's but I think the end result would have been the same but they may have recovered the bodies faster. I have now looked at the newer style of life jackets, the Stormy Seas and they are a big improvement in comfort and could be worn more of the time but even those may not have helped this time" (Witness Statement 3).

**Coroner's Recommendations:**

**Recommendation 1**

Marine Safety Victoria (then the Marine Board of Victoria) and the State Boating Council consider seeking amendment of the appropriate Australian Standard to require manufacturer's 'compliance plate' to include detail of suitable waterway for use. (coronial finding of case number 1411/1995 and 1242/1995 pp 8 and 9)

**Recommendation 2**

That the State Boating Council [and other appropriate agencies] consider ways of encouraging the design, manufacture and marketing of an affordable, comfortable personal flotation device [in accordance with Australian Standard 1512/88] with the intention of increasing acceptance of the boating public of the need to wear such a garment at all times during boating operations. With the evidence in all of the cases investigated indicating that a personal flotation device would significantly reduce the death rate the importance of encouraging public acceptance for regular wearing cannot be underestimated. There is a clear need to design a product that fits into a number of styles but is primarily affordable, comfortable and complies with Australian Standard [1512/88]. A product that is fashionable and able to be worn as a garment before and after recreational boating would also be advisable. This would go a long way to improve the boating public's acceptance [and wearing rate]. Clearly there is a need to develop and market such a product in the lower end of the price structure. Apparently suitable products already exist at the more expensive end of the market.

Evidence indicates that many of the products at the cheaper end of the market are stored in lockers of the boats to comply with regulations. They are uncomfortable, unattractive, bulky and clumsy - not designed to encourage wearing. Accordingly they are not worn and they should be - at all time on the water. Most of the incidents investigated happen 'too quick' to retrieve that necessary safety item the 'life jacket' which is invariably stored in an inaccessible locker. Then it is too late.

When professional fishermen begin to wear personal flotation devices at all times when working on a boat this should deliver a clear message to both the recreational boating public and the industry. During the evidence, one professional fisherman has begun to trial the wearing of one of the modern semi jacket type personal flotation devices [type 1] and indicated that it was comfortable and easy to wear. Basically he
informed the court he was reluctant to wear the jacket at the start but now would not go to sea without it.

Recommendation 3
That the relevant authority examine the availability of boating safety training programs with a view to considering introduction of a standardised State wide system. Also the authorities should consider re-examining the issue of licensing of recreational boat owners/operators.

Recommendation 4
It may be necessary to undertake a professional study as to the recreational boating community's awareness of the relevant law on 'personal flotation devices' for children under 10 and, if necessary, re-examine enforcement strategies.

Recommendation 5
That the appropriate occupational safety bodies dealing with the professional fishing industry advise of the risk of fishing close to shore in the conditions as prevailed in the case at Apollo Bay. Also the authorities and professional organizations should encourage regular wearing of the modern personal flotation type garment. Further research into injury rates in the commercial fishing industry might also be appropriate. The development of a regular safety information newsletter for professional fishermen and the boating industry might be considered.


**Incident 5**
**Circumstances:** Seventeen-year-old deck hand became entangled in the line of an electric winch whilst on watch alone at night on a squid fishing vessel.

**Use of PFD:** Not Applicable (incident on deck of vessel).

(0526/1996, single fatality 24 nautical miles from Portland, 21 February 1996)

**Incident 6**
**Circumstances:** Caretaker's assistant working on board a motor tanker located deceased in the bath, in the vessel's hospital. A high level of morphine was detected in the deceased's blood consistent with heroin use.

**Use of PFD:** Not Applicable (incident inside ship).

(3126/1996, single fatality 15 nautical miles south of Warrnambool, 21 October 1996)

**Incident 7**
**Circumstances:** Deceased was standing under the path of a suspended container during unberthing operations. The crane operator could not see persons standing under the path of the container when it fell.
Use of PFD: Not Applicable (incident on land).

Coroner's Recommendations:

The following recommendations are made in relation to the operation of portainer cranes as there is a risk of injury or death in the following types of circumstances associated with container loading/unloading operations:

- there is a failure or malfunction of the crane or lifting gear;
- a load becomes dislodged from the crane or stack; or
- the crane driver makes an error of judgement

Accordingly the recommendations are as follows:

1) Pedestrians and/or employees should not be under or near operating portainer cranes (exclusions zones for pedestrian/employees should be marked off by portable barriers prior to unloading). This procedure should apply to both the dock area and the ship. It should not be left as a matter of judgement of the employee that it is safe to pass under the crane during loading operations as there was not a load overhead.

2) All wharf employees should be provided with information, instruction and training highlighting the dangers of standing or working under suspended loads and the dangers of crossing the line of travel of a suspended load, and detailing the safe working procedures for personnel near suspended loads (exclusion from the area). This information should be regularly reinforced in training.

(2913/1997, single fatality Swanston Dock 3 East, Footscray, 27 September 1997)

Incident 8

Circumstances: The deceased was a deck hand on a cray fishing vessel which was set up with 50 cray pots for shooting into the water. Deceased pushed the pot, as instructed by the skipper, and one of his legs became entangled around rope attached to the cray pot just released. The weight of the cray pot pulled the deceased overboard and into the water.

Use of PFD: Not Specified

(3459/97, fatality at Rotten Point on route to Cape Otway, 15 November 1997)

Incident 9

Circumstances: Deceased was setting mesh nets from his 5 metre boat. Ten minutes later he could not been seen in his vessel. He was found five days later by divers.

Use of PFD: Common practice of professional fisherman not to wear one (PFD).

(3298/1998, single fatality at Lake King, 29 October 1998)
Incident 10

**Circumstances:** Deceased was on a cray fishing vessel intending to go and check some pots when two "rouge" waves hit the vessel. The deceased was thrown overboard and did not respond to rescue attempts (having received a blow to the head). Formal weather warnings were not received.

**Use of PFD:** PFDs were not worn as they restrict movement.

**Coroner's Comments:**

While I accept that the vessel was properly equipped with life jackets as required by Marine Safety [then Marine Board] regulations I am surprised that no thought appears to have been given by professional fisherman or those charged with the regulation of safety issues within the industry to the use of either life harnesses or modern inflatable personal flotation devices. As a long time recreational yachtsman involved in both inshore and offshore racing it seems that they type of equipment currently available could be used or readily adapted to the requirements of professional fishermen and could provide a valuable element of added safety in extreme conditions such as were met by the vessel.

Modern harnesses and inflatable PFDs such as those being considered by the NSW Coroner in his investigation into the 6 deaths in the 1998 Sydney to Hobart yacht race can be worn without undue interference with the need to move freely; they are relatively robust and can be readily obtained at reasonable cost. Whilst clearly the decision of when or indeed if to wear such a device will be up to the individual I believe that if the deceased had had access to either he may not have been washed overboard, or if he had, he might have been more readily recovered.


Incident 11

**Circumstances:** Two deceased individuals were attending to cray pots set along the coast near Peterborough. The vessel was later found capsized with no sign of the two fishermen.

**Use of PFD:** Deceased 1 was wearing an inflatable jacket when found (Stormy Seas brand). The investigating water police found that the canister had been deployed however it had sustained a puncture. It also had further damage to it, which police concluded had been caused by a shark or similar. The internal bladder was not damaged. Police conducted other tests on the jacket and canister, which lead them to believe that the jacket canister must have been in an unserviceable condition prior to the events and any attempt to activate the jacket would have failed.

Not known if deceased 2 was wearing a lifejacket.

Incident 12

**Circumstances:** Deceased was on board his father’s 62 ft fishing trawler when he became entangled in the winch rope and was dragged into the winch.

**Use of PFD:** A PFD would not have prevented this fatality however as the child was under 10 years of age at the time of the incident, technically he was required to be wearing one while on board the vessel. (Coronial Finding).

**Coroner’s Comments:**

The Coroner concurs with the identified need that there be a Memorandum of Understanding between WorkSafe Victoria and the Marine Board (now Marine Safety Victoria) to facilitate appropriate intervention activity in circumstances such as those that arose in the instance.

The issue of the presence of children on operational commercial fishing vessels ought be addressed by the relevant agencies (i.e. whether children ought be permitted upon such vessels at all and if so:

i. in what circumstances; and

ii. subject to what conditions including safety measures as might be deemed appropriate.

(1051/00, single fatality of child on board a fishing trawler (son of the owner and skipper of the vessel), 47 nautical miles east-south-east of Lakes Entrance (Tasman Sea), 7 April 2000).

Incident 13

**Circumstances:** Deceased left to go fishing alone about 11pm. Another fisherman found the boat with the motor running and the nets half out but with no person on board. The deceased was located two kilometers from the boat.

**Use of PFD:** Not specified in file why the deceased did not wear a PFD. The Investigating Water Police officer noted for the coroner that this was the second incident of this type (i.e. professional fisherman working alone in smooth waters [i.e. 3298/1998]) and recommended that some consideration be given to addressing the current situation where fishermen working alone (or otherwise) are not required to wear PFDs.

(3353/2000, single fatality in Corner Inlet 10 October 2000).

Incident 14

**Circumstances:** Deceased was working as a deck hand on a fishing trawler on his first trip as a deck hand when he went overboard. The sea was flat and calm and the section of the net he was working at come onto the tray where he stood at such an angle as to form a barrier which would require him to climb 900mm to get over the net, or to crawl under it, to reach the sea. Safety railings around the trays other three sides would have kept him from falling in those directions. It is left open as to how the deceased entered the water.
Use of PFD: PFDs not worn as such apparel generally considered a dangerous encumbrance on fishing boats. Statement made that fishermen do not wear lifejackets as it is impossible to complete their duties wearing one.


Incident 15

Circumstances: Two fishermen working on a trawler vessel misjudged the arrival of severe weather conditions and atrocious seas. The vessel broke up at sea.

Use of PFD: Not specified in file why the two deceased did not wear a PFD.


Incident 16

Circumstances: A man drowned when the vessel he was a passenger on capsized during a sight seeing tour. A PFD was not made available to the deceased.

Use of PFD: Was not required to and was not present during a briefing where safety measures and procedures were outlined. The Surf Life Saving Club only had three PFDs, which were required to be worn by the crew at the time. While in an uninflated state it permits the wearer to dive under waves. It can be inflated by the wearer when it is judged safe to do so or as the need arises. It is necessary for some instruction to be given in relation to the safe use of an inflatable life jacket. Standard buoyancy vests or inflated jackets can prove hazardous in surf conditions. There was some concern expressed that without adequate instruction the wearer may be tempted to inflate an inflatable life jacket in circumstances in which it would be unsafe to do so. It appears that the only other type of life jacket available for use was a buoyancy type vest. As this type of life jacket was considered unsuitable for use in surf conditions it would appear that great reliance was placed on the efficacy of the ‘buddy system’ in the event of any mishap.

Coroner’s Comments:

There was a failure to provide the deceased with an inflatable life jacket coupled with a failure to provide him with appropriate instruction in relation to the use of such a life jacket represented a significant risk factor. It is possible to speculate that his chances of survival would have been enhanced had he been wearing a life jacket and had he been provided with appropriate instruction in relation to its use.

(2338/2001, single fatality in Southern Ocean near Port Campbell Beach, 29 August 2001).
CONTRIBUTING FACTORS TO THE DEATH / INCIDENT

Contributing factors to the fatal incidents were identified from a number of sources in the coronial file, including: police investigations; expert investigation reports by the Marine Safety Victoria and WorkSafe Victoria; and the coroner’s finding. Factors for each incident are listed by vessel type.

Cray Fishing Vessels
n=4 incidents (6 deaths)

Vessel Capsize (1411/1995; 1242/1995)
- vessel located too close to the shore;
- misjudged either the sets frequency or the size of the wave; and
- vessels (generally) go in close (to the shore) in all conditions, the industry (fishing) demand for crayfish has probably caused this to happen.

Vessel Capsize (0126/2000; 0269/2000)
- error of judgment in being too close to the cliffs;
- minor event such as an engine flame out or a grounding placed the vessel in a dangerous position given its proximity to the cliff face; and
- a large wave had overcome the vessel close to the cliff.

NB. MSV recommended that an investigation regarding the operation of these types of vessels and types of fishing be conducted. A review of present stability requirements on vessels of this class and size.

Man Overboard (3459/1997)
- no detailed safety briefing was given to the deceased as skipper relied on the deceased's experience and proven competence;
- deck of the vessel was covered with cray fishing pots; and
- the combined weight of the pot and drag on the line, caused by the forward motion of the boat, was sufficiently strong to prevent the deceased from disengaging himself from the line before he was pulled off balance and over the side.

Man Overboard (0040/2000)
- Bass Strait and coastal waters of Victoria are notoriously difficult to forecast accurately;
- formal weather warnings were not received;
- two "rogue" waves hit the vessel;
- no PFD was worn; and
- Marine Safety Victoria reports indicated that neither the vessel or the work practices on the boat contributed to the death.
Fishing Trawler Vessels
n=4 incidents (5 deaths)

Vessel Capsize (2442/1991)
- change of course, which as events proved was unwise and bad seamanship;
- skipper failed to take account of worsening weather conditions; and
- prime cause of the capsize was that the vessel was being steered on the course with the wind and particularly the sea on the port quarter.

Vessel Capsize (2043/2001; 2055/2001)
- rough seas;
- severe weather (wind speed in excess of 30 knots blowing northeast); and
- skipper and crew misjudged the bad weather which was predicted and did not give it due consideration.

Caught in Rotating Warping Head (1051/2000)
- lack of supervision of the child whilst equipment was operating on the vessel; and
- lack of systems to separate persons from moving / rotating parts of a winch.

Man Overboard (1501/2001)
- clothing the deceased was wearing at the time of the incident would have made it impossible for him to remain on top of the water; and
- unknown - no witnesses.

Squid Fishing Vessels
n=1 incident

Caught in Tangle (0526/1996)
- positioning of the machine did not allow the deck hands sufficient room to operate around the machine, in a safe environment, when the machine was working;
- deckhand was working alone on the vessel at the time of the fatal accident;
- deckhand was unsupervised at the time he became trapped in the machine;
- deck hand had not received any formal instruction or training in the work he was undertaking;
- the alarm had not sounded on the machine; and
- deceased did not have the experience to get himself out of this tangle.

Cargo Vessels
n=2 incidents (2 deaths)

Incident 1 (0881/1992)
- the primary cause of the accident was the rapid retrieval of the stern rope, resulting in its rotation and pendulum action as it neared the fair lead; and
- deceased changed the setting to "Cargo Warp" understanding the dangers of doing so. Therefore the deceased contributed to his own death.

Incident 2 (2913/1997)
- accepted and common practice of persons crossing the intended line of travel, or path, of a load on a Portainer Crane, if it was thought to be clear to do so;
- concerns in relation to operation of the crane reported but were not documented or recorded;
• had the fault been properly documented, it could have been followed up with the maintenance crew of the day it was reported;
• crane operator continued to operate the crane even though it may have been faulty;
• no warning signs or indicators on the ship’s portside deck, to indicate to persons on the ship’s deck, that the number 3 Portainer Gantry Crane; and
• employer of deceased did not adequately supervise or enforce the requirement that employees not work or stand under suspended loads where a Portainer Crane was working overhead.

Fishing Boats
n=2 incidents (2 deaths)

Man Overboard (3298/1998)
• working alone and towards the rear of the vessel in and around moving nets;
• standing up on the rear seat while shooting his net out past his left side as he motored forward, which places the operator in danger of being caught by the net or causing him to lose his footing. This would result in the operator falling over the rear of the boat very quickly; and
• not wearing a flotation device and was wearing heavy protective type clothing;

NB. Common practices for professional fisherman: they often work alone whilst setting nets; they often work towards the rear of the vessel in and around the moving net; they do not wear flotation devices; and the work in heavy protective type clothing.

Man Overboard (3353/2000)
• appears one of the nets was caught on the floorboard of the boat and was knocked into the water while trying to fix it.

NB. Investigation police officer recommended that some consideration be given to addressing the current situation where fishermen working alone (or otherwise) are not required to wear PFDs.

Other Vessels
n=3 incidents (5 deaths)

• impossible to come to a precise conclusion as to the cause of the incident;
• the fact that no distress message was sent is conclusive that the event was sudden and catastrophic. It is probable that was overwhelmed by some unusual condition of the sea beyond the ability of the craft to survive.

Motor Tanker (3126/1996)
• unintentional drug overdose

Inflatable Motor Boat (2338/2001)
• extremely dangerous area;
• sea conditions were described as particularly hazardous;
• the area where the craft stalled was in an area that fell within the ‘wave zone’ - that is an area in which waves were forming and in which waves were breaking.
• all three experienced lifesavers found the conditions life threatening;
• deceased was not considered required to and was not present during a briefing where safety measures and procedures were outlined; and
• SLC only had three PFDs which were required to be worn by the crew at the time.
• life jacket was considered unsuitable for use in surf conditions it would appear that great reliance was placed on the efficacy of the ‘buddy system’ in the event of a any mishap.
INJURY DATA

According to figures from WorkSafe Victoria, the fishing industry reports, on average, 28.33 injury claims per year in Victoria (from reported claims, by report year, for the period 1996-2001).

Table 2
Reported Injury Claims, by Report Year and Sub-industry Sector, Victorian WorkCover Authority

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>A0431C Rock Lobster Fishing</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>A0433J Ocean and Coastal fishing</td>
<td>30</td>
<td>17</td>
<td>16</td>
<td>20</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>A0434K Oyster farming and inland fishing</td>
<td>2</td>
<td>2</td>
<td>7</td>
<td>5</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>TOTAL</td>
<td>35</td>
<td>22</td>
<td>26</td>
<td>29</td>
<td>32</td>
<td>26</td>
</tr>
</tbody>
</table>

Table 2\(^{11}\) (above) demonstrates that the sub-industry classified as Ocean and Coastal Fishing reported the highest numbers of injury claims during this time period. It is likely that this is due to higher numbers of workers within this sector that would be eligible for workers’ compensation in the event of an injury.

In terms of injuries in the Western Australian fishing industry, statistics from WorkCover Western Australia’s Safetyline, shows that the commercial fishing industry accounts for approx 135 lost time injury and diseases (LTIDs) per year (that is, all workers’ compensation claims involving one or more working days lost from work), calculated from 1995/96-1999/00 figures available from the Internet). The average duration of these claims over this time is 46.3 days per claim which is higher than a number of other Agriculture sub-industries.

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\(^{11}\) Denominator data for age of workers in the commercial fishing industry was not available.
DISCUSSION

It has been acknowledged that the limitations of case identification methods may have resulted in an unknown amount of under-reporting in this study, although this is likely to be minimal. All figures should be interpreted with an appropriate degree of caution.

The results of the current investigation revealed that commercial vessel fatalities in Victoria have occurred in a number of industries. Two-thirds of these fatalities involved the commercial fishing industry. Drowning was the most common cause of death with all but four deaths on the open water a result of immersion in the sea following a capsize or man overboard.

The results also illustrated that nearly all of the deaths were of males and almost half were aged between 40 and 60 years. Where information was available, safety equipment or procedures were present on the vessels, but were most often not utilized, in particular the wearing of personal flotation devices (PFDs). Witness statements from other commercial fishermen and survivors of incidents revealed that there was strong opposition to the use of PFDs in the industry. Fishermen consider them uncomfortable to wear, dangerous in the working environment and in the surf and most importantly make it impossible to complete their duties.

At present, it appears that the PFDs required by Marine Safety Victoria to be carried on board commercial vessels are of a design that can only be worn while inflated. Given the dangers outlined by the fishermen associated with wearing inflated devices, in and out of the water, the current practices of these fishermen may be arguably valid. Safety regulators and organisations should investigate and trial devices that allow fishermen to wear PFDs without them endangering their lives and hindering their work activities.

One example of these types of devices are the Stormy Seas brand PFDs (See Appendix 1). These jackets feature a water activated or manual removable inflatable system, which would allow fishermen to wear the garment as a normal jacket or vest. A surviving cray fishermen from one incident was given a Stormy Seas brand jacket to wear following the drowning death of his two colleagues. He commented at the coronial inquest into these deaths that the Stormy Seas jacket was a big improvement in comfort and could be worn more often than other brands he had tried. He also stated that he would never go out to sea without it on (case numbers 1411/95 and 1242/95).

Marine Safety Victoria and WorkSafe Victoria would be the two organizations most appropriate to conduct any investigation into trialling the use of other PFDs and any subsequent change to the requirements regarding the wearing of PFDs. This investigation may be incorporated into initiatives already being undertaken, outlined below. See the Recommendations section for more detail.

CURRENT WORK BEING UNDERTAKEN BY WORKSAFE VICTORIA INTO COMMERCIAL FISHING INDUSTRY

1. Fishing Industry Safety Advisory Group

WorkSafe has recently become involved with the Fishing Industry Safety Advisory Group (FISAG) – the inaugural meeting was held 18 October 2001 at Marine Safety Victoria. WorkSafe representative: Ms Anni Gardiner. Other attendees: John Lord, MSV (Chair), Mark Hughes and Steve Barron (MSV), Stephen McCormack (Fisheries Vic), Ross
Hodge and John Sealey (Seafood Industry Victoria), Rod McDonald, Bill Cull (Cull Fisheries), and Peter Clark (LEFCOL: Lakes Entrance Fisheries Co-operative Ltd). It is expected that these meetings will be held bi-annually.

The main issue discussed at this meeting was the introduction of a joint WorkSafe/MSV pre-sea mandatory deck hand training course. Such a course has been drafted, with a mandatory OHS component, and is currently being considered by the FISAG.

The motivations and background of this document include:

- Memorandum of Understanding brokered between WorkSafe and Marine Safety Victoria (MSV) first mooted approx 15 months prior to meeting (signed in 2001).
- Series of forums and regional meetings involving fishing industry personnel regarding the potential one-day course development. Parties involved in these forums and regional meetings included: WorkSafe, Gippsland Ports, SEAMEC, Water Police, MSV and local fishing associations and fishermen. Meetings/forums were held in Geelong, Lakes Entrance and Portland over a 12 month period.
- A fatality of a nine year old boy on a working commercial fishing vessel on April 7th, 2000, where the coroner’s report highlighted the need for a Memorandum of Understanding between the MSV and WorkSafe to “facilitate appropriate intervention activity in circumstances such as those that arose in this instance”. The coroner’s report also notes: “The issue of children on operational commercial fishing vessels ought to be addressed by the relevant agencies, i.e. whether children ought to be permitted upon such vessels at all and if so:
  i. in what circumstances; and
  ii. subject to what conditions including safety measures as might be deemed appropriate”.

Other matters discussed at the FISAG meeting included recent fishing vessel incidents (reported by MSV); fishing vessel compliance with collision regulations (a notice to all mariners was put out by the MSV on 22 March 2000 regarding the correct use of lights and shapes); and Seafood Industry Training Package (SITP) implementation (that is, a national curriculum document towards the issuance of national certificates of competencies for Part ‘D” of the National Standards for Commercial Vessels (NSCV) that replaces the Uniform Shipping Law (USL) Code).

The list of incidents provided by the MSV included 20 incidents in the last 22 months. 7 involved mishaps with Bars (6 at Lakes Entrance), 4 involved rogue waves, 2 were man-overboard incidents, 3 capsizes, 2 fires and 2 sinkings, with a total fatality count of 6 persons over this time.
2. Issues raised at various forums/meetings included such issues as:

Shipboard Dangers:
- deck hands performing unfamiliar / untrained activities without supervision (i.e. opening hatches);
- engineering controls for dealing with noise lacking (often rely on PPE);
- potential for hair entanglement;
- radiation from aerials/antennas;
- identification of dangerous goods and their properties (i.e. compatibility and storage);
- slips, trips, falls in galleys and on slippery decks; and
- alcohol and water don’t mix.

Other Dangers:
- infectious diseases;
- first aid; and
- shore based work (i.e. spray painting, shore asbestos, working in confined spaces, solvents etc).

Industry issues:
- strong need for advertising in local media to create an awareness within industry as whole on OHS issues;
- possibility of creating video on OHS for training purposes;
- apprehension in industry re: cost of safety; and
- visitors to port and security arrangements.

3. Ports Authorities

WorkSafe also has a history of involvement with Melbourne Port Emergency Management Plan (MPEMP) Planning Committee (WorkSafe representatives: Don Gilmour, now retired, and Anni Gardiner, plus port inspectors as necessary). This committee plans annual exercises to test emergency plans at various locations (for example, there was a test performed in October 2000 at Coode Island with a scenario involving a spillage of benzene, known as “Exercise Overflow”).

WorkSafe is also represented on the Port of Melbourne Cargo Facilitation Committee which meets monthly to discuss issues facing the Port of Melbourne including legislative requirements such as health and safety and other controlling agencies (e.g. EPA, VicRoads).

Similarly, WorkSafe has involvement with Gippsland Ports (i.e. explosives transport from Port Welshpool, proposed Devil Cat operation from Port Welshpool and general OHS issues); the Regional Marine Pollution Committee and State Marine Pollution Committee (including committees such as the Whisky Emergency Response Committee for Port Phillip Bay and Western Port, Toll Westernport Region, Port Phillip Bay, and Gippsland Region – generally quarterly meetings); and Port Operator/manager meetings (convened by WorkSafe six monthly, involving AMSA and VCA).
WorkSafe is also looking at developing some form of guidance material for the commercial fishing industry. This has come out of an Australian Worker’s Union (AWU) forum, and is currently in the beginning stages of consultation and development.
RECOMMENDATIONS

The following recommendations are broken up, for ease of reading, into vessel type, although it may be appropriate for bodies dealing with each specific vessel type to make themselves aware of recommendations for all vessel types.

Some of the following recommendations are summarized versions of existing recommendations from the coronial findings. Where this is the case, each recommendation has been referenced by the coroner's case number. Other recommendations (not referenced) were developed by the researchers to cover issues that arose in the cases under study but for which no recommendation was explicitly given.

FISHING VESSELS

1. Weather Conditions

That more timely information is available for vessel operators from the Bureau of Meteorology and that professional bodies undertake such activities as are appropriate to encourage fishing vessels to use the service more often, and to encourage the sharing of sudden weather changes amongst vessels known to be out\(^\text{12}\).

That deck hands and other fishing-related training courses incorporate more training on how to judge the relative “dangerousness” of weather conditions while at sea and what to do to avoid being put into a dangerous situation.

2. Training

That the joint work of Marine Safety Victoria and WorkSafe Victoria in attempting to implement an OHS component into training towards deck hand qualifications be applauded, and that other relevant agencies (such as training bodies and industry representatives) work together to speed the implementation of this recommendation.

That the issue of children on operational commercial fishing vessels be addressed by the relevant authorities (i.e. whether children ought be permitted upon such vessels at all if so, in what circumstances, and subject to what conditions including safety measures as might be deemed appropriate) [coronial case number 1051/00]

3. Use of On Board Equipment

There is a need for fishermen to take into consideration the need to separate persons on board the vessel from moving machinery (such as winches and return ropes) as much as possible, either through re-engineering of equipment or by better systems of work.

Training and induction is also necessary for machinery used on a commercial fishing vessel in the same way that it is for other Victorian workplaces under the Victorian OHS Act (1995).

\(^{12}\) See for example the Coroner's Recommendations and Comments in the Linton Wildfire Inquest Findings (particularly pages 366-636) and the Coroner's Recommendations in the Sydney to Hobart Yacht Race.
4. Wearing of PFDs

That appropriate bodies (i.e. State Boating Council, Marine Safety Victoria etc) in collaboration with the commercial fishing industry consider ways of encouraging the design, manufacture and marketing of affordable, comfortable personal flotation devices (PFDs) (in accordance with Australian Standard 1512/88 or amendment to the standard) with the intention of increasing their use. It may also be necessary to trial various currently available PFDs (e.g. Stormy Seas brand) to determine their suitability and acceptability to the commercial fishing industry for a range of fishing vessel tasks [coronial case numbers 1411/95 and 1242/95]. It also may be necessary to encourage training in how to correctly wear and fit PFD's.

5. Cray-Fishing

That OHS and fishing agencies work together with the cray-fishing industry to develop safer methods of pot setting and collection close into shore [coronial case numbers 1411/95 and 1242/95].

That appropriate bodies look at funding research into the causes of vessel capsizing with a view to engineering more appropriate boats, especially for in-shore work.

That OHS and fishing agencies investigate the feasibility of distributing safety alerts or similar to the cray-fishing industry regarding the risks of capsizing and strategies that can be used in close to shore work to avoid capsizing, as well as measures that might assist in the timely rescue of capsized crew (for example, painting hulls bright, consistent colours, or the use of positioning devices etc) [coronial case numbers 1411/95 and 1242/95].

6. Training in Rescue/Resuscitation

That all deck-hand qualifications include a component of training in rescue methods and resuscitation skills, and that refresher courses be undertaken within the industry as required.

7. Working Alone

That fishermen be made aware of the dangers of working alone.

That the work of the Abalone Industry of South Australia Inc in considering a system whereby members of the Association notify a central point of their area of operations for the day and to notify upon completion of diving operations for the day, thereby establishing what aviators call a Search and Rescue (‘SAR’) watch be applauded. That the local appropriate fishing agencies consider also investigating the feasibility of such a system within Victorian waters.
PILOT/GUIDE VESSELS

1. Ability of Vessels to Withstand Rough Weather Conditions

That more timely information is available for pilot/guide vessel operators from the Bureau of Meteorology and they are encouraged to use the service more often.

That pilot/guide training courses incorporate more training of how to judge the relative “dangerousness” of weather conditions while attempting to cross the ‘bar’ and what to do to avoid being put into a dangerous situation.

That pilot/guide vessels fit Emergency Position Indicating Radio Beacon (EPIRB) devices or radio transponders to allow position monitoring [coronial case numbers 2678/91, 2679/91 and 2680/91].

2. Wearing of PFD

That appropriate bodies in collaboration with pilot/guide vessel operators consider ways of encouraging the design, manufacture and marketing of an affordable, comfortable personal flotation devices (PFDs) (in accordance with Australian Standard 1512/88) with the intention of increasing their use. It may also be necessary to trial various currently available PFDs (e.g. Stormy Seas brand) to determine their suitability and acceptability to the needs of pilots in charge of tug/guide vessels [coronial case numbers 2678/91, 2679/91 and 2680/91].

OTHER COMMERCIAL VESSELS

1. Training

That there be consistent qualifications for all persons involved in piloting a commercial vessel - including OHS qualifications and rescue and resuscitation skills.

2. Use of Machinery

That consideration be given to the design of and installation positions of machinery necessary for use in loading/unloading or other berthing functions to avert danger of crew members being trapped by moving parts, or from ropes whipping/recoiling during berthing and unberthing.

That pedestrians should not be under or near operating portainer cranes during loading/unloading of cargo, and that all wharf employees should be provided with information, instruction and training highlighting the dangers of working under suspended loads [coronial case number 2913/97].

3. Wearing of PFD

That appropriate bodies in collaboration with the operators of commercial vessels consider ways of encouraging the design, manufacture and marketing of an affordable, comfortable personal flotation devices (PFDs) (in accordance with Australian Standard 1512/88) with the intention of increasing it’s use. It may also be necessary to trial various currently available PFDs (e.g. Stormy Seas brand) to determine their suitability and acceptability to the range of tasks appropriate on other commercial vessels (including cargo vessels, surf life saving vessels and sight seeing vessels).
That other than in an emergency or rescue situations all passengers aboard a boat or related craft operated by a surf life saving club or agency be required to wear a life jacket at all times [coronial case number 2338/01].

That Surf Life Saving Victoria and its affiliate associations undertake a review of their risk management procedures and training [coronial case number 2338/01].

**GENERAL**

1. **Industry Awareness**

   That the work of the “FISAG” group convened by WorkSafe Victoria and Marine Safety Victoria be applauded and expanded. Models provided by the “TISG” (Transport Industry Safety Group) and “TFSG” (Tree-Felling Safety Group) suggest that a group consisting of safety, industry, training and investigatory bodies can be effective in raising the profile of safety within an industry from a “grass-roots” point of view. WorkSafe Victoria and Marine Safety Victoria should consider the formation of such a group for the commercial fishing industry with the FISAG group as a potential starting point.

   That appropriate agencies (such as Marine Safety Victoria and WorkSafe Victoria) look at the feasibility of engineering an EPIRB device that is designed to be permanently fitted to boat with self-activation when boat capsizes.

   The development of a regular safety information newsletter for professional fishermen be considered [coronial case numbers 1411/95 and 1242/95].

2. **Investigation**

   That appropriate protocols be established between the Victoria Police, Marine Safety Victoria and WorkSafe Victoria to promote a more cooperative and informative approach in relation to the investigation of any boating incident involving a fatality [coronial case number 2338/01].

3. **Vessel design**

   That industry personnel are made aware of the risk of falling overboard, particularly on small vessels, or vessels with lowered sides, and that the feasibility of re-designing such vessels is investigated.
CONTACT DETAILS FOR COMMERCIAL VESSEL BODIES/AGENCIES

1. Victorian Department of Natural Resources and Environment – fisheries division
   Executive Director, Richard McLoughlin
   8 Nicholson Street
   East Melbourne VIC 3002
   Ph: (03) 9637 8000
   http://www.nre.vic.gov.au

2. Australian Fisheries Research and Development Corporation (FRDC)
   Mr Peter Dundas-Smith, Executive Director
   Fisheries Research House, 25 Geils Crt, Deakin, ACT, 2600
   Ph: (02) 6285 0400

3. Department of Agriculture, Fisheries, Forestry – Australia (AFFA)
   Edmond Barton Building, Broughton St, Barton, Canberra, ACT, 2601
   Fisheries Department: (02) 6272 5777
   http://www.affa.gov.au

4. Marine Safety Victoria
   Nauru House, Level 11
   80 Collins St, Melbourne, VIC 3000
   Ph: (03) 9655 3399
   http://www.mariesafety.vic.gov.au

5. Australian Maritime Officer’s Union (AMOU)
   377 Sussex St, Sydney, NSW, 2000
   Ph: (02) 9264 2388

6. Maritime Union of Australia (MUA)
   2nd Floor, 365 Sussex St, Sydney, 2000
   Ph: (02) 9264 5024
   Victorian Branch
   46 Ireland St, West Melbourne, VIC, 3003
   Ph: (03) 9329 5477

7. Tuna Boat Owners Association of Australia Inc
   6 Phipps Place, Deakin, ACT 2600

8. Northern Fishing Companies Association Limited
   15 Pudney St, Farrer, ACT, 2607

9. Boating Industry Association of Australia
   162-164 Adderley St, West Melbourne, VIC 3003
   Ph: (03) 9328 4855

10. Recfish – peak national body for recreational and sport fishing in Australia
    PO Box 854, Dickson, ACT 2602
    Ph: (02) 6257 1997
    http://216.121.25.179/whoarewe.htm
11. National Marine Safety Committee  
   PO Box 1773, Rozelle, NSW 2039  
   Ph: (02) 9555 2879  
   Fax: (02) 9818 8047  
   Email: secretariat@nmsc.gov.au  
   http://www.nmsc.gov.au

   Editor: Stephen Morgan  
   Email: s.morgan@fishingmonthly.com.au  
   http://www.fishingmonthly.com.au

13. Victorian Water Police  
   Water Police Search and Rescue Squad  
   24 The Upper Esplanade  
   St Kilda Vic 3182  
   Tel (03) 9537 1827  
   Fax (03) 9537 1435

14. Australian Maritime Safety Authority (AMSA)  
   Melbourne Office  
   Level 2, Building 3, 6 Riverside Quay, South Melbourne, VIC 3205  
   Postal:  
   PO Box 272. World Trade Centre, Melbourne, VIC 3005  
   Ph: (03) 9674 3000  
   Fax: (03) 9674 3003  
   Email: melbourne@amsa.gov.au  
   http://www.amsa.gov.au
REFERENCES


APPENDIX 1 - STORMY SEAS JACKETS

Source: http://www.scanit.com/row/stormyseas/
http://www.landfallnavigation.com/stormyseas.html
http://www.stormyseas.com/home.html

If you are serious about your personal safety, and the safety of your family and crew, you've come to the right place. We only use the best material in the construction of Stormy Seas products. The inflatable chamber is made of a 200-denier nylon, which is coated with urethane to make it 100% air-holding. This is the same material that is used to make life vests for both civilian and military aviation-the life vest under your seat on a commercial airline is made from this same material. Stormy Seas products are designed for prolonged use in saltwater environments. Since our beginning, the only approval that we have ever pursued is that of the people who use Stormy Seas products. The result of this simple, honest approach is our many satisfied customers, including the U.S. Forest Service, U.S. Coast Guard, U.S. Navy, commercial fishermen, recreational boaters, water sports enthusiasts, and many more.

Stormy Seas products are made to perform well in the most difficult environments known to man. They will perform just as well in a quiet cove, a still lake, or the open ocean. The key word is wearability. Since the beginning, Stormy Seas has placed their patented inflation system in the types of clothing that people actually wear-comfortable jackets and vests. It's a simple concept that works extremely well, as evidenced by the many lives these garments have helped to save. Components such as valves and cylinders are made from non-corrosive metals or (when appropriate) high strength plastic and nylon.
APPENDIX 2 - MAP OF FATAL INCIDENTS