MAIB

MARINE ACCIDENT INVESTIGATION BRANCH

Report on the Analysis of Fishing Vessel Accident Data 1992 to 2000

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Department for Transport

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Extract from

The Merchant Shipping

(Accident Reporting and Investigation)

Regulations 1999

The fundamental purpose of investigating an accident under these Regulations is to determine its circumstances and the cause with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame

Photograph accreditations:

Arosa	-	Courtesy of Shannon Marine SAR
Harbour Lights	-	Sean Hernon

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

EPIRB	-	Electronic Position Indicating Radio Beacon
LSA	-	Life-saving Appliances
m	-	metre
MAFF	-	Ministry of Agriculture, Fisheries and Food
MCA	-	Maritime and Coastguard Agency
ME	-	Main engine
SW	-	Salt Water

Chief Inspector's Foreword

The Marine Accident Investigation Branch's sole aim is to improve safety at sea. It achieves this in three ways: by investigating a number of accidents thoroughly to determine the causes, by identifying and promulgating lessons to be learned and, thirdly, by analysing trends.

An MAIB investigation aims to identify the main and underlying causes so that recommendations can be made to improve safety. The reports are made public.

Rather more accidents result in the MAIB making a number of inquiries to identify the lessons to be learned and, through its Safety Digests, pass them on to others.

The third method involves making a close study of the information held in its database to identify trends, or to draw conclusions from, a number of accidents. These are then published in a Safety Study to draw attention to a particular shortcoming or concern. They are produced to inform the general public about certain aspects of safety at sea, and for the industry to note and, where appropriate, act on the information provided.

About one third of all accidents reported to the MAIB involve fishing vessels or fishermen. It is not a happy record. In 2000 alone, 39 fishing boats were lost and 33 fishermen were killed. In 2001 the number of losses had reduced to 33 with 10 fishermen losing their lives. Livelihoods have been destroyed or severely disrupted, and the families of victims have been devastated. It was against this unpromising background that the MAIB decided to search its database to try and identify any trends or other factors which could account for such a high casualty rate.

This search led to a formal study being undertaken with a view to publishing the findings. The study was, to an extent, hampered by the way data had been compiled over the years. Inputs in the early days of the MAIB's existence were not as comprehensive as those entered more recently. Notwithstanding this factor, the final outcome was not affected.

No major trends or startling factors emerged. The study confirmed the view that fishing is a dangerous occupation and that accidents occur regularly. Many of the findings will come as no surprise to an industry well accustomed to tragedy. Although the study is almost exclusively centered on information held in the MAIB's database, my own views also take account of the many representations made to me by a number of people in the fishing industry over the past five years. Many of the views put to me privately have been both revealing and, without exception, helpful in trying to improve safety.

My first observation is how few fishermen ever report accidents direct to the MAIB despite the clear requirement to do so. Every unreported accident is an opportunity lost to improve safety. Because the Branch receives a daily summary of all incidents from the coastguard we are, nonetheless, aware of most incidents around the UK coast. This is usually sufficient for us to follow up those we wish to look at more closely.

Many fishermen are unaware of the reporting requirement, while others believe that they will be penalised if they do or that their insurance claims will be affected. They are not.

I take this opportunity to restate that the MAIB's aim is to prevent accidents, and the best way of achieving this is to be provided with as much information as possible. Every report forwarded to us makes a contribution to this process. The MAIB does not apportion blame, is not a prosecuting authority and is totally independent of the Maritime and Coastguard Agency.

The Study

The study, based on information held in the MAIB's database, reveals a number of factors which concern me. The most significant is the frequency with which machinery breakdowns feature. Although these do not necessarily lead to accidents as such, they raise questions about maintenance standards. A more encouraging statistic is that the number of such incidents has been falling in the past three years.

This downward trend is not, however, reflected in the frequency of flooding incidents, with nearly a quarter resulting in the vessel being lost. A disturbingly high proportion of the more recent losses has involved Scottish-registered vessels over 12m in the white fish sector. Many of these occurred in relatively fine weather with, thankfully, the crews being rescued. I am also concerned by the number of accidents involving Anglo-Spanish vessels over 24m.

A number of common features have emerged while trying to identify the underlying reasons for these founderings. Among the most frequent observations was how often the automatic bilge alarm was not working. In many instances this was known to both skipper and crew prior to sailing, with little being done to rectify it.

Pipework failures are believed to be a prime source of flooding but conclusive evidence has not been easy to obtain. There are, however, compelling indications to show that the maintenance of valves and pipework in some vessels is not good.

While many fishermen have an intuitive feel about their vessel's stability and rarely refer to the stability book, a significant percentage of those involved in founderings showed little in-depth knowledge of the subject. The consequences of free surface effect, and the failure to contain flooding as quickly as possible, feature in many incidents.

One of the most frequently made observations is how often, and how rapidly, a vessel will sink because weathertight doors, hatches and other deck openings have been left open at sea despite the stability book stating they should be shut when not in use. A vessel may survive for years with such openings being left open, but when it really matters and it becomes essential to keep water out, the stability that is provided by having them properly closed is missing. The vessel then runs the risk of sinking so fast that those on board cannot escape.

Fatigue or sleep deprivation is endemic. It is widely accepted by the industry, and is either the main cause of many accidents or is judged to be a strong underlying factor. Many collisions, and a number of groundings, can be attributed to watchkeepers falling asleep when outward bound having sailed at around midnight, or when returning to harbour after several days intensive fishing. Fatigue also features as a significant cause of personal injuries.

Inadequate training is very evident in a number of emergency situations. Fires have broken out with crews demonstrating insufficient knowledge about how to fight them. The same applies to flooding instances. In too many cases it is highly probable that a vessel could have been saved had the crew known what to do when the flooding was discovered.

There is evidence to show that some crews believe the safety regulations involve nothing more than having the requisite lifesaving equipment on board to satisfy the surveyor. They are wrong. It's there to save life as a last resort. There have been several instances where liferafts could not deploy properly because they were incorrectly stowed, or lifejackets could not be used because they were still in their plastic bags and stowed somewhere inaccessible.

EPIRBs have made a major contribution to saving life by alerting the authorities to vessels sinking, but there have been occasions where the beacon has either failed to deploy or been registered to the wrong vessel.

A high percentage of personal injury accidents occur because of carelessness or negligence, and the failure of a colleague to notice impending danger.

Many fatalities involve fishermen going over the side. Although it cannot be proved beyond doubt, there are enough indications to show that had the victims been wearing lifejackets, some might well have survived.

Watchkeeping standards in a number of the vessels involved in accidents have not been good, and there is evidence that some of those entrusted with keeping a watch have an inadequate knowledge of the Rule of the Road.

There is evidence that some of the young people who go to sea as fishermen do so without any form of training.

Identifying the problems is one thing, making recommendations that will lead to a significant and sustained reduction in the number of accidents, is another.

I am in no doubt that fishing is, by its very nature, a hazardous occupation, and that many have been going through very difficult times recently. Among the worst affected has been the white fish sector where skippers have been facing high costs, shortages of fish, quota restrictions, disappointing prices and extreme difficulties obtaining or retaining experienced crews.

The MAIB concludes there is a correlation between the economic fortunes of the industry and safety. When the fishing is good and the prices are high, safety improves. When the opposite applies, and fishermen take greater risks or sail short-handed, the accident rate increases. Finding an acceptable solution is not easy. I have no doubt whatsoever that commercial and financial pressures have a direct bearing on safety in the fishing industry. Given such pressures, many are tempted to take greater risks, stay out in rougher weather and sail with fewer people on board.

Many in the industry have argued that safety will only improve if tax payers' money is made available in the form of grants and subsidies to offset 'the high cost of complying with safety regulations.' Having looked at this very carefully I am, with one exception, unconvinced by this argument and do not believe this is the panacea sought by many.

When we investigate an accident and identify the underlying causes, we rarely find that additional money would have solved whatever the shortcomings were. In nearly every instance they could have been prevented, or contained, by something very simple and at little or no expense. Very few accidents are caused by a single event; they are nearly always the result of several things coming together to create the situation for the accident to happen. The MAIB consistently finds that most accidents could have been prevented without recourse to spending large sums of money. Some have argued that the cost of maintenance, surveys and safety equipment is now prohibitive but many, rightly in my opinion, tell me that these are basic expenses that need to be met to ensure a vessel and her crew can pursue normal commercial activities. They argue that a well maintained vessel is more likely to be profitable. I agree.

Time and time again accidents occur because those on board ignore basic principles of seamanship. People fail to identify potential risks and do something about them. They do things because they have always been done that way, or undertake tasks for which they are ill prepared. Some fishermen are not good at predicting the likely consequences of a particular action. One factor stands out in many, but not all parts, of the industry: the lack of a safety culture.

In my opinion the number of accidents will only reduce if there is a sustained campaign to create a more effective and instinctive safety culture.

This is not an easy message to deliver and, over the years, other industrial sectors have faced similar difficulties. Those attempting to change attitudes have always faced the same predicament; how to bring about a cultural change in safety in an industry with a high accident rate. There are always two hurdles to be overcome: the tendency of those concerned to blame accidents on something or somebody else, and an instinctive denial that a safety culture is lacking.

So it is with fishing. In private discussions, many within the industry admit to this lack of a safety culture but feel it is almost impossible to change. It is only very rarely that I see such views being made public. There is an urgent need for the various fishing federations and fishermen's representatives to accept, and publicly declare, that change is necessary.

There is a need for the trade press to comment much more positively on safety matters. At the moment it is usually the 'outsiders' who promote safety and the average fisherman does not take kindly to anyone - other than another of his profession - telling him what to do. The industry itself must take the lead.

Fishermen themselves should be encouraged to think safety, with the more experienced becoming involved in training the younger generation. There is a need for a greater understanding of stability. Vessels must be kept weathertight at sea. Bilge alarms should be kept in working order. Crews should be capable of handling basic damage control and fire-fighting incidents. Pipework should be routinely surveyed and the dangers of fatigue and sleep deprivation should be clearly recognised.

I referred earlier to there being one exception to where public money does have a positive effect on safety: training. Many young men starting in the fishing industry are keen to learn and, without doubt, benefit from the mandatory basic training that now includes a general safety module. When they get to sea they often find that peer group pressures to adopt traditional, and in many instances less safe, methods are difficult to resist. I believe that much can be done to improve training and some of the initiatives taken in recent months are among the most encouraging developments for some time.

There is a need for fishermen to accept that there are many people and organisations trying to help create a better understanding of safety. They include the MCA, SFIA, the RNLI and the MAIB. Above all, some fishermen are trying hard to change attitudes. Recent research by the Banff and Buchan College of Further Education, into bilge monitoring and the effect of critical pipework on safety, exemplifies this new approach. The initiatives deserve every encouragement.

There is great scope to improve the safety record of the industry. The MAIB is making a small contribution to this process but ultimately the most effective, and long lasting, change will only occur when the industry itself embraces the need for a safety culture that has eluded it for so long.

This safety study not only seeks to provide new material for others to use as they see fit, but also to encourage all fishermen to take safety much more seriously and do their utmost to prevent accidents from happening.

JOHN LANG
Chief Inspector of Marine Accidents

SECTION 1 - INTRODUCTION

1.1 BACKGROUND

The MAIB was established in 1989 to investigate marine accidents with the sole purpose of contributing to safety at sea. In an average year some 1500 accidents are reported from merchant and fishing vessels, ranging from minor bumps and scrapes, to vessels and lives being lost.

On receipt of the initial report, a file is opened and data on the accident and the vessel(s) involved is entered in the MAIB database. About 3% of the more serious accidents are fully investigated, others are subjected to varying lesser degrees of enquiry. Before a file is closed, the database is completed with a short text summary identifying, where possible, the causal factors. Additionally, in the case of investigated accidents, the underlying human and technical factors are also recorded.

The MAIB periodically analyses the stored data to identify trends and the most common fundamental causes.

This safety study is the product of an in-depth analysis of fishing vessel accidents which occurred between 1992 and 2000. During this period the MAIB received 5,138 reports of accidents to fishing vessels and/or their crew. About 30% of all accidents reported each year are from UK-registered fishing vessels. 1992 was chosen as the start point as it was the first full year that text summaries were recorded.

1.2 AIM

The aim of this study was threefold:

- To identify and analyse trends in the frequency and type of fishing vessel accidents (Sect. 3);
- To identify the principal factors which lie behind the more common accidents (Sect 4);
- To analyse the results and to establish areas where improvements in procedures or training would have the most effect on reducing accident frequency and severity (Sect 5).

1.3 DISCLAIMER – COMPILATION BY A NON-STATISTICIAN

Every effort has been made to ensure that these figures and diagrams fairly represent the facts as derived from the data, but the study was not carried out by a trained statistician.

1.4 FORMAT

The study is presented in three parts: trends, causal factors and their analysis, and conclusions.

SECTION 2 - THE MAIB DATABASE

2.1 STRUCTURE

The Marine Incident Database System (MIDS) provides a fully integrated system which is used to record all reported incidents and details of the vessels, injured people and factors involved. It also records the actions taken by the MAIB for each incident. Additionally, it provides comprehensive and flexible management reporting facilities.

Details of an incident are recorded using a number of pre-defined factors to describe the sequence of events leading to an incident and the underlying causes. This is achieved using a selection of menus split into the broad categories of Machinery; Deck; Safety and Ship. The standard phrases are, in turn, split into many menus under the headings involving, What, How/why, and Accident Factors.

By selecting appropriate phrases from pull-down menus and presenting them in a logical sequence, MAIB inspectors are able to create a thumbnail sketch of any incident.

2.2 LIMITATIONS

2.2.1 Under-reporting of accidents

Only accidents reported, or otherwise coming to the MAIB's notice, are included in the statistical database. The actual number is likely to be much larger owing to the known under-reporting of accidents by fishing vessel owners and skippers.

The coastguard draws the MAIB's attention to the majority of fishing vessel accidents. As the proportion of accidents notified in this way has not varied significantly over the period of the survey (87% in 1992 and 92% in 2000), and the involvement or otherwise of the coastguard is not usually a matter of choice, it is unlikely this limitation has affected the analysis of accident trends.

It is also considered that those recorded in the database represent a fair cross-section of all fishing vessel accidents, and that the analysis of the factors is valid.

2.2.2 Incomplete information

Where an accident is not investigated, input to the database is entirely dependent on information received by the branch. This is usually limited and often incomplete in many aspects.

2.2.3 Inaccurate information

The accuracy of information received is not checked in many instances.

2.2.4 Inconsistent data entry

Data entry is often subjective and variable owing to:

- The difficulty in interpreting imprecise and/or incomplete information;
- Several people inputting data into the database;
- Difficulty in interpreting the correct data entry field.

2.3 THE BASIC DATA

The data used in this analysis differs in some minor respects from that previously published by the MAIB. The differences arise mainly where there is incomplete information. In a number of minor accidents the data is unclear as to whether and/or where a fishing vessel was registered, or whether the accident is, or is not, reportable/recordable (under the Accident Reporting and Investigation Regulations). In each case a subjective decision has been taken on whether the data should be included for the purpose of this study.

Population Figures

The following figures have been used in this study to relate accident figures to fleet size when considering accident trends:

Table 1: Fleet sizes

YEAR	VESSELS①	<12m	12m-24m	>24m	Fishermen②
1992	10,958	8,846	1,694	418	[15,640]
1993	11,030	8,845	1,713	472	[15,640]
1994	10,702	8,604	1,583	515	15,640
1995	9,816	7,840	1,461	515	16,073
1996	8,700	6,987	1,257	456	15,371
1997	7,921	6,475	1,081	365	14,832
1998	7,692	6,311	1,036	345	14,436
1999	7,532	6,215	1,006	311	12,970
2000	7,327	6,057	983	287	11,899

Notes:

① Number of registered fishing vessels sourced from MAFF until 1997 and MCA thereafter. The mean of successive end of year figures has been calculated to represent approximate mid-year figures. For example: Total registered fleet size at end of 1992 was 10,953 vessels and 10,963 at the end of 1991. The mean fleet size figure of 10,958 vessels has been used for 1992.

② Number of fishermen – figures sourced from MAFF Sea Fisheries Statistics 1999 and 2000. The figures used refer to regular fishermen only. Figures for 1992, 1993 (in square brackets) extrapolated from nearest quoted figure.

Basic Accident Data

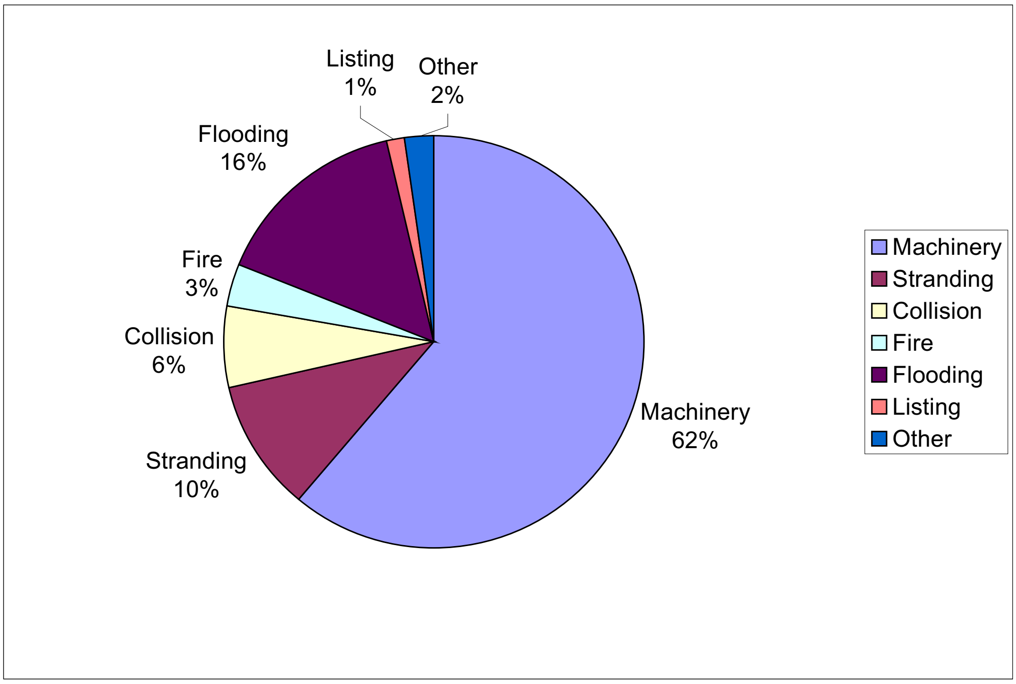
Table 2 shows the total numbers of accidents which occurred on UK-registered fishing vessels as reported during the years of the survey. Additionally, each accident is separately accounted for under its initial incident category as entered into the MAIB database. The number of fishermen injured or killed in each of the years is also shown.

Table 2: All reported accidents divided into initial accident categories

Year	Total number of accidents			Initial Accident category - Accidents to vessels							Injuries (Deaths)①
	All Accidents	Accidents to vessels	Accidents to persons	Machinery	Stranding	Collision	Fire	Flooding	Listing	Other	
1992	618	477	141	270	51	31	19	97	6	3	157(16)
1993	646	536	110	307	61	42	20	88	7	11	147(17)
1994	653	530	123	321	55	31	17	89	6	11	151(27)
1995	688	586	102	384	58	34	10	73	5	22	123(17)
1996	606	515	91	323	61	31	19	68	7	6	119(20)
1997	582	465	117	316	43	26	17	51	6	6	138(29)
1998	489	395	94	243	40	20	9	62	10	11	119(26)
1999	447	378	69	233	32	23	15	55	9	11	82(9)
2000	409	330	79	173	41	26	16	61	5	8	104(32)
Total	5138	4212	926	2570	442	264	142	644	61	89	1140(193)

① The total figure <u>includes</u> the number of deaths which appears in brackets

Figure 1: Accidents to vessels – initial accident categories 1992-2000



SECTION 3 - ACCIDENT TRENDS 1992 TO 2000

This section explores accident trends over the nine-year period of the survey. The data is considered separately year by year to establish whether changes are occurring in the number or type of accidents. All reported accidents are considered together in sub-section 3.1. Accidents to vessels (3.2) are considered separately from those that result in injury or death (3.3).

3.1 ALL REPORTED ACCIDENTS

Figure 2: All accidents (vessels and persons) 1992 to 2000 per 100 registered vessels.

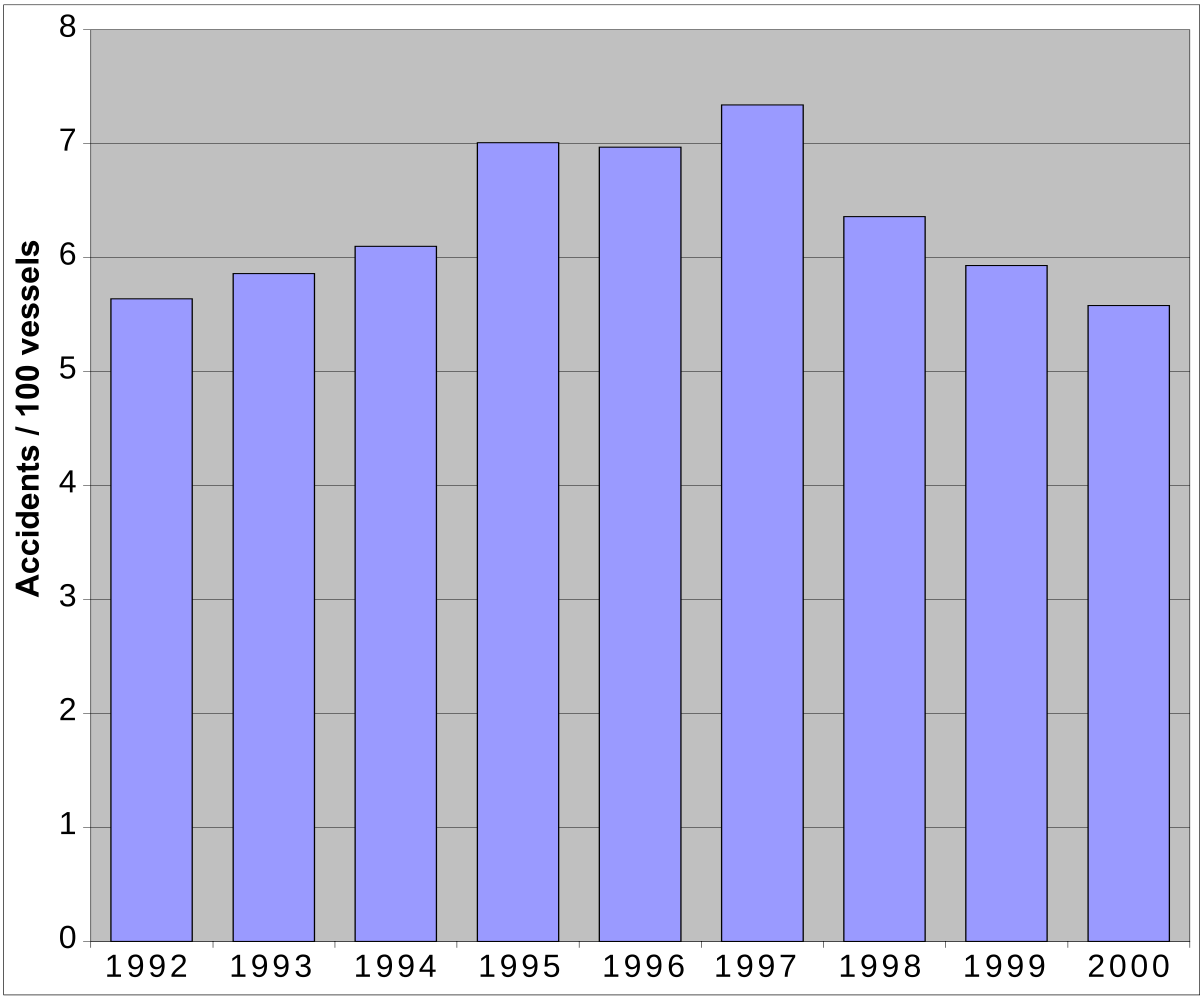
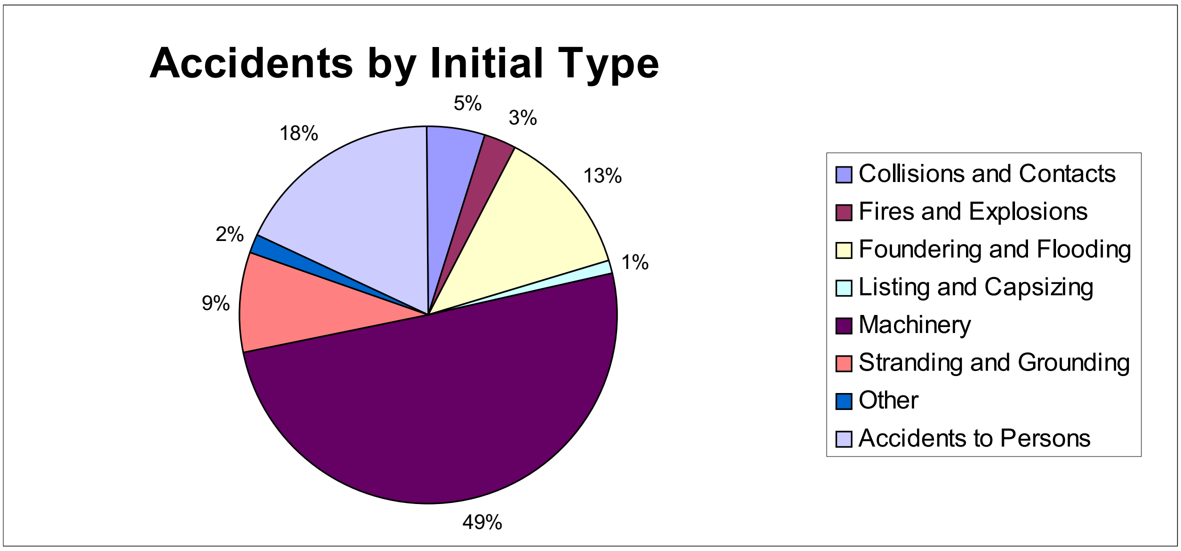


Figure 2 shows a gradual increase in the accident rate in the early part of the survey period, reaching a peak in 1997 at an annual rate of over 7 per 100 registered vessels. The trend shows a gradual reduction thereafter.

To try to explain the 1997 peak, the total figure of 5138 accidents was broken down into different initial accident categories.

Note: Each accident reported to the MAIB is categorised by its initial accident category. This is the first accident in a chain irrespective of the relative significance. For example an accident involving a grounding where the vessel *subsequently floods, capsizes and founders, has initial accident category "Stranding and Grounding". If, on the other hand, a steering gear failure led to the grounding, the accident would be categorised "Machinery Failure".*

Figure 3: Pie chart showing initial accident categories 1992-2000

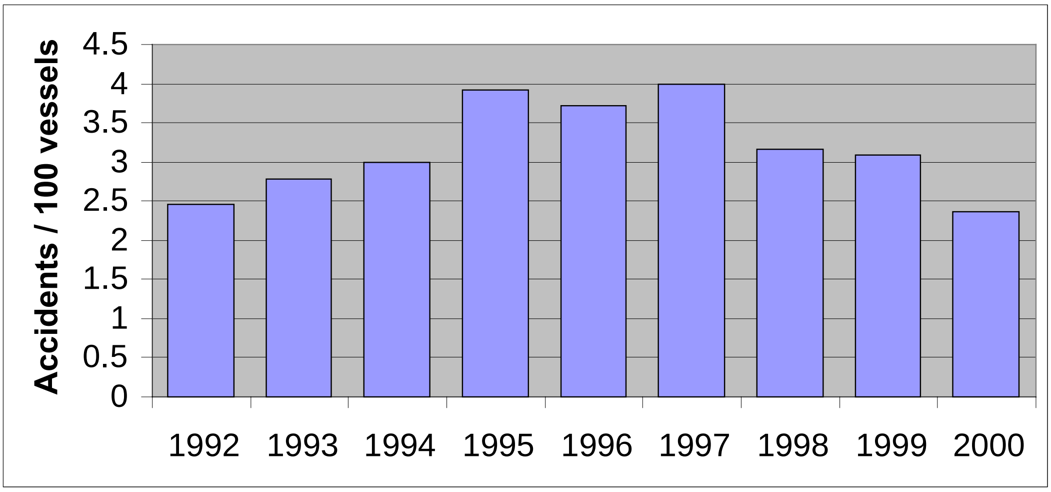


It can be seen from the diagram that the accident figures are dominated by those in the initial accident category *machinery*.

Machinery accidents are mainly those in which a machinery breakdown has either caused the vessel to be disabled for 12 hours, or necessitated a tow into port. Fouled propellers cause a large proportion of these accidents.

Machinery accident figures are considered valuable indicators of general maintenance, operational and safety standards but do not generally culminate in damage, pollution or injury except in very rare cases where an initial breakdown has caused a subsequent accident of a different type.

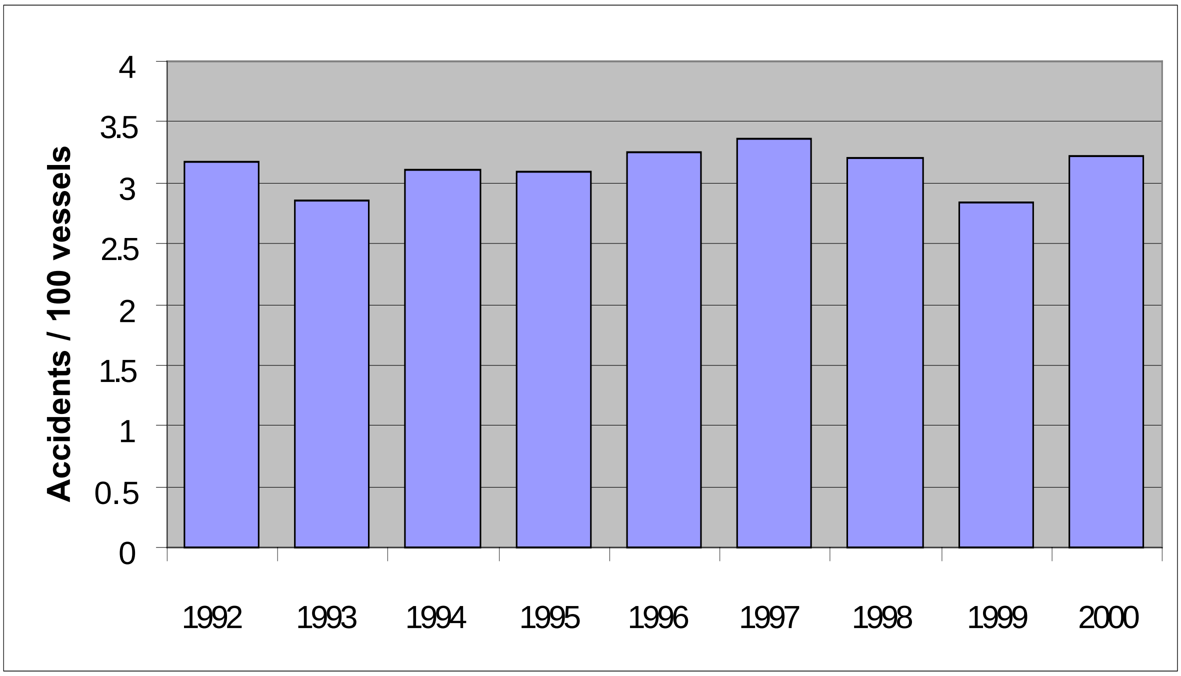
Figure 4: Machinery accidents/100 registered fishing vessels



This bar chart shows machinery accidents reached a peak in 1997 at a rate of 3.99 accidents per 100 registered vessels.

So that the more general accident figures are not masked by those accidents which were initially categorised as *Machinery*, these have been excluded from those used in Figure 1 with the result shown in Figure 5:

Figure 5: All accidents (vessels and persons) 1992 to 2000/100 registered fishing vessels (excluding category *machinery*).



It can be seen from Figure 5 that with machinery accidents excluded there is little discernible trend.

Machinery accidents were analysed to try and establish a possible reason for the high rate apparent between 1995 and 1997.

The machinery accidents data for 4 years was considered. 1996, 1997, 1998 and 1999 were chosen as representative years where the accident rate was high (1996 and 1997) and relatively low (1998 and 1999).

In 1996, 323 accidents were reported which were categorised “machinery” (4.0 accidents per 100 registered vessels)

In 1997, 316 accidents were reported which were categorised “machinery” (4.0 accidents per 100 registered vessels)

In 1998, 243 accidents were reported which were categorised “machinery” (3.2 accidents per 100 registered vessels)

In 1999, 233 accidents were reported which were categorised “machinery” (3.1 accidents per 100 registered vessels)

The relevant accident data was identified and the text summaries of all the machinery accident reports for these years were analysed and compared. To differentiate between accidents caused by operational errors, and those caused by poor maintenance or lack of investment, the "machinery" accidents were sub-categorised as "Fouled Propeller", Mechanical Failure" or "Other". The latter category consisted mainly of reports for which no explanation for the accident was given.

Table 3: Machinery accidents by sub-category

	1996	1997	1998	1999
Fouled Propeller **Rate**	78 0.90/100	80 1.01/100	75 0.98/100	67 0.89/100
Mechanical Failure **Rate**	182 2.09/100	179 2.26/100	117 1.52/100	130 1.73/100
Other **Rate**	63 0.72/100	57 0.72/100	51 0.66/100	36 0.48/100

Notes:

① "Mechanical Failure" category includes accidents caused by dirty fuel
② "Other" category includes accidents caused by running out of fuel

Conclusion:

The results indicate clearly that the higher incidence of reported accidents in 1996 and 1997 in the category "machinery" was almost entirely due to mechanical failure. This is indicative of poorer maintenance standards and lack of investment.

The reason for this has not been positively identified, although it is possible that there is a connection with the general reduction in fleet size which occurred during this period. Impending, or hoped for, de-commissioning might have led to neglect of maintenance and investment in a few cases. The registered >10m fleet was reduced between 1992 and 1996 by 19% (578 vessels) through de-commissioning.[1] A further 104 vessels were decommissioned in 1997. The fleet in general was also reducing in size for other reasons. The overall fleet size reduced by 812 vessels during 1994, 959 in 1995, 1273 in 1996 and 285 in 1997. The vast majority of the reductions occurred among <12m vessels.

The trend shown in Fig 2 has been affected by the increase in machinery accidents that occurred in 1995, 1996 and 1997. When machinery accidents are not included there is little discernible rise or fall in the overall trend.

So as not to mask accident trends generally, figures have been produced both with and without accidents in the initial accident category "machinery" in trend analyses below.

[1] **MAFF The Economic Evaluation of the Fishing Vessels (Decommissioning) Schemes, Nautilus Consultants, Table 1.3 p8**

3.2 ACCIDENTS TO FISHING VESSELS

3.2.1 All accidents to fishing vessels

This section looks at statistical trends in accidents to fishing vessels. The base data used is that in respect of all accident categories except Accident to Persons.

Figure 6: Accidents to fishing vessels 1992 to 2000/100 registered vessels

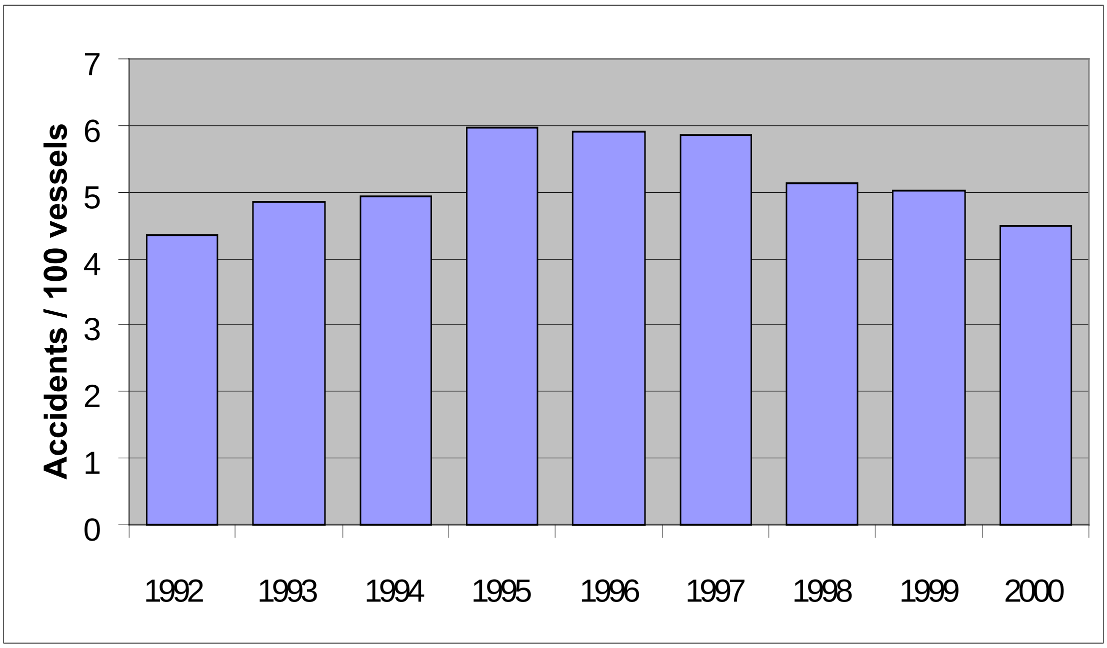


Figure 7: Pie chart showing main accident categories 1992-2000

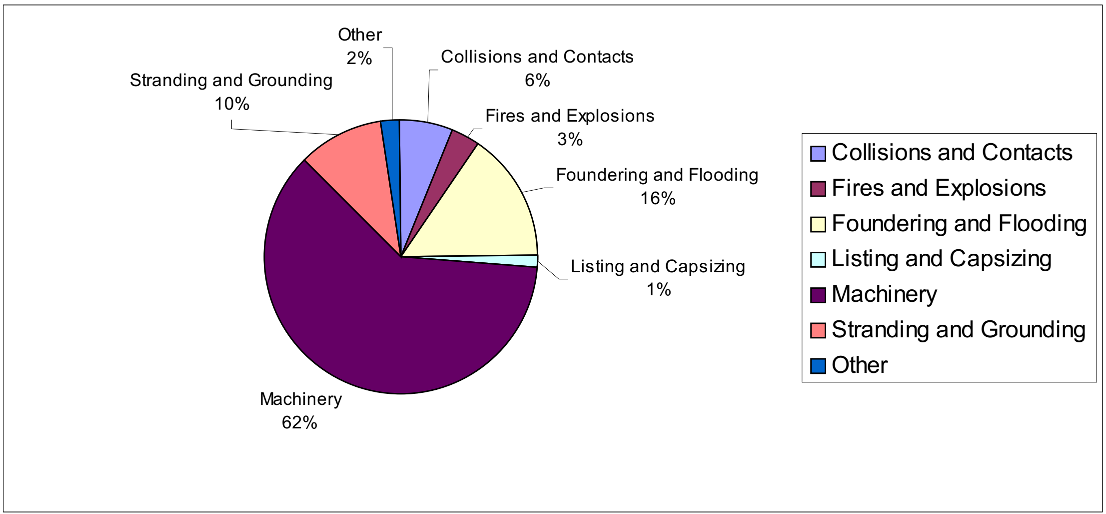
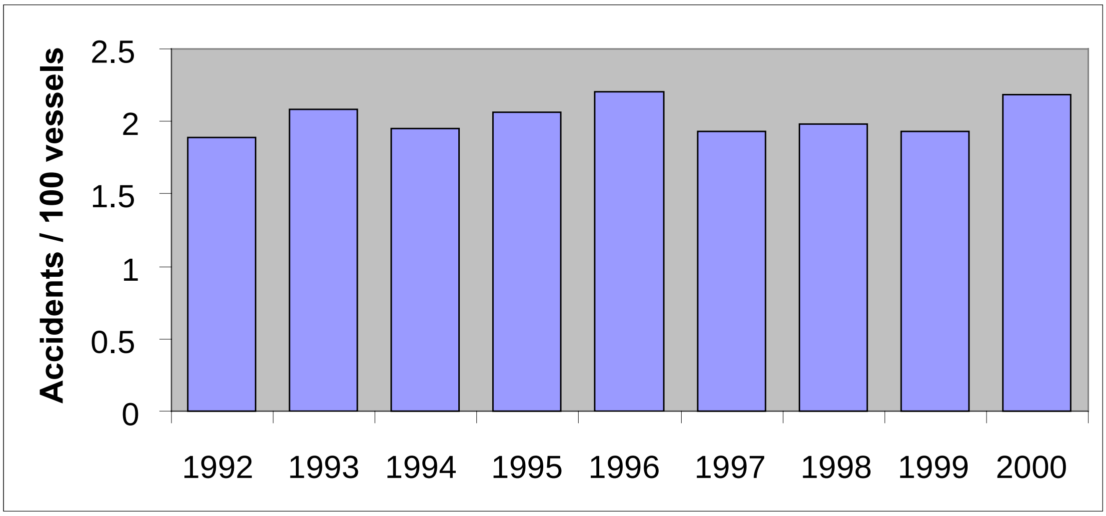


Figure 8: Accidents to fishing vessels (excluding machinery)/100 vessels



Conclusion:

Figure 6 indicates a rising trend between 1992 and 1995 to peak in the years 1995, 1996 and 1997 when, in each year, 6% of the fleet reported accidents.

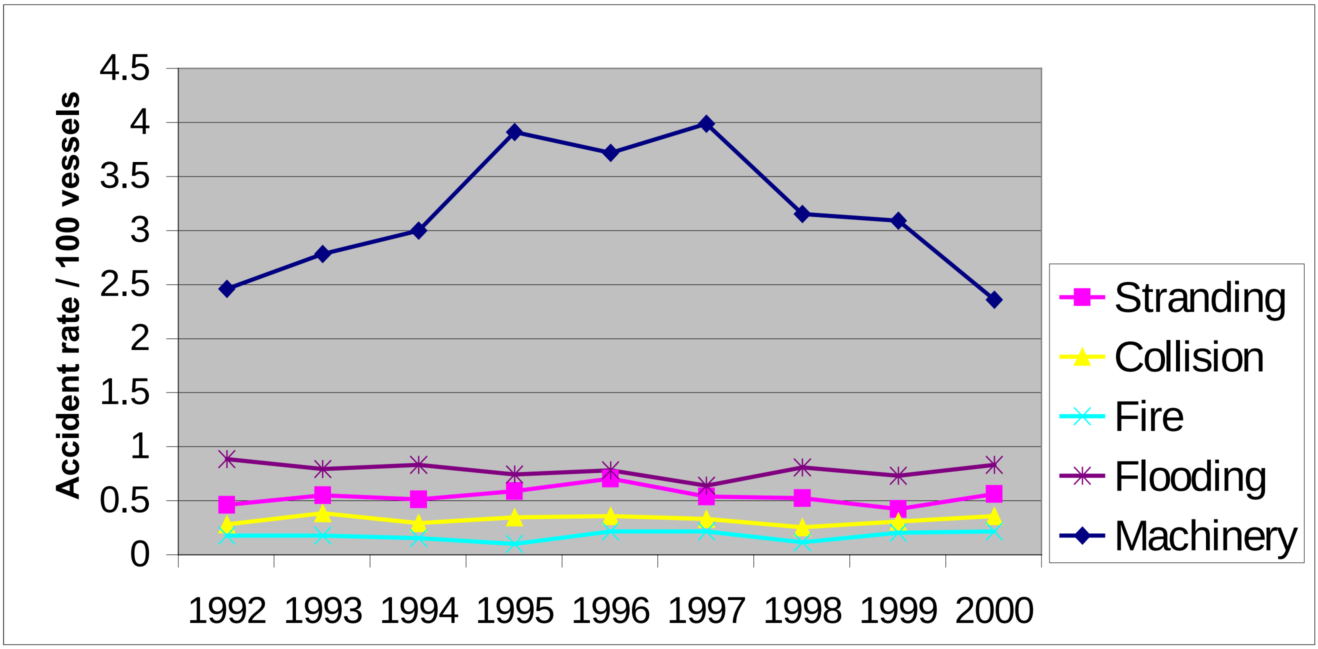
Between 1997 and 2000 the trend gradually reduced to a similar level to that of 1992.

Figure 7 shows that accidents in the category *machinery* comprised 62% of the total accidents reported.

Figure 8 shows that, once again, when machinery accidents are excluded, no discernible accident rate trend is apparent for the 9-year period of the survey.

3.2.2 Accidents to fishing vessels considered in initial incident categories

Figure 9: Accident rate - initial incident category/100 registered fishing vessels



Conclusion:

Figure 9 shows the accident rate trends for each of the main initial incident categories. It can be seen that while the machinery accident rate rose to a peak in the years 1995, 1996 and 1997 the accident rate for other categories showed only minor fluctuations. A probable explanation for the rise in machinery accidents has been discussed in the preceding section.

3.2.3 Accidents to fishing vessels considered in vessel length ranges

Figures 10.1, 10.2 and 10.3: Accident to fishing vessel trends for length ranges:

Figure 10.1

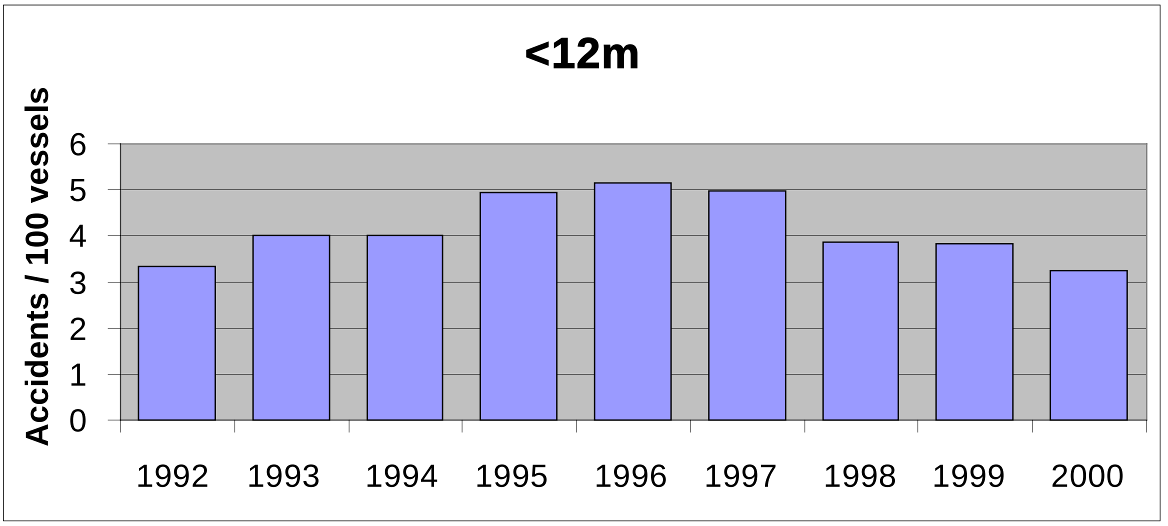


Figure 10.1 shows the accident rate for <12m vessels rising from 3.35% per annum in 1992, to 5.15% in 1997. It then gradually reduces to 3.24% in 2000.

Figure 10.2

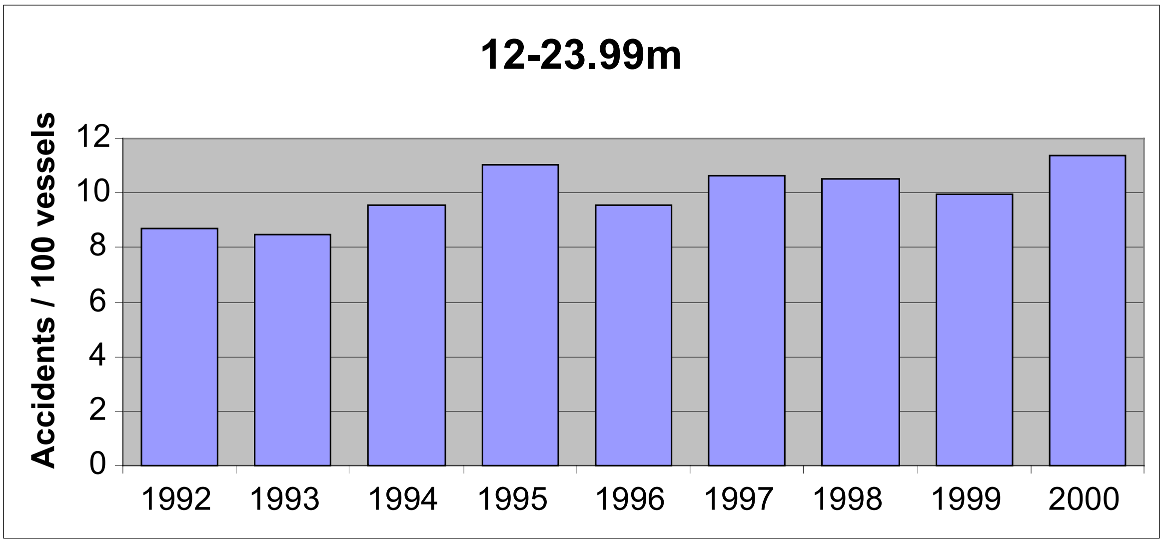
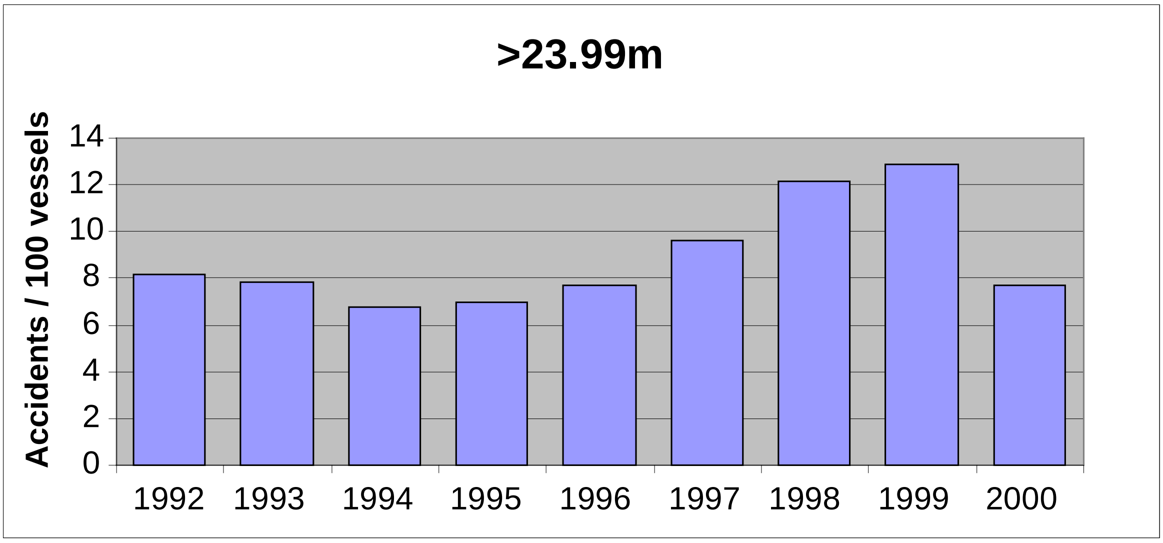


Figure 10.2 shows the rate for vessels between 12m and 24m in length increasing from 8.62% per annum in 1992 to 11.02% in 1995, and then remaining fairly steady until the end of the study period in 2000. It will be noted that the accident rate for this length range (and for >24m vessels) is generally considerably higher than for <12m vessels. This may be attributed to a number of factors, including that the <12m accident rate is influenced by a larger fleet size, and that many only operate part-time and in good weather. According to figures estimated by the MCA[2] <12m vessels spend on average 1200 hours at sea each year, as opposed to 4800 hours for the >12m vessels.

[2] **FISG 50/4.b revised and FISG 51/4.b**

Figure 10.3



Analysis - Accidents to fishing vessels considered in length ranges

Figure 10.3 shows the rate for >24m vessels indicating a slight fall from 8.13% in 1992 to 6.8% in 1994, and thereafter a sharp increase to 12.86% in 1999. The year 2000 rate of 7.67% represents a very sharp reduction from the high of 1999, but this may be an anomalous year made possible by the relatively small numbers involved. There were 40 reported accidents to >24m vessels in 1999 and 22 in 2000.

Figures 11.1 11.2 and 11.3: Accident to vessel trends for length ranges - as Figure 10 but ex-machinery and averaged over three year periods

Figure 11.1

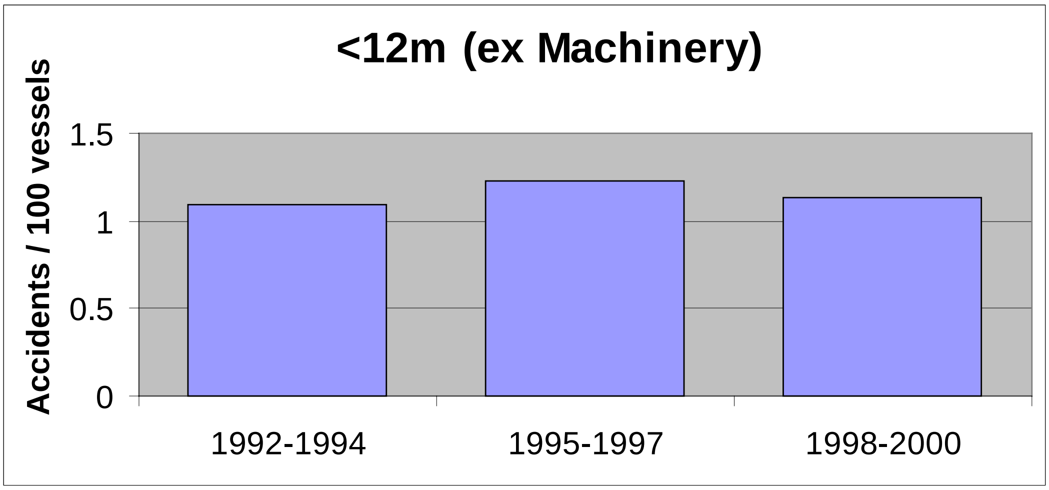


Figure 11.1 shows only a slight rise in the accident rate (excluding category *Machinery*) for <12m vessels in the years 1995 to 1997. Comparing this with Figure 10.1 (which includes *machinery*) it can be seen that a majority of accidents that contribute to the sharply rising trend in 1995, 1996 and 1997 can be attributed to *machinery*. By analysing these figures further, and comparing them with those for >12m vessels, it is concluded that the rising trend in fishing vessel accidents in general shown in Figures 1 and 2 can be attributed to *machinery* accidents in <12m vessels.

The analysis of *machinery* accidents on page 12 concludes that the rise in the rate of those accidents can be attributed almost entirely to breakdowns which are caused by poor maintenance and under-investment. A possible connection between this and the reduction in fleet size has been discussed on page 13. This can now be qualified further. Over one third of all the vessels decommissioned between 1993 and 1996 were in the length range 10 to 12m.[3] In addition, a number of <12m vessels were taken out of service for other reasons. The <12m registered fleet size reduced by 871 vessels during 1995, 836 vessels during 1996 and 215 in 1997. The hypothesis of a connection between the rise in *machinery* accidents and the reducing fleet size remains valid.

[3] **MAFF The Economic Evaluation of the Fishing Vessels (Decommissioning) Schemes, Nautilus Consultants, Executive Summary para 9**

Figure 11.2

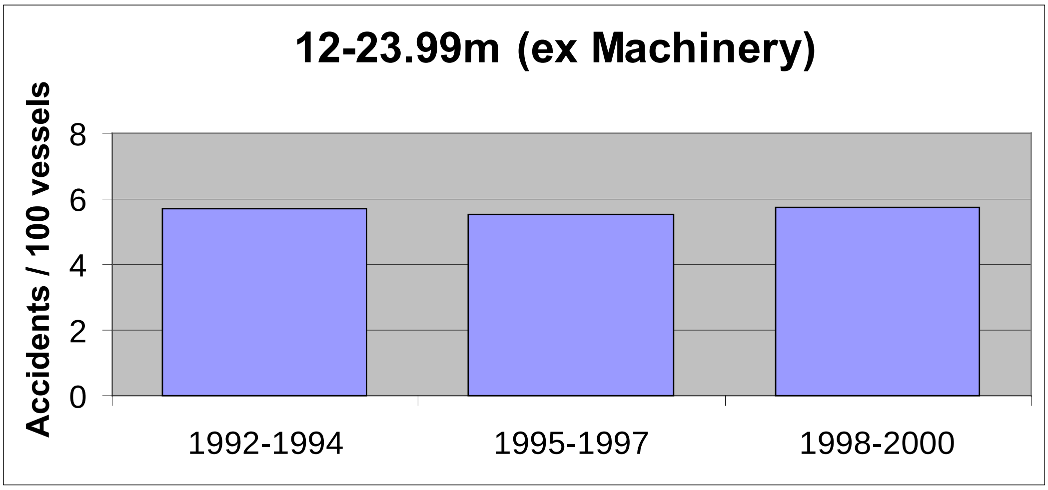


Figure 11.2 shows little or no discernible trends in the accident rate for vessels of between 12m and 24m in length (excluding *machinery*).

Figure 11.3

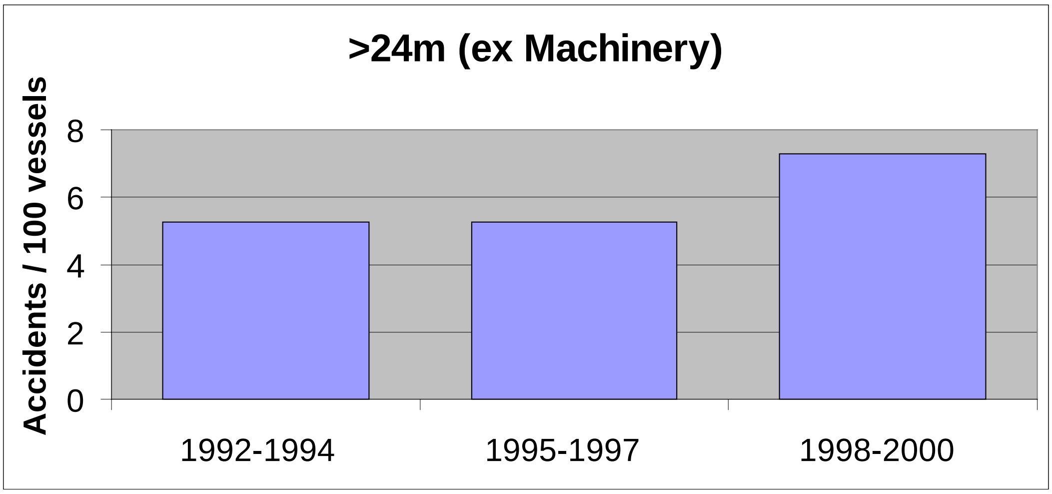


Figure 11.3 shows a steep rise in reported accidents in >24m vessels (excluding *machinery*) for the three year period 1998 to 2000. Owing to the small >24m fleet size this may not necessarily be indicative of an accident trend.

Conclusions - accidents to vessels

When *machinery* accidents are excluded from the figures, there is little or no discernible trend in the accident rate. A rise in the rate for those vessels >24m in length is shown but, owing to insufficient accident numbers, an average trend is not discernible.

A rise in the incidence of reported *machinery* accidents in the years 1995, 1996 and 1997 is attributed almost entirely to mechanical breakdowns on <12m vessels arising from poor maintenance and under investment.

3.2.4 Vessel losses

The data used in the following analysis derives from that of every UK-registered fishing vessel which was reported lost, or to be a constructive total loss in the years 1992 to 2000. The figures have been adjusted to reflect the changing fleet size over the years in question to produce an annual vessel loss rate.

Figure 12.1: Fishing vessel losses/1000 registered vessels, annual accident rate

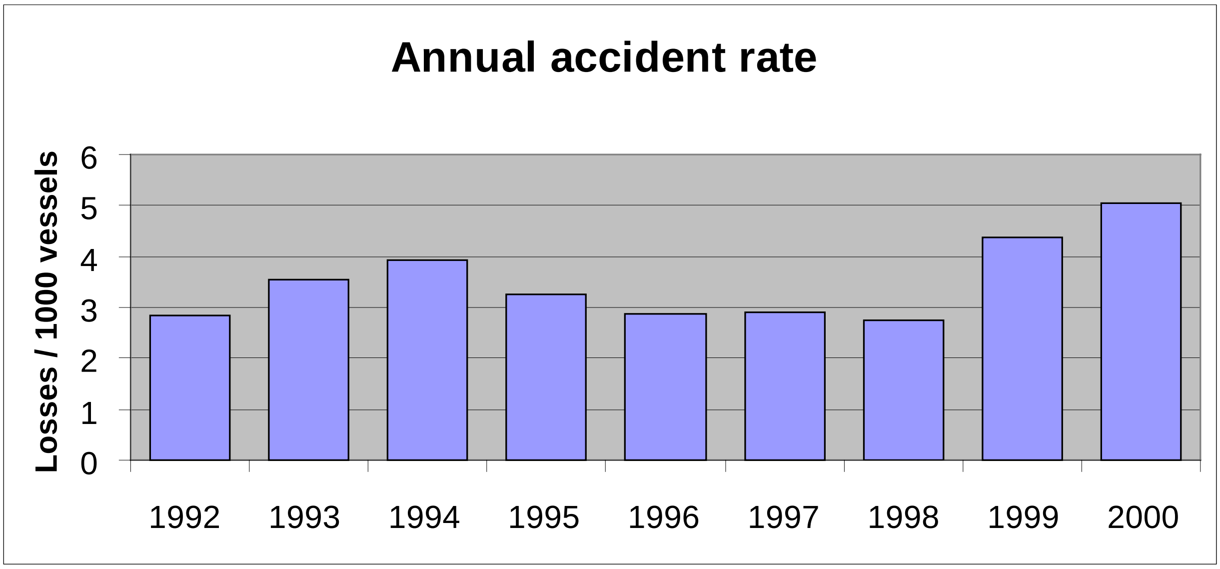
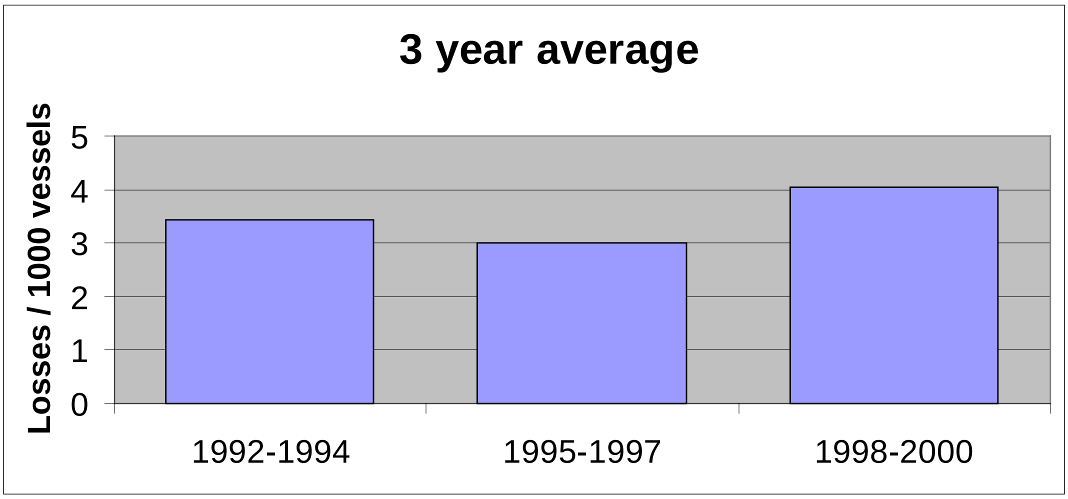


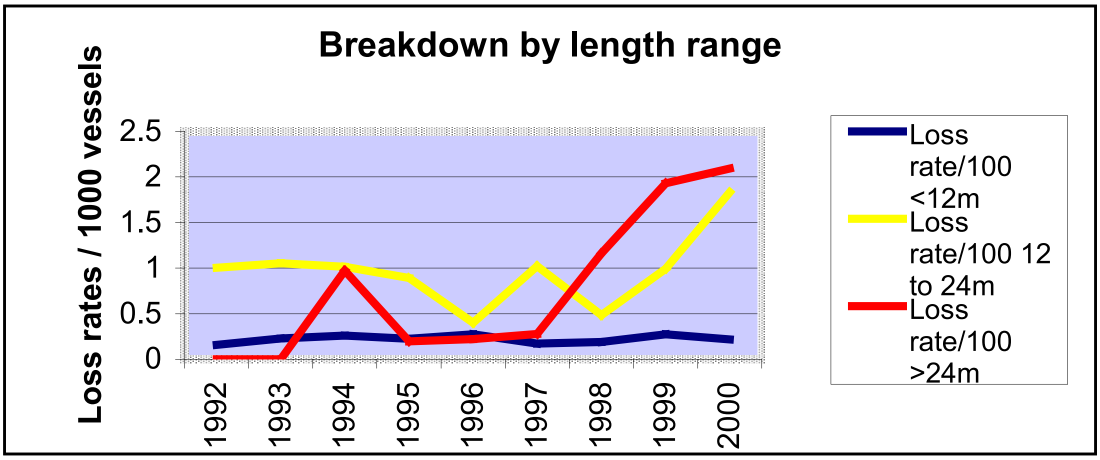
Figure 12.2: Fishing vessel losses/1000 registered vessels, accident rate averaged over three year periods



Figures 12.1 and 12.2 show the vessel loss rate rising from 0.28% in 1992 to 0.39% in 1994 before falling again to reach a steady rate of about 0.28% during 1996,1997 and 1998. It then rose sharply to reach 0.51% in 2000.

To establish whether this trend is followed in all vessel length ranges the loss rate was analysed for each.

Figure 13: Fishing vessel loss rate/1000 registered vessels in length ranges



This figure clearly indicates that the rise in the loss rate during 1999 and 2000 was entirely due to accidents to vessels over 12m. There were 40 >12m fishing vessels lost during 1999 and 2000. In 2000 alone, about 2% of the whole >12m UK fleet was lost.

3.2.5 Special study of over 12m vessel losses in 1999 and 2000

Ownership

Analysing the ownership details of the 40 >12m vessels which were lost in 1999 and 2000, 29 were registered at Scottish ports.

Seven of the 40 vessels lost had beneficial ownership outside the UK, six were Anglo-Spanish and one Anglo-Belgian. These seven vessels were registered at ports in the UK other than Scotland. Only four vessels with beneficial ownership in the UK outside Scotland were lost in this period.

Vessels with beneficial ownership outside the UK typically call at UK ports about seven or eight times a year: they land the majority of their catch abroad; are crewed by foreign nationals and have a different financial basis for their operation from those owned and registered here.

It is concluded that, when considering a regional variation in vessel loss rate, vessels with beneficial ownership outside the UK should be treated separately to those that are owned and registered here.

<u>Anglo-Spanish Fleet</u>

At the end of 1998 there were 97 UK-registered fishing vessels of Spanish beneficial ownership, all of which were >24m in length. In 1999 and 2000, six of these vessels were lost, giving an average loss rate of approximately 3.1% per annum. This is well above the average rate for all UK-registered vessels of >12m length (about 1.5%) for the same period. Losses to Anglo-Spanish vessels in these two years were disproportionately high when considered against those of the >24m fleet in general.

The Anglo-Spanish fleet comprised about 30% of the UK >24m fleet at the end of 1998, but contributed 50% of all losses to >24m vessels. In 2000, five of the six UK-registered >24m vessels that were lost were Anglo-Spanish (83%). One involved the loss of 12 lives. The average age of the Anglo-Spanish vessels lost was 34.3 years. In considering these figures, it should be remembered that the sample size is small, and conclusions should be drawn with caution.

<u>Other vessels with beneficial ownership outside UK</u>

The Anglo-Belgian fleet consisted of one vessel at the end of 1998. It was lost in 1999, but no conclusions can be drawn from a single incident. However, as with the Anglo-Spanish vessels above, this vessel was >24m in length. Therefore 58% of all the >24m losses in 1999 and 2000 came from vessels with beneficial ownership outside the UK. At the end of 1998 there were 138 >24m vessels with beneficial ownership outside UK in a total UK registered >24m fleet of about 328 (42%).

No vessels were lost from the Anglo-Dutch, Anglo-Icelandic or Anglo-Irish fleets. There were 43 such vessels at the end of 1998.

Scottish vessels

Of the 29 >12m vessels lost in 1999 and 2000 that were registered at Scottish ports, all had owners with addresses in Scotland.* Figures from the MCA indicate that about 59% of the total UK-registered fleet of >12m vessels (695 vessels) were registered in Scottish ports.[4] Allowing for those vessels registered in Scotland but with beneficial ownership outside the UK, none of which were lost, (39 vessels at the end of 1998), the loss rate for Scottish owned and registered vessels was about 2.2% per annum.

**Two of these vessels, Solway Harvester and Karianda were registered in Scotland but, on paper, had owners in Hull. It is known, however, that the beneficial ownership of these vessels lies in Scotland.*

Rest of UK vessels

Four >12m vessels which were registered in the UK outside Scotland and not of foreign beneficial ownership, were lost in 1999 and 2000. Three had owners with addresses in England, and one had owners based in Scotland. The total number of >12m vessels registered at UK ports outside Scotland is 484. Allowing for those vessels registered in the UK outside Scotland, but with beneficial ownership outside the UK, the accident rate for which has been considered above (102 vessels at the end of 1998), the loss rate for these vessels was 0.5% per annum.

Ownership comment

It can be seen that the overall high loss rate for 1999 and 2000 in vessels over 12m, is caused by a high loss rate among the larger vessels registered in Scotland and, to a smaller extent, to vessels of beneficial ownership outside the UK.

It should be noted that port of registry alone is not necessarily an indication of area of ownership and/or area of operation. Vessels when sold often retain their original port of registry despite changing owners and home port. Where discrepancies have been noted to exist, mention is made in the text. It is considered that such vessels are the exception rather than the rule and that the conclusions reached are valid despite this uncertainty. Because of the way the MAIB database has been configured, an analysis of vessel loss against ownership and area of operation could not have been carried out in any other way.

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[4] **Figures valid May 2001. Figures for previous years were unobtainable.**

Analysis of >12m fishing vessel losses in 1999 and 2000

To understand better why there should be such a significant difference between the loss rates of Scottish-owned and registered vessels, and those owned and registered in the rest of UK, the circumstances and associated factors have been analysed:

Scottish-registered and owned fishing vessels

Initial incident type	Number of vessels
Fire and Explosion	3
Foundering and Flooding	20
Capsize	1
Machinery	2
Stranding	3

These figures are largely in line with those recorded for all UK-registered FV losses 1992-2000 (see later section), although the proportion of foundering and floodings appears high at 69% compared with 54% for all UK losses. This aspect will be analysed in more detail later in the study.

The average age of the 29 vessels being considered is 21.68 years. This is similar to the average age of all the UK-registered vessels that were lost between 1992 and 1999, 21.9 years, but very much younger than the average age of the Anglo-Spanish vessels (34.3 years). The average age of the UK registered fleet in 2001 was approximately 20 years.

Table 4: >12m Scottish vessels lost in 1999 and 2000 including summary of each accident

YEAR	ARM	Name	Deaths	Sea State	Wind	Age	Incident type	Summary Notes
2000	0756/00	ALEX WATT	0	Calm	0 to 3	35	Machinery	Machinery failure (unknown cause) followed by a grounding which resulted in CTL
2000	0144/00	ANGELA	0	Mod	4 to 6		Flooding	Down-flooding due to angle of list produced by catch on deck
2000	0324/00	ANNANDALE	0			20	Flooding	Flooding in engine room - unknown cause. Not discovered until too late
1999	0284/99	ASCANIA	0	Mod	4 to 6	22	Flooding	Flooding in engine room - unknown causes. Not discovered until too late. Bilge alarm did not function.
2000	0085/00	ASTRA	0	Calm		39	Grounding	Grounding in coastal waters followed by CTL. Unqualified sole watchkeeper.
1999	0017/99	AURORA	0	Mod	4 to 6	16	Flooding	Flooding in engine room - unknown cause. Not discovered until too late
2000	0084/00	BE READY	0	Rough	7 to 9	26	Fire	Fire due to drying clothes in galley
1999	0378/99	BE READY	0		0 to 3	15	Grounding	Grounding in fog in harbour
2000	0823/00	BETTY JAMES	0	Calm	4 to 6	1	Grounding	Grounded due to fatigue of watchkeeper
2000	0218/00	BOY LESLIE	0	Calm	4 to 6	22	Machinery	Main engine stopped while on test run for new alternator. Vessel drifted ashore and crew abandoned her.
1999	1582/99	CARVELLA	0		4 to 6	20	Capsize	Listing and capsize followed by flooding and foundering
1999	1461/99	EMMA JAYNE	0	Mod	4 to 6	12	Flooding	Fishing in bad weather when engine room began to flood. Cause not identified. Electric bilge pumps failed and hand pumps inadequate.
2000	1387/00	ESHA NESS	0	Calm	0 to 3	27	Flooding	Flooded in engine room. No bilge alarm. Water too deep to access sea cocks. Electrics disabled making bilge pumps inoperative.
1999	1011/99	FLORESCO	0	Calm	0 to 3	40	Flooding	Bilge alarm went off and operated auto electric pump- however skipper re-set alarm. Within minutes found engine room flooded. No W/t bulkhead so fish hold also flooded. Mayday sent and crew took to liferaft and were picked up by RNLI lifeboat.
1999	0976/99	FRAOCH BAN	0	Calm	0 to 3	21	Capsize	Skipper loaded sand eels in bulk and free surface caused capsize and loss of vessel
2000	1265/00	GOLDEN SCEPTRE	0	Mod	4 to 6	20	Flooding	Possible collision with floating object caused vessel to flood. No watertight bulkheads
1999	1131/99	JASPER III	0	Mod	4 to 6	28	Flooding	Pair trawler - bilge alarm sounded while fishing - engine room flooded, bilge pumps could not cope. Probable cause put down to sw pipework. Personnel rescued by partner vessel. Despite steel construction bulkheads were not watertight.
2000	0977/00	KARIANDA	0			24	Flooding	Vessel flooded - police investigating report that it might have been deliberate.
1999	0218/99	KESTREL	0	Mod	0 to 3	19	Flooding	Engine room flooded. First noticed when engine revs dropped (bilge alarm did not work). Engine was stopped and sea cocks closed. Water continued to rise despite electric bilge pump operating. Eventually electric power lost.

YEAR	ARM	Name	Deaths	Sea State	Wind	Age	Incident type	Summary Notes
2000	0706/00	MANX MAID	0	Mod	4 to 6	42	Flooding	Flooded for unknown cause. Bilge alarm did not operate. No W/T bulkheads. Sea cocks could not be accessed due to floodwater. Flooding disabled electrics and radio. Crew took to liferaft.
2000	1429/00	MARGO	0	Mod	4 to 6	20	Flooding	Wooden vessel made contact with floating object. Vessel flooded through forward damage and sank within 30 minutes.
1999	0641/99	MARGONA	0			27	Flooding	Flooding in engine room discovered while pair trawling. Previous electrical overload problem made bilge alarm and bilge pump inoperative. Cause unknown but probably SW pipework.
1999	0456/99	POSEIDON	0	Mod	0 to 3	10	Fire	Fire in aft accommodation not discovered until too late.
2000	0487/00	PROGRESS	0			18	Flooding	Flooding discovered when electrics affected, (before bilge alarm sounded). Cause SW pipework. Repair attempted twice but on the third occasion flooding could not be controlled and vessel was lost.
1999	0940/99	RADIANT STAR III	0	Calm	0 to 3	12	Flooding	Flooding occurred on pair trawler after having had slight contact with partner vessel. First noticed when lights were affected. Leak could not be stopped and pumps could not cope.
1999	0922/99	SHARONA	0	Calm	4 to 6	25	Flooding	Flooding in engine room. No bilge alarm. No W/T bulkheads. Cause failure of SW pipework.
2000	0045/00	SOLWAY HARVESTER	7	Rough	7 to 9	8	Flooding	Down-flooding through open ice scuttles caused capsize
2000	0995/00	VALHALLA	0		0 to 3	27	Fire	Fire cause subsequent foundering. Cause unknown
2000	1340/00	WISTARIA II	0		4 to 6	21	Flooding	Flooding in engine room. No bilge alarm. Water too deep to operate sea cocks. Crew abandoned to liferaft to be picked up by RNLI lifeboat.

Fishing vessels registered and with beneficial ownership in UK outside Scotland

Four vessels were lost, one of which was registered in Brixham but had owners based in Scotland. Three were typical flooding accidents where the engine room flooded for an unknown reason and, by the time it was detected, it was too late to control. The fourth accident involved fishing gear becoming snagged on an unknown object followed by flooding and capsize. Two occurred to the north of Scotland, one in the Western Approaches to the Channel and one in the North Sea. None resulted in any injuries.

Analysis of >24m fishing vessel losses in 1999 and 2000

To understand better the influence of vessels registered in the UK, but with beneficial ownership outside the UK on the loss rate for vessels of over 24 metres in length in 1999 and 2000, the circumstances and factors surrounding all >24m losses have been analysed.

It can be seen from the following table that all the Scottish >24m vessels were lost through flooding compared with only 50% for Anglo-Spanish vessels. The average age of the Scottish vessels lost was 21.2 years, compared with 34.3 years for the Anglo-Spanish vessels.

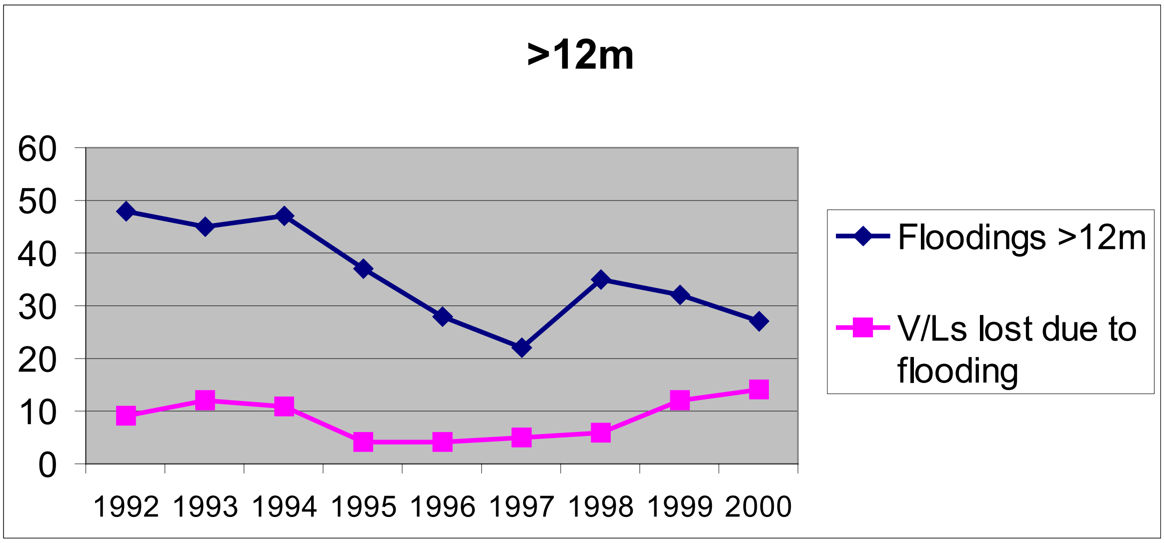
Table 5: All >24m losses in 1999 and 2000 with data including summary of each accident

	ARM	Name	Ownership	Deaths	Sea State	Wind	Age	Incident type	Summary Notes
1999	1582/99	CARVELLA	Scottish	0		4 to 6	20	Flooding	Flooding in steering compartment and in engine room detected by engine room bilge alarm but vessel was lost despite extra pump being airlifted to vessel.
2000	1387/00	ESHA NESS	Scottish	0	Calm	0 to 3	27	Flooding	Flooded in engine room. No bilge alarm. Water too deep to access sea cocks. Electrics disabled making bilge pumps inoperative.
1999	1131/99	JASPER III	Scottish	0	Mod	4 to 6	28	Flooding	Pair trawler - bilge alarm sounded while fishing - engine room flooded, bilge pumps could not cope. Probable cause put down to sw pipework. Personnel rescued by partner vessel. Despite steel construction bulkheads were not watertight.
1999	0218/99	KESTREL	Scottish	0	Mod	0 to 3	19	Flooding	Engine room flooded. First noticed when engine revs dropped (bilge alarm did not work). Engine was stopped and sea cocks closed. Water continued to rise despite electric bilge pump operating. Eventually electric power lost.
1999	0940/99	RADIANT STAR III	Scottish	0	Calm	0 to 3	12	Flooding	Flooding occurred on pair trawler after having had slight contact with partner vessel. First noticed when lights were affected. Leak could not be stopped and pumps could not cope.
1999	0167/99	DE KAPER	Anglo-Belgian	0	Calm	0 to 3	13	Fire	Fire in engine room quickly spread out of control. Engine room door had been hooked open. Gas smothering controls could not be reached because of flames. Crew took to liferaft and were picked up within minutes by another FV. Vessel towed to port. CTL
1999	1275/99	SLEBECH TWO	Anglo-Spanish	0	Calm		38	Flooding	Bilge alarm alerted crew to flooding, but pumps could not cope. Crew abandoned to liferafts.
2000	0059/00	ROSS ALCEDO	Anglo-Spanish	0	Mod	0 to 3	27	Fire	Fire in engine room spread out of control due to engine room door being hooked open. Unable to get to CO2 controls due to flames. Crew took to liferaft and were picked up by passing cargo ship. Vessel towed to port CTL
2000	0113/00	MILFORD EAGLE	Anglo-Spanish	0	Rough	7 to 9	40	Fire	Fire in crew cabin when crewman on watch. Unknown cause. Crew abandoned to liferaft. Vessel towed to port. CTL
2000	0393/00	MERA 1	Anglo-Spanish	0	Calm	0 to 3	36	Flooding	Flooding discovered in engine room when already over floor plates. Pumps could not cope. Mayday sent and 12 crew abandoned to liferafts. Picked up by another fishing vessel within 20 minutes.
2000	1223/00	AROSA	Anglo-Spanish	12	Rough	7 to 9	26	Grounding	Vessel ran aground for an unknown reason while on passage from fishing grounds to Galway Bay to take shelter. 12 of the 13 crew lost their lives.
2000	1525/00	ZORRO ZAURRE	Anglo-Spanish	0	Mod	0 to 3	39	Flooding	Engine room flooded through unknown cause. Distress call made and crew airlifted to safety. Vessel later drifted ashore in SW Ireland.

Analysis of flooding accident rate in >12m vessels

Flooding accounted for the majority of vessels lost in the years 1999 and 2000. To establish whether this was a disproportionately high figure, this section compares the numbers of reported flooding incidents and actual losses between the years 1992 and 2000.

Figure 14: Reported flooding accidents and vessel losses due to flooding for >12m vessels between 1992 and 2000



It can be seen from this figure that the number of losses caused by flooding appears to be converging with the number of reported flooding incidents in vessels of >12 m. The overall trend is apparent throughout the period, but is most marked in 1998, 1999 and 2000. In 1998 there were six losses from 35 incidents, in 1999 there were 12 from 32 incidents and, in 2000, 14 from 27 incidents.

Conclusions - losses of >12m vessels in 1999 and 2000

The increased loss rate recorded in the years 1999 and 2000 for vessels >12m in length was caused by:

1. The loss of a disproportionate number of Scottish-owned and registered vessels in the length range 12m to 24m. Of the 28, 12 to 24m vessels lost in this period 24 were Scottish-owned and registered. Scottish-registered vessels comprised about 62% of the fleet [5] but 86% of the losses.

2. The loss of a disproportionate number of Anglo-Spanish vessels. Of the total of twelve >24m vessels that were lost in the years in question six were Anglo-Spanish. For vessels >24m Anglo-Spanish vessels contributed 50% of the losses but only about 30% of the fleet. While in the >12m sector they accounted for 15% of the losses but only 7% of the total. The average age of the Anglo-Spanish vessels involved was 34.3 years which is very much older than the age of the >12m losses in general.

[5] Figures derived from MCA for 2001. Figures for previous years unobtainable.

Of the 33 UK beneficially owned >12m fishing vessels that were lost, 20 (60%) were due to flooding through the hull (three English-registered and 17 Scottish). In most incidents the flooding was not detected until the engine slowed or the electrical power generation was affected.

The bilge alarm was known to be operational in only 3 cases and was not functioning in at least 13.

In many instances the controls for closing sea cocks could not be reached by the time the flooding was detected.

In nearly all the accidents the investigation was unable to establish the precise cause of the flooding. On each occasion the event occurred in moderate or better sea conditions and no lives were lost or people injured.

The average age of the vessels lost through flooding through the hull was 25.1 years.

Conclusions - fv loss trends

The fishing vessel loss rate rose to a peak of nearly four vessels per 1000 in 1994 and then fell to less than three vessels for the years 1996, 1997 and 1998. The years 1999 and 2000 saw a steep rise in loss rate to over five vessels per 1000.

The steep rise in the loss rate recorded in 1999 and 2000 was almost entirely due to vessels over 12m in length.

The factors underlying vessel losses are identified and analysed in Section 4. Since 1995 there has been an increasing trend in losses caused by flooding in >12m vessels, whereas the number of reported flooding incidents from these vessels has been reducing overall. No explanation for this is offered. There is a possible correlation between the reducing and comparatively low loss rate due to flooding for >12m vessels between 1993 and 1997 and the five years of decommissioning. The last year of the last round of decommissioning was 1997. The loss rate increased dramatically in 1999 and 2000.

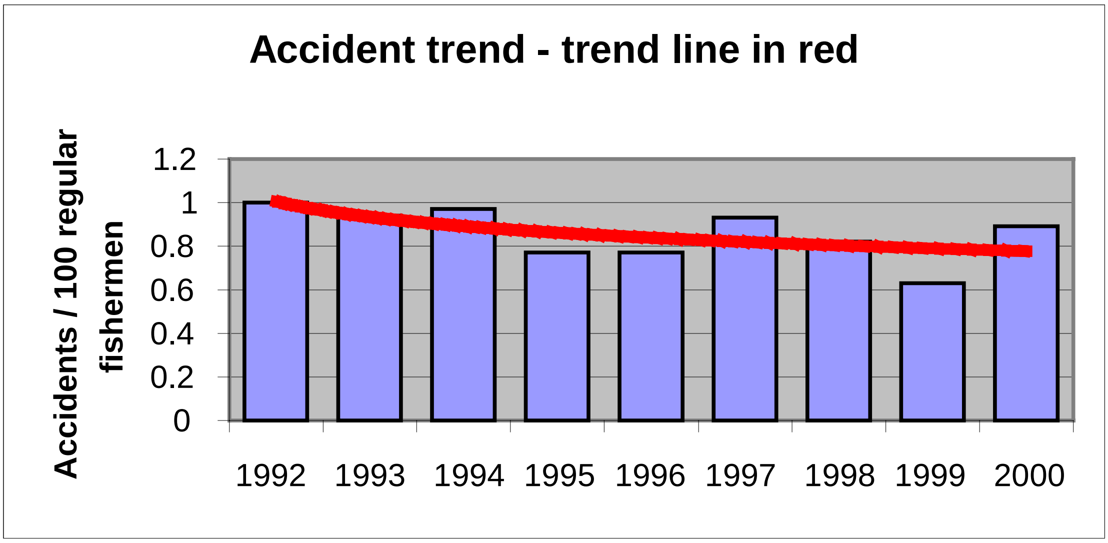
An analysis of all flooding incidents is addressed in Section 4.1.3.

3.3 ACCIDENTS TO PERSONS

3.3.1 All injuries to fishermen

This section looks at statistical trends in accidents to fishermen. The base data used is that in respect of all accident categories where an injury or fatality occurred including category Accident to Personnel

Figure 15: Accident rate trend, 1992 to 2000 per 100 regular fishermen



The accident rate for injuries has reduced steadily during the period 1992 to 2000.

It should be noted that the rate refers to the number of Regular Fishermen[6]*. As no data was available for the years 1992, 1993 the nearest known population figure was used. The figures for Regular Fishermen are not representative of the total number of fishermen employed, since many of them are employed on a casual or part-time basis. No accurate figures for the total population of fishermen could be obtained. For the purpose of the survey the total number of Regular Fishermen gives sufficient indication of the relative change in numbers of people at risk year by year.*

3.3.2 Fatalities to fishermen

This section looks at statistical trends in accidents to fishermen which result in fatality. The base data used is that in respect of all accident categories where a fatality occurred including category “accident to personnel”.

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[6] **MAFF, United Kingdom Sea Fisheries Statistics, 1998**

Figure 16: Fatality Rate Trend / 1000 Regular Fishermen for 1992 to 2000

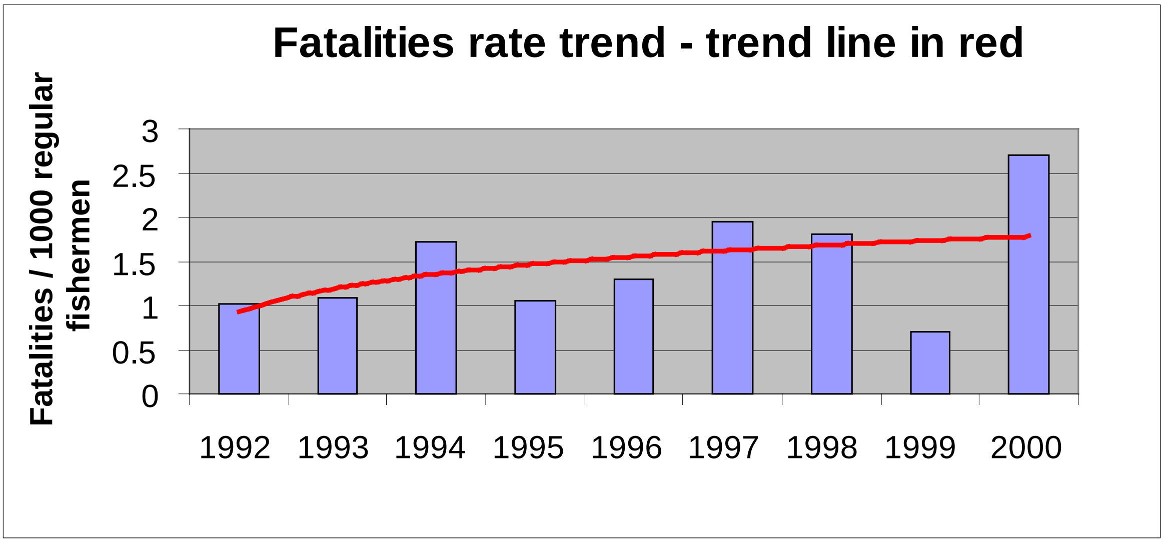
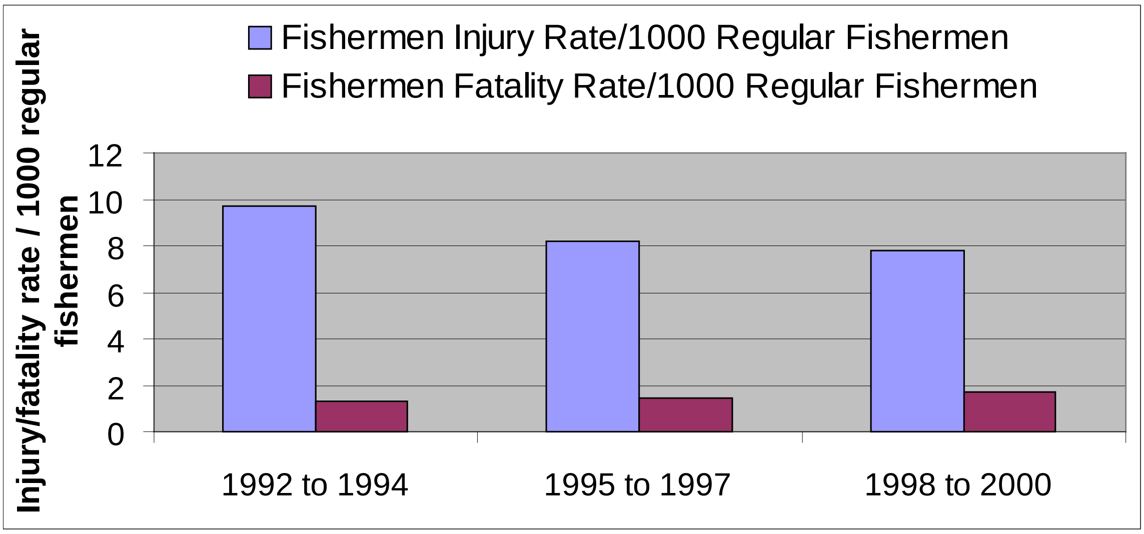


Figure 17: Three year averaged injury rate and fatality rate per 1000 regular fishermen



The fatality rate for fishermen, which has been adjusted to account for the number of Regular Fishermen employed, has been steadily increasing. This rising trend is opposite to that recorded for injuries, which is decreasing.

A possible explanation for this apparent anomaly could be an increasing under-reporting of injuries to the MAIB. Although this cannot be discounted, it is unlikely, as injuries generally come to the MAIB's attention via a third party such as the coastguard. The proportion of accidents initially coming to the MAIB's attention through third parties has not substantially changed during the period of the survey.

The trends indicate that although fewer fishermen are being injured each year, the injuries sustained are more serious. The percentage of reported fatal injuries has increased from 13% between 1992 and 1994, to 22% between 1998 and 2000.

SECTION 4 - ACCIDENTS - CAUSAL FACTORS AND THEIR ANALYSIS

This section analyses the causal factors which lay behind the accidents reported between 1992 and 2000. It is divided into four sections. Accidents to vessels (4.1), vessel losses (4.2) personal injury (4.3) and death (4.4).

4.1 ACCIDENTS TO VESSELS

The MAIB has investigated 194 accidents to fishing vessels between 1992 and 2000 and identified 518 separate factors.

Figure 18: Accidents to vessels - initial incident types 1992-2000

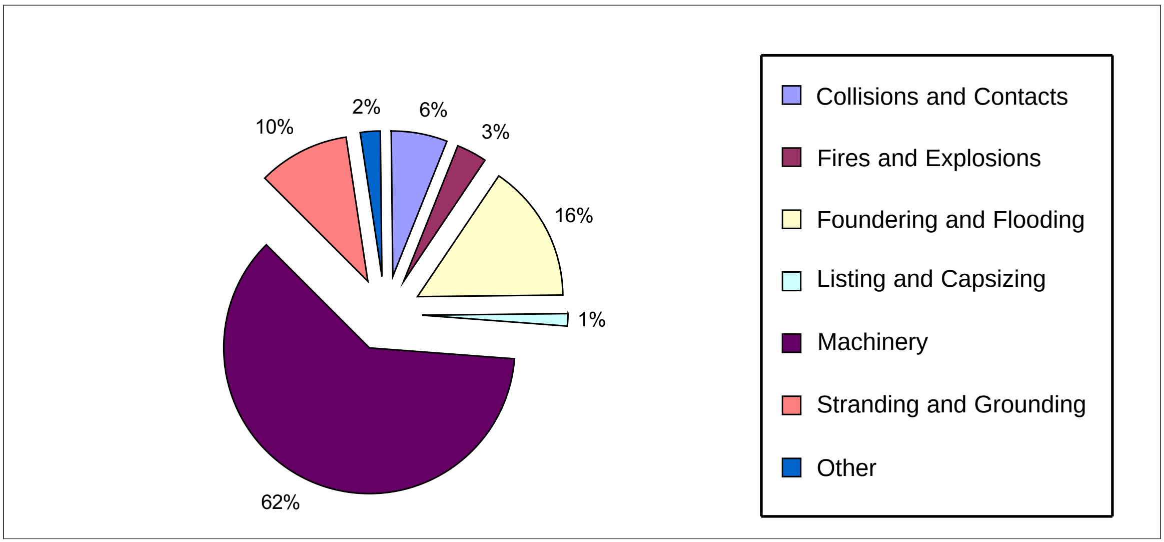


Figure 18 shows a breakdown of the initial incident types recorded and are analysed separately below.

4.1.1 Collisions

General

39 of the 264 UK fishing vessel collisions reported to the MAIB were investigated. 73 contributory factors were identified of which 67 were human (see Appendix Table A3).

Collision Factors

23 of the fishing vessels involved in collisions were found not to have complied with the regulations. The watchkeepers in nearly all of these had failed to keep a proper lookout.

25 of the identified human factors were associated with individual failings:

- In 9 instance, the skippers or watchkeepers had failed to understand and allow for the risks involved;
- Recognised procedures or rules were intentionally violated in 5;

- 7 involved lack of competence, experience and/or training;
- 3 were associated with fatigue; and,
- 1 with poor communications.

In addition, there were 11 factors associated with the organisation and working practices of the crew. Of these, 6 involved unsafe working practices and 3 an inappropriate allocation of responsibility. One of the others was the application of inadequate procedures.

Analysis

To gain further insight into the factors outlined above, the text summary of each collision investigated was analysed.

- Poor lookout contributes to the majority of fishing vessel collisions;
- Watchkeeping responsibility is too often delegated to inexperienced and unqualified members of the crew;
- Passing distances are too small; and
- Procedures and regulations are sometimes intentionally violated.

4.1.2 Groundings

General

A total of 442 grounding incidents were reported between 1992 and 2000, of which 26 of the more serious were fully investigated. One is still under investigation. 83 contributory factors have been identified. As can be seen in Table A3 in the Appendix , 5 were “Failures of Equipment” (items or systems) and the other 78 were “Human Factors”.

Grounding factors

Non-compliance with regulations

The most common factor was non-compliance with regulations. This accounted for 10 of the human factors identified. A typical example is the failure to keep a lookout. It can occur for a number of reasons but nine of the groundings were caused by the watchkeeper falling asleep. These incidents typically occurred on the way back to harbour after a long day, or series of days, fishing.

Daylight or darkness?

Of the 26 groundings investigated, only 4 occurred in daylight. This may be partly explained by fatigue and partly by the greater difficulty in navigating at night. It is probable that fatigue played a part in more than the 9 accidents identified: it is only entered as a factor if it can be shown to be contributory. Vessels over 12m in length were involved in 21 of the 26 accidents investigated. Using the whole database of 442 grounding accidents, a comparison of the time of day against length range of vessel, reveals that <12m vessels are twice as likely to ground during daylight, while >12m vessels are 2.5 times more likely to ground at night (see Table 6). This is not surprising as many <12m vessels only operate in daylight, and many >12m vessels leave and return to harbour early in the morning or late at night.

Table 6: Grounding investigations, length range against light conditions 1992-2000

Length Range	Light	Semi-Dark	Darkness	Grand Total
<12m	105	12	58	175
12-16.49m	19	6	51	76
16.5-23.99m	25	9	62	96
24m+	23	3	32	58
Total	**172**	**30**	**203**	**405**

N.B. The data on a further 37 accidents did not record light/dark information

Good visibility or bad?

Most of the accidents investigated happened in good visibility (19), and only 3 occurred in poor visibility. It was moderate in 4 instances.

Other factors

33 of the identified causes were human factors arising from individual failings. 9 groundings involved fatigue, 2 were attributed to alcohol, 13 were related to training and competence of the watchkeeper and 5 involved no perception of the risk.

Conclusions:

Human error is at the root of nearly all groundings. They usually occur because of a failure to keep an efficient lookout arising from poor watchkeeper competence. This can be exaggerated by the effects of fatigue and/or alcohol.

4.1.3 Floodings

General

Many flooding incidents which do not lead to the loss of a vessel are never reported to the MAIB.

The 644 accidents, which were reported and listed under the Initial Accident Category “Founderings and Floodings”, were analysed.

190 occurred on the high seas, 347 in coastal waters and 49 in a port or harbour area, 3 occurred in a river or canal. The location is not known in 55 flooding accidents.

325 flooding incidents occurred on <12m vessels, 97 on vessels of between 12m and 16.5m, 173 on vessels between 16.5m and 24m, and 49 on >24m vessels.

158 incidents occurred in calm conditions, 203 in moderate conditions and 61 in rough conditions. In a further 222 cases the sea state was not recorded.

The average age of the vessels reporting flooding incidents was 20.71 years.

71 accidents in this category have been investigated, from which 197 causal factors have been established (see Appendix Table A4).

Flooding Factors

The main causal factor categories were “Failure of Equipment and/or Structure” (44 factors) and “Human Factors” (118 factors).

Other significant causal factor categories were:

- Environmental (9) - where the wind and sea state were influential
- Design and Construction (9) - where the design and/or stability proved inadequate.

Failure of Equipment and/or Structure occurred in 39 accidents (see Appendix Table A5). In some of the accidents it proved impossible to identify precisely the item that had failed but, where the precise cause was identified, it was shown that:

- The hull integrity failed in 48% of cases
- The SW cooling system failed in 39% of cases.

The average age of the vessels which had “Failure of Equipment” as a sub-factor was 25.6 years; five years older than the average of all vessels reporting flooding incidents.

Human Factors were identified as causal in 66 cases, and featured in 92% of the flooding accidents investigated (see Appendix Table A6).

35 of the 117 identified Human Factors were associated with equipment, including Poor Maintenance (16), Poor Design (3), Non-availability (9) and Personnel Unfamiliar with the Equipment and Misuse (6).

22 of the factors were associated with the failings of individual fishermen. These included lack of any risk perception (7), lack of training experience or knowledge (6), the violation of procedures (4), and poor decision-making (3). These 22 factors arose from 18 accidents, only 7 of which involved flooding through the hull or SW cooling system. They arose from overloading, snagging, swamping, downflooding or from failures associated with the bilge/deckwash system.

Examination of the text summaries for the 65 accidents investigated (all those available) indicates that:

- The bilge alarm failed to operate or failed to alert the crew in at least 10 cases (15%);
- The bilge pump(s) failed to operate, or quickly became choked, in at least 11 accidents (17%);
- The bilge pumps failed to cope with the inflow of water in at least 7 accidents (11%);
- 39 (60%) of the accidents were caused by flooding through the hull, deck caulking or SW system;
- 7 of the other accidents involved swamping or downflooding;
- 4 involved stability problems or overloading;
- 3 involved snagging;
- 6 involved other identified causes.

The cause associated with the remaining 6 accidents is not known.

Analysis

Only major flooding accidents come to the MAIB's attention. The branch will only hear of them when the coastguard or other rescue organisation has been involved. Very occasionally, the police, harbour authority or the vessel owner will report the incident. There is a strong suspicion, and a certain amount of evidence, to show that 644 accidents in nine years represents only a small percentage of the total. Many more potentially serious accidents occur, and are dealt with effectively, by those on board. Flooding, both at sea and in harbour, is common. The MAIB sought to establish the reasons why.

- 85% of flooding incidents (where the sea conditions have been recorded) occurred in moderate or calm conditions. Contrary to popular expectation there is no connection between flooding incidents and bad weather. Weather and sea conditions appear to have little or no impact on the source of flooding.

- The average age of the vessels involved was 20.71 years, which equates the average age of the fleet. Analysis of the age of vessels involved in flooding incidents, reveals they can occur regardless of how old the vessel is. There is, however, a significant increase in the number of Scottish fishing vessels involved in flooding incidents in the age bracket 15 – 30 years. In many incidents, the precise cause has not been identified, but there is circumstantial evidence to indicate that routine maintenance of pipework and sea water services was not as good as it might have been.

- No conclusion can be drawn about the location of the vessel when flooding occurs. Incidents frequently occur in port as well as at sea, and under-reporting of accidents in port is likely to be very much higher than those at sea.

- 50% of the accidents occurred on vessels of <12m in length despite this category making up about 80% of the fleet. As many of these vessels operate part-time, no firm conclusion can be drawn from this statistic.

Flooding accidents occur predominantly because salt water pipework fails or the hull integrity is breached. Downflooding is also common, but to a lesser extent, and often occurs because weathertight hatches, scuttles, or doors have been left open in poor weather conditions. Poor design frequently allows water to downflood through ventilators, or air pipes. The common factor in all these cases involves poor operational practice, poor maintenance and poor design.

Bilge alarms, when operating correctly, give early warning of high water levels, but too often they do not operate when required. Why? Flooding, when detected early, can often be controlled but, if the bilge alarm does not operate, the first warning received by the watchkeeper may be a loss of engine or electrical power. By that time it is frequently too late, as valve controls are already underwater and the loss of power might have disabled the bilge pumps. Even when bilge pumps have power they become choked frequently on debris and either operate inefficiently or not at all. On occasions, bilge pumps have been found to be insufficiently powerful.

Although the evidence has been hard to come by, and is not recorded in the database, there are indicators to show that had effective action been taken as soon as flooding had been detected, the crew might have been able to save the vessel. The late detection of flooding in many instances has been a significant factor in the subsequent foundering.

4.1.4 Listing and capsize accidents

29 accidents, which had Listing and Capsize indicated as the Initial Accident Category, were investigated. These investigations elicited 90 accident factors, of which 47 were human.

It can be seen from Table A7 in the Appendix that of the 43 technical factors:

- 20 were associated with design and construction. 9 were specifically stability defects and a further 9 involved inadequate design.
- 8 factors were associated with rough sea conditions.
- 8 involved snagging an underwater obstruction.

Of the 47 human factors:

- 17 were failings of the individual. 6 of these involved perception of risk (skippers or others not understanding or not caring about the risk involved) and 5 were to do with a lack of training, experience or knowledge.
- 12 of the factors involved rules being inadequate, ignored or applied incorrectly.
- 11 more factors were associated with equipment being poorly designed or not available.
- 5 involved failings in the systems on board for directing or controlling the crew.
- 2 involved unsafe working practices.
- 2 cases involved procedures being violated.

Listing and capsize factors

The fundamental cause of 8 of the capsizes was snagging on an underwater obstruction. 2 were associated with poor initial stability, and a further 2 with overloading.

Swamping caused 7 of the accidents. In each case the vessel was working in heavy weather or sea conditions for which it was not suited.

Five were caused when lifting heavy weights by derrick. Of these, 2 were beam trawlers; 1 was on board a fishing vessel which was retrieving a heavy cod end, and the other 2 happened in harbour when loads were being moved. All of them arose from marginal stability for the task in hand and a lack of full understanding of stability by the operators.

Weights shifting on deck in heavy weather caused 2 accidents.

1 accident, on a clam dredger, was caused by equipment failure on one side while recovering catch; the uneven weight then caused the vessel to capsize.

2 of the capsize incidents had flooding as the fundamental cause. The flooding led to a lack of stability which in turn led to capsize.

One accident was caused by capsize during launching of a boat down a slipway, another was caused by a person trying to reboard a small boat from which he had fallen overboard, and yet another caused by overloading with a bulk catch of sand eels and the consequent free surface effect.

Analysis

A large proportion of capsize incidents occur because a vessel is operating in weather conditions for which it is not suited. Others involve overloading with fish either as the sole cause of a lack of stability, or when combined with fishing gear snagging. In each incident the skipper decided to either carry on working in poor weather or to continue loading the catch after the vessel was fully laden. Commercial pressures may explain such decisions, but in some instances skippers will either disregard safety or make an incorrect assessment of the risk being taken. Some capsizes occur because the skipper lacks knowledge of stability. Better training would help to avoid these accidents.

4.1.5 Fires and explosions

General

Between 1992 and 2000, 141 fishing vessel fires were reported to the Branch, 20 of which resulted in the loss of the vessel. The MAIB investigated 19 of the more serious fires, and 65 contributory accident factors have been established (see Appendix Table A9).

Fire factors

Of the 65 factors, 33 are classified as Human Factors and 27 as Failures of Equipment. 4 factors are associated with Design and Construction defects, and 1 fire was caused by an external factor.

Of the 27 classified as Failures of Equipment, 16 are "Item Failures" and 5 are "Material Failures".

Of the "Item Failures" 6 were associated with the main engine (ME) Fuel System and 2 with other ME Components. A further 2 were associated with Electrical Distribution.

A problem with the Fire-Fighting System was a revealed in 10 (over half) of the fires investigated.

Fires - human factors

Of the 33 Human Factors (see Appendix Table A10), 3 involved non-compliance with regulations and 5 incorrect installation and defective equipment. 11 factors were associated with crew routines including general unsafe working practices, training and procedures. 7 of the human factors were associated with equipment being badly maintained, misused or with personnel being unfamiliar with its use.

Text summaries

Examination of the text summaries shows that 13 vessels were lost owing to fire.

The precise cause could not be established in 8 (42%) of the accidents.

3 of the fires started in the accommodation and 15 (79%) in the engine room. In one case the position of the seat of the fire was not established.

Lack of training and inefficient fire-fighting was cited as significant in 8 (42%) cases.

In at least 2 incidents the engine room door was left open, which allowed the fire to spread quickly out of control.

A fuel leak was cited as the initial cause in 3 incidents, and a hydraulic oil leak in another 2.

One vessel sank because rubber piping to the bilge system melted to allow the engine room to flood.

Analysis

Poor housekeeping, poor fire-fighting standards and the combustible nature of many fishing vessels led to 14% of these being lost.

Most fires that start in the engine room are caused by equipment failure such as a pipe carrying hydraulic or fuel oil that starts to leak. The consequent oil spray lands on an unprotected hot surface such as an exhaust manifold, and ignites. The successful containment of the ensuing fire is dependent on early detection and an effective initial response. Analysis of the database has shown that the fire is often well-developed before it is detected. Poor fire-fighting techniques then allow the fire to get out of control.

The number of fishing vessel losses caused by fire can be reduced by identifying and removing potential risks, by understanding the nature of fires and through constant practice in dealing with them. Training should not be taken lightly, and crews must know how to use the equipment they have been provided with. Vigilance and good fire safety practice costs little or nothing.

4.1.6 Machinery

General

2,570 accidents were reported giving the initial accident category as "Machinery". The majority of these were minor accidents involving engine breakdown or a fouled propeller (see analysis of machinery accidents reports received in 1996 to 1999 in Section 3.1). 3 of the more serious were investigated. 2 involved a loss of propulsion close to shore followed by a grounding, foundering and loss. The third incident was investigated because the MAIB had received several reports involving machinery breakdown in the same vessel.

Analysis

Machinery accidents occur because of poor maintenance standards and/or poor operational procedures.

4.2 VESSEL LOSSES

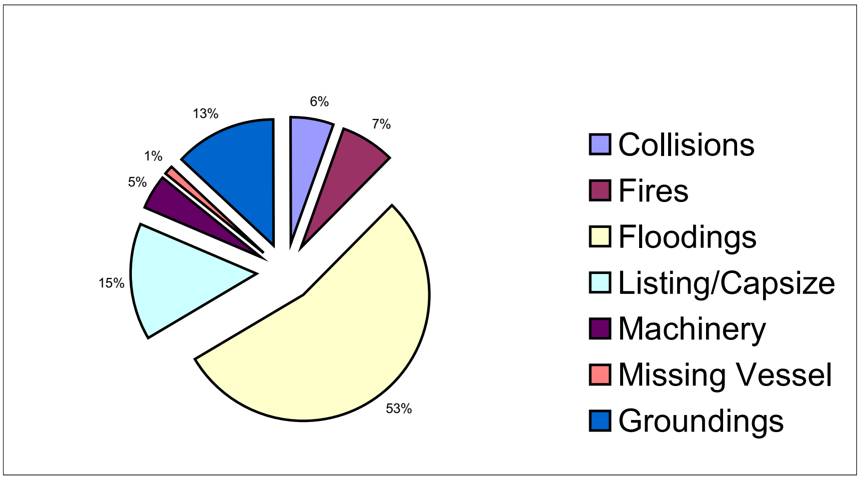
283 UK-registered fishing vessel losses were reported to the MAIB in the years 1992 to 2000. 130 were investigated. 333 accident factors were identified, 214 of which were human.

4.2.1 Vessel losses by initial incident type

Analysis of the 283 losses show that:

- 16 were collisions
- 20 were fires
- 153 were foundering/floodings
- 43 were listing and capsizes
- 13 were machinery
- 1 was a "missing vessel" accidents
- 37 were stranding and groundings

Figure 19: Vessel losses by initial incident category 1992-2000



4.2.2 Losses - technical factors

119 technical factors were identified (see Appendix Table A11)

- 53 were associated with failure of equipment and/or structure (see Appendix Table A12), of which:

    - 17 involved the failure of an item of machinery, usually engine room pipework

    - 9 involved the failure of a system, often the fire-fighting, bilge pumping system or ME fuel system

    - 8 involved the failure of structure, usually the hull structure

  - 7 involved material failure, usually pipework or hull, and
  - 5 involved corrosion.
- 16 involved external causes, for example, an underwater obstruction or another vessel
- 15 were associated with strong winds and high seas,
- 29 involved poor design and construction, of which:
  - 14 embraced inadequate design; and
  - 11 involved a defect associated with stability in the design such as control valve handles for sea cocks being positioned too low in the engine room. This means they cannot be reached even after minor flooding.
- 7 involved “cargo” such as overloading or cargo shift.

4.2.3 Losses - human factors

214 human factors were identified.

- 41 involved regulations or survey shortcomings:
  - 24 involved non-compliance with regulation or guidance (typically lack of lookout or vessel not complying with stability requirements);
  - 7 were to do with incorrect installation or defective structure (often liferafts incorrectly secured to the vessel, engine room bulkheads not fireproof/watertight).
- 61 factors were classified under the heading *Individual*. Of which:
  - 18 involved perception of risk (typically continuing to work or going to sea in too rough conditions, not wearing a lifejacket);
  - 19 involved a lack of training, knowledge, experience, competence or skill (skipper’s lack of knowledge of stability, lack of safety training – particularly fire-fighting, poor watchkeeping);
  - 7 involved fatigue; and,
  - 7 poor decision-making/information use.
- 57 human factors were classified under the heading *Equipment.* Of which:
  - 15 involved equipment being badly maintained (typically the bilge alarm/pump, emergency power supplies);

    - 15 referred to equipment not being available when needed (typically lifesaving or fire-fighting/detection equipment);

    - 10 factors involved equipment being poorly designed for operational use (watch alarms not waking watchkeeper, fishing gear not suitable with respect to vessel's stability).

    - 8 involved the misuse of equipment (use of video plotter for navigation, incorrect installation of HRU, using equipment to block freeing ports);

    - 9 recorded personnel being unfamiliar with the equipment or not trained in its use (examples include being unfamiliar with the bilge pumping arrangements).

- 37 of the human factors were *Crew Factors*. Of which:

    - 14 involved unsafe working practices (engine room door being hooked open at sea, weathertight doors and hatches not being closed);

    - 12 involved inadequate procedures (not shutting down engine or engine room before discharging fire-smothering gas).

4.2.4 Analysis - vessel losses - flooding

54% of fishing vessel losses occurred through flooding (down flooding and flooding through the hull), 15% through listing and capsize and 13% through groundings. The general factors that underlie accidents in these and other categories have been analysed in previous sections.

The majority of the flooding incidents occur through the hull, because of defective caulking, or SW pipework failure.

Comment

- Subdivision and pumping capacity should be able to cope with all but the most extraordinarily severe flooding incidents;
- Fishing vessel design should be such that the flooding of a single compartment should not result in loss;
- Means of isolating pipework and sea valves should be accessible after flooding is detected;
- Early warning should be given by operational bilge alarms;
- Pumping capacity should be able to cope with reasonable levels of predicted inflow and consideration should be given to protecting the power supply to bilge pumps so that they remain operational after severe flooding has occurred;
- Flooding through the hulls of wooden fishing vessels will take place from time to time, but this should not result in the loss of the vessel if proper care and attention is paid to design, maintenance and operational practices.

A number of the vessels were lost due to down flooding. In these cases, poor design and operational practices are the key factors. Flooding typically occurs in bad weather because doors, hatches and scuttles have been left open, or gradually through ventilators or air pipes which have been poorly sited. Most of these accidents could be avoided by good seamanship and a general awareness of the risks such openings provide.

There were 644 flooding accidents reported to the MAIB in the years 1992 to 2000. 153 (24%) culminated in the vessel being lost. That nearly a quarter of major flooding incidents end in foundering is a major cause for concern.

There is an urgent need to review the design criteria for fishing vessels including the capacity of bilge pumps, the watertight integrity of the bulkheads, and the maintenance of sea water service pipework.

4.2.5 Analysis - fires

14% of all fires reported to the MAIB have resulted in the vessel being lost. This is a high percentage and, to a large extent, can be attributed to poor design and inadequate practices.

Comment

- Crews rarely carry out fire drills, and fire-fighting equipment is not utilised effectively when required;
- Engine room doors are frequently left hooked open which allows a small fire to quickly get out of control;
- Remote stops are located in positions where they quickly become inaccessible in the event of a fire and many older skippers have never undertaken fire-fighting training;
- Fires at sea on fishing vessels may occur, but should not result in vessel loss.

4.2.6 Analysis - capsizes

A massive 70% of all major listing and capsize incidents culminate in vessel loss. This high percentage probably reflects that only the very serious listing accidents come to the notice of the MAIB, and capsize almost inevitably means the vessel is lost. Nothing more can be drawn from this statistic. The fundamental causes of these accidents have been explored in a previous section of this report.

4.2.7 Analysis - groundings

8% of all grounding accidents in the period resulted in vessel loss. Grounding accidents invariably happen because of poor watchkeeping, but the actual loss usually occurs because of the consequent hull damage and extensive flooding.

4.3 INJURIES TO FISHERMEN

All data for accidents to UK registered fishing vessels between 1992 and 2000, where injury or death of a fisherman occurred, were analysed. 1,140 fishermen were reported injured or killed (947 injured and 193 killed). 1,102 causal factors have been identified (see Appendix Table A14).

The most frequently recorded causal factors are as follows:

- 199 (19%) carelessness or negligence of the victim;
- 188 (17%) involving fishing gear or equipment (other than lifting equipment);
- 140 (13%) involving ship movement;
- 111 (11%) were categorised as *Other* [this group includes some of the worst accidents where multiple deaths occurred because the vessel foundered];
- 101 (10%) involving lifting gear and equipment;
- 48 (5%) involving sea washing inboard;
- 48 (5%) involving a slippery surface;
- 45 (4%) involving failure of deck machinery;
- 64 no known cause.

Other causal factors recorded include:

- Alcohol (11);
- Door or hatch not secured (17);
- Failure to comply with orders/warning (23);
- Failure to use protective clothing or equipment (18);
- Involving mooring or towing gear (30).

4.4 FATAL ACCIDENTS

Between 1992 and 2000 193 fishermen lost their lives, many of them in accidents which resulted in multiple deaths. 126 accidents involved one or more fatality.

The MAIB investigated 80 of the accidents, which resulted in 110 causal factors being positively identified. *No Known Cause* was recorded in 30 cases and the database entry was left blank in 31 cases. Note: These particular causal factors refer to the death, and not necessarily the accident which initiated the death.

Table 7: Fatal accidents: causal factors

Alcohol	5
Carelessness/Negligence of Accident Victim	2
Door or Hatch Not Secured	4
Electrical Faults	1
Failure of Deck Machinery or Equipment	4
Failure to Comply With Warnings/Orders	1
Failure to Use Protective Clothing or Equipment	8
Fatigue	1
Involving Lifting Gear and Equipment	4
Involving Mooring or Towing Gear and Equipment	5
Involving Other Fishing Gear and Equipment	12
Involving Trawl Boards	4
No Known Cause	30
Other	38
Sea Washing Inboard	17
Ship Movement	2
Slippery Surface	1
Unsecured Non-Fishing Gear/etc on Deck	1
Blank	31
Total	**171**

Notes:

30	*No Known Cause*	For example missing at sea, usually after a vessel has foundered.
38	*Other*	For example trapped on board a vessel which has foundered
29	*Involving Equipment Machinery etc*	For example sudden tensioning or mechanical failure.
17	*Sea washing inboard*	For example working on deck in unsuitable conditions, sometimes reported as abnormal wave.
15	*Failure of personnel*	For example not following instructions, not wearing protective clothing, acting recklessly/carelessly or not following good seamanship practice.
5	*Alcohol*	For example returning to the boat from ashore and falling in the water while getting on board

These figures apply to the incidents and not the number of fatalities. For example there were 38 incidents recorded as *Other*. These incidents involved many more than 38 fatalities.

4.4.1 Accidents involving multiple fatalities

Investigations have shown that 95 (49% of total) fishermen lost their lives in 28 accidents involving multiple (two or more) deaths. 25 accidents (88 deaths) involved vessels capsizing or otherwise foundering. 31 deaths occurred in 8 accidents when the vessel was on passage to or from the fishing grounds. 7 fatalities occurred where there was no accident to the vessel, 3 from inhalation of toxic fumes and 2 falling overboard while boarding the vessel (alcohol involvement). 2 washed overboard by an abnormal wave.

4.4.2 Text summary analysis

Of the 126 accidents that involved fatalities, 80 were investigated (146 lives). 46 were not investigated (47 lives). From an analysis of the text and factors for all these (investigated and non-investigated) case records the following conclusions have been reached:

- 104 fishermen lost their lives when their vessel was lost; at least 35 died because they were trapped on board when the vessel sank. The implications are that many lives could be saved by increasing the survivability of vessels, improving the escape arrangements and efficacy of the lifesaving appliances.

- 33 fishermen lost their lives through falling, or being washed, overboard. The implications are that safety lines, buoyancy aids, working in less rough conditions and fitting retrieval systems could reduce the number of deaths from this cause.

- 14 were dragged overboard by fishing gear often, though not exclusively, from potters. Improved working practices would save lives.

- 16 fishermen were killed by fishing gear striking them (sudden wire tension, part failure, lack of guard). Better safety awareness, including the wearing of personal protective equipment, is needed.

- 8 died as a direct result of alcohol. The most usual set of circumstances involved members of the crew boarding their vessel, often at night, and falling into the water in the process (poor access arrangements, lighting). Better safety awareness and a greater sense of personal responsibility is needed.

- 9 fishermen died from other causes – including fumes and electric shock. Better safety awareness and training is required.

- No information has been recorded about the deaths of a further 9 fishermen (mostly in 1992 when no text summary was entered).

The following points were noted during the analysis:

- At least 18 of the fatalities involved fishermen who were sailing single-handed.

- In at least 17 incidents the investigator noted that fishermen might have been saved had they been wearing lifejackets. Victims have fallen, or been washed overboard while working, and death has resulted because of the time it took to find and retrieve them. It has not been possible to establish whether death occurred because of drowning or hypothermia.

- Insufficient or inadequately maintained LSA was a contributory factor in 23 of the fatalities. Liferafts had not been supplied or carried, were not operated properly, or were lashed in their cradles so they could not float free.

- EPIRBs have not always functioned. There have been instances where they were registered to the wrong vessel, or have been prevented from floating free as the vessel sank.

- Heavy weather was a contributing factor in 20 fatalities. Usually working in very rough conditions.

4.4.3 Conclusions:

The majority of fishermen who lose their lives do so as a result of a vessel foundering, and not from fatal injury.

The study found that lives are not generally lost where flooding through the hull occurs, even though the vessel subsequently sinks. In such circumstances the situation evolves sufficiently slowly to enable the crew to prepare liferafts and seek assistance.

The largest loss of life occurs when a vessel capsizes without warning. Such incidents can happen when the vessel is on passage, sometimes in bad weather, and the crew is asleep. A feature of these accidents has been the speed with which the vessel goes over, usually because it lacks stability or sufficient buoyancy. This in turn prevents the crew escaping, having sufficient time to prepare lifesaving equipment or sending a distress message.

A common factor in many rapid capsizings is the failure, before the accident, to secure weathertight doors, hatches, or ice scuttles properly, despite clear directions in the stability book to do so when not in use at sea. The reason for this direction is to provide sufficient buoyancy to either save the vessel or to give the crew time to escape.

For those who do manage to escape, survival is dependent on the proper working and automatic release of the lifesaving appliances. These include the liferafts and the EPIRB. Too often these have not functioned through poor maintenance and siting. The information in the database does not reveal how many people died as a result of these shortcomings, but of the 104 lives lost as a result of foundering, at least 35 were trapped on board. Many of the other 69 probably escaped from the vessel, but then drowned or died of hypothermia.

Although not part of the Safety Study as such, the value of having readily available lifejackets and survival suits is very evident. On several occasions lifejackets could not be used quickly because they were stowed in inaccessible places.

SECTION 5 - SUMMARY OF CONCLUSIONS

5.1 CONCLUSIONS - ACCIDENT TRENDS

Accident trends

The overall accident rate is masked by those in the *machinery* category. If this is discounted, no trends emerge in any of the fishing vessel length ranges.

There was a marked increase in *machinery* accidents on <12m vessels in the years 1995,1996 and 1997. These can be attributed almost entirely to mechanical breakdowns caused by poor maintenance and lack of investment. A possible explanation is that impending decommissioning affected the investment in, and maintenance of, those vessels likely to be affected.

Loss trends

The loss rate rose to a peak of nearly 4 vessels per 1000 in 1994, and then fell to less than 3 vessels for the years 1996, 1997 and 1998. The years 1999 and 2000 saw a steep rise to over 5 vessels per 1000.

The rate recorded in 1999 and 2000 embraced, almost entirely, vessels over 12m in length. A disproportionate number of these losses involved vessels registered and owned in Scotland. The figures have also been affected, to a smaller extent, by a disproportionate number of losses involving Anglo-Spanish vessels of >24m in length.

Since 1995 there has been an increasing trend in losses caused by flooding in >12m vessels, whereas the number of reported flooding incidents from these vessels has been reducing overall. No explanation for this is offered, but there is a possible correlation between the reducing and then comparatively low loss rate due to flooding for >12m vessels between 1993 and 1997, and the five years of decommissioning. The final year of the last round of decommissioning was 1997. The loss rate increased dramatically in 1999 and 2000.

Fatality and injury trends

The accident rate for injuries to fishermen has reduced slightly from about 10 per 1000 fishermen in 1992 to around 9 per 1000 fishermen in 2000. The fatality rate, however, has increased steadily over the same period from about 1 per 1000 regular fishermen in 1992 to around 2.7 in 2000.

No reason for this increase in fatalities has been established. The statistics appear to show that although fishermen are having fewer accidents, they are more serious when they occur. It is unlikely that this is because of any reduction in reporting the less serious cases because nearly all come to the MAIB’s attention through third parties such as the coastguard.

5.2 CONCLUSIONS - ACCIDENT FACTORS

5.2.1 Collisions and groundings

Human factors, with poor lookout and poor watchkeeper competence in particular, lie at the root of nearly all collisions and groundings. Intended passing distances between vessels are sometimes too small and lead to collisions where rules and regulations are sometimes violated intentionally. Too many vessels ground returning to harbour after a long day, or series of days at sea: fatigue features as the main factor.

5.2.2 Flooding and foundering

Flooding is common in fishing vessels. There are strong suspicions that the 644 accidents brought to the MAIB's attention in 9 years represent only a small proportion of the total. Many remain unreported.

Weather and sea conditions contribute little to flooding incidents. Vessel age does not appear to be a factor, and flooding occurs as frequently in port as it does at sea. Although a higher percentage of Scottish-registered vessels in the 15-30 year old bracket seem to experience flooding incidents.

Flooding accidents occur predominately because salt water pipework fails or the hull integrity is breached. Downflooding is also common, but to a lesser extent. It often occurs because weathertight hatches, scuttles or doors have been left open in bad weather. Poor design frequently allows water to downflood through ventilators or air pipes, and little allowance seems to be made for vessels to list heavily to the extent that some vents and other openings are dangerously exposed.

The common factors in nearly all flooding accidents are poor operational practice, lack of maintenance and unsatisfactory design. The frequency with which flooding occurs suggests under-investment in the industry in general, and that a number of vessels are fishing with unidentified shortcomings.

Bilge alarms, when operating correctly, give early warning of high water levels but, too often, fail to operate when required. There are a number of recorded incidents where the skipper and crew knew the alarm was defective but sailed nevertheless. Flooding when detected early can often be controlled but, if the bilge alarm does not operate, the first indication of a problem may be a loss of engine or electrical power. By that time it is frequently too late, as valve controls are already underwater and the loss of power may have disabled the bilge pumps. Even when they have power they become choked with debris, and either operate inefficiently or not at all. On occasions, bilge pumps have been found to be insufficiently powerful.

5.2.3 Capsize

A large proportion of capsize incidents occur because the vessel is operating in weather conditions for which it is not suited. Others involve overloading. It is either the sole cause of a lack of stability, or it combines with fishing gear becoming snagged. These incidents follow decisions to either carry on working in poor weather or to continue loading the catch even though the vessel is fully laden. Commercial pressures may explain such decisions, but in some instances skippers will either disregard safety or make an incorrect assessment of the risk being taken. Lack of risk perception is a common feature in many such incidents.

Some capsize accidents have occurred because of the skipper's lack of knowledge of stability and failure to refer to the stability book. There is evidence to indicate a lack of awareness of free surface effect. Better training would help to avoid these accidents.

5.2.4 Fire and explosion - accident factors

Poor housekeeping, low standards of fire-fighting and the general combustible nature of many fishing vessels led to 14% of all fishing vessel fires resulting in the vessel being lost.

Most fishing vessel fires start in the engine room and are caused by a failure of equipment, typically a leak from a pipe carrying hydraulic or fuel oil. The consequent spray of oil lands on an unprotected hot surface such as an exhaust manifold and ignites. The successful containment of the ensuing fire is dependent on early detection and an effective initial response. Analysis of the database has shown that the fire is often well-developed before it is detected. Poor fire-fighting techniques then allow the fire to get out of control.

The number of fishing vessel losses caused by fire can be reduced by identifying and removing potential risks, by understanding the nature of fires and through constant practice in dealing with them. Training should not be taken lightly and crews must know how to use the equipment they have been provided with. Vigilance and good fire safety practice costs little or nothing.

5.2.5 Vessel losses

54% of fishing vessel losses occurred through flooding (downflooding and flooding through the hull), 15% through listing and capsize and 13% because of groundings.

644 flooding accidents were reported to the MAIB in the years 1992 to 2000 and, of these, 153 (24%) led to the vessel being lost. That nearly a quarter of major flooding incidents end in foundering is a cause for concern. There is an urgent need to review the design criteria for fishing vessels including the capacity of bilge pumps, the watertight integrity of bulkheads and the maintenance of sea water service pipework.

A number of the vessels were lost owing to downflooding. Poor design and operational practices are the key factors. Flooding typically occurs in bad weather because doors, hatches and scuttles have been left open or gradually through ventilators or air pipes which have been poorly sited. Good seamanship, and a general awareness of the risks such openings provide, could avoid most of these accidents.

14% of all fires reported to the MAIB resulted in the vessel being lost. This, too, is a high percentage, and to a large extent can be attributed to poor design and practices. Crews rarely carry out fire drills, and fire-fighting equipment is not utilised effectively when required. Engine room doors are frequently left hooked open, which allows a small fire to get out of control. Remote stops are located in positions where they become inaccessible in the event of a fire and many older skippers have never undertaken fire-fighting training. Fires at sea on fishing vessels will occur, but need not result in the vessel being lost.

A massive 70% of all major listing and capsize incidents culminate in vessel loss. This high percentage probably reflects that only the very serious listing accidents come to the MAIB's notice, and capsize almost inevitably means the vessel is lost. Nothing more can be drawn from this statistic.

8% of all grounding accidents resulted in vessel loss. Groundings invariably occur because of poor watchkeeping, but the loss usually occurs because of the consequent hull damage and extensive flooding.

5.2.6 Injuries to fishermen

Carelessness and/or negligence of the accident victim is the most frequently recorded causal factor in injuries to fishermen. Combined with other factors such as *Failure to Wear Protective Clothing or Equipment*, *Failure to Comply with Orders or Warnings* and *Alcohol*, it indicates a lack of awareness and safety culture within the fishing industry. These accident causes can be mitigated by better safety education and training.

The second most frequently recorded causal factor *Involving Fishing Gear and Equipment* can be combined with other operational factors such as *Involving Failure of Deck Machinery*, *Involving Towing or Mooring Gear* and *Failure of Lifting Gear.* These show that over 30% of all injuries occur while on deck handling fishing, lifting, towing or mooring equipment.

The environment also contributes significantly to the dangers. Major causal factors such as *Sea Washing Inboard, Ship Movement* and *Slippery Surface* all go to show that it is essential to take sensible seamanlike precautions and not to underestimate the power and effect of the sea.

A common feature in many injury reports is a near total failure to recognise the potential consequences of taking an unnecessary risk

5.2.7 Fishermen fatalities

The majority of fishermen who lose their lives do so, not because they were fatally injured, such as being hit by a parted wire or swinging load, but because their vessel foundered.

The founderings which cause the largest loss of life are those that occur rapidly and unexpectedly, often on passage when the crew is asleep. In these circumstances the speed of sinking denies the crew an opportunity to escape or prepare lifesaving equipment. Distress messages are not sent and crew members are trapped on board. In such circumstances the safety and survival of those who escape from a sinking vessel is dependent on the proper working and automatic release of the lifesaving appliances including the liferafts and the EPIRB. They fail too often through poor maintenance and siting. The figures are unable to tell us precisely how many lives were lost for this reason, but of the 104 lives lost through the vessel foundering, at least 35 were trapped on board. Many of the other 69 probably escaped from the vessel but then drowned or died of hypothermia.

Appendix

Accident Factor Tables

Table A1: Collision Accident Factors

	Factor Classification					
How/Why	Environmental	External Causes	Failure of Equipment &/Or Structure	Human Factor	(blank)	Total
Allocation of Responsibility Inappropriate				3		3
Communication				1		1
Competence and Skill				2		2
Equipment Badly Maintained				1		1
Equipment not Available as Needed				2		2
Fatigue and Vigilance				3		3
Floating Objects		1				1
Inadequate Resources				1		1
Item Failure			1			1
Manning (Rotation/Watches)				1		1
Non-compliance				23		23
Other Vessel		1				1
Perception of Risk				9		9
Performance Affected by Visual Environment/Visibility				3		3
Poor Decision-Making/Information use				4		4
Procedures Inadequate				1		1
System Failure			1			1
Training, Inexperience, Knowledge				1		1
Unsafe Working Practices				6		6
Violation of Procedures				5		5
Visibility	1					1
(blank)	1			1		2
Total	2	2	2	67		73

Table A2: Grounding Accident Factors

	Factor Classification		
How/Why	Failure of Equipment &/Or	Human Factor	Total
Allocation of Responsibility Inappropriate		3	3
Communication		4	4
Competence and Skill		4	4
Equipment Badly Maintained		1	1
Equipment Design - Manufacturer		1	1
Equipment Misuse		4	4
Equipment not Available as Needed		1	1
Equipment Poorly Designed for Operational use		1	1
Fatigue and Vigilance		9	9
Health: Drugs/Alcohol		2	2
Item Failure	4		4
Management and Supervision Inadequate		5	5
Manning (Rotation/Watches)		1	1
Non-compliance		10	10
Perception of Risk		5	5
Perceptual Abilities		1	1
Performance Affected by Visual		2	2
Personnel Unfamiliar with Equipment/Not Trained in		3	3
Poor Decision-Making/Information use		4	4
Procedures Inadequate		5	5
System Failure	1		1
Training		2	2
Training, Inexperience, Knowledge		5	5
Training, Skills, Knowledge		1	1
Unsafe Working Practices		2	2
Violation of Procedures		1	1
Workload		1	1
(blank)			
Total	5	78	83

Table A3: Groundings - Breakdown of human factors

	Human Factor Classification						
How/Why	Company and Organisation	Crew Factors	Equipment	External Bodies Liaison	Individual	Working Environment	Total
Allocation of Responsibility Inappropriate		3					3
Communication		1		1	2		4
Competence and Skill					4		4
Equipment Badly Maintained			1				1
Equipment Design - Manufacturer				1			1
Equipment Misuse			4				4
Equipment not Available as Needed			1				1
Equipment Poorly Designed for Operational use			1				1
Fatigue and Vigilance					9		9
Health: Drugs/Alcohol					2		2
Item Failure							
Management and Supervision Inadequate		5					5
Manning (Rotation/Watches)		1					1
Non-compliance				10			10
Perception of Risk					5		5
Perceptual Abilities					1		1
Performance Affected by Visual Environment/Visibility						2	2
Personnel Unfamiliar with Equipment/Not Trained in use			3				3
Poor Decision Making/Information use					4		4
Procedures Inadequate		5					5
System Failure							
Training		2					2
Training, Inexperience, Knowledge					5		5
Training, Skills, Knowledge	1						1
Unsafe Working Practices		2					2
Violation of Procedures					1		1
Workload					1		1
Total	1	19	10	12	34	2	78

Table A4: Flooding Accidents - Identified Factors

	Factor Classification							
How/Why	Cargo	Design & Construction	Environmental	External Causes	Failure of Equipment &/Or Structure	Human Factor	Unknown	Total
Allocation of Responsibility Inappropriate						1		1
Beaufort Scale			9					9
Communication						2		2
Competence and Skill						2		2
Constructional Defect		1						1
Corrosion					5			5
Design Inadequate		5						5
Equipment Badly Maintained						16		16
Equipment Design - Manufacturer						2		2
Equipment Misuse						2		2
Equipment not Available as Needed						9		9
Equipment Poorly Designed for Operational use						3		3
Inadequate Resources						3		3
Incorrect Installation/Defective Equipment						2		2
Item Failure					12			12
Management and Supervision Inadequate						1		1
Material Failure					9			9
Non-compliance						8		8
Operator Error					1			1
Other Vessel				3				3
Overloaded	1							1

	Factor Classification							
How/Why	Cargo	Design & Construction	Environmental	External Causes	Failure of Equipment &/Or Structure	Human Factor	Unknown	Total
Perception of Risk						7		7
Performance Affected by Ship Movement/Weather Effects						3		3
Personnel Unfamiliar with Equipment/Not Trained in use						5		5
Poor Decision Making/Information use						3		3
Poor Housekeeping						1		1
Pressures – Organisational						1		1
Procedures Inadequate						7		7
Rope				3				3
Stability Defect		2						2
Structural Failure				1				1
Structure Failure					10			10
System Defect		1						1
System Failure					3			3
Training						1		1
Training, Inexperience, Knowledge						6		6
Training, Skills, Knowledge						2		2
Underwater Obstruction				1				1
Unsafe Working Practices						4		4
Vibration					2			2
Violation of Procedures						4		4
(blank)	1				2	22	8	33
Total	2	9	9	8	44	117	8	197

Table A5: Flooding Accidents - Identified Equipment Factors

	Factor	
What	**Failure of Equipment &/Or Structure**	**Total**
Bilge/deckwash System	1	**1**
BLANK	4	**4**
Bottom Shell	5	**5**
Bow	2	**2**
Electrical Installation	1	**1**
Emergency Elect Generation	1	**1**
Hull Mounted Appendix	1	**1**
M.E. SW Cooling System	13	**13**
Not Known	6	**6**
Side Plating	4	**4**
Side Shell	1	**1**
Stern	3	**3**
Weather Deck structure	2	**2**
Total	**44**	**44**

Table A6: Flooding accidents - identified human factors

	Factor	
How/Why	Human Factor	Total
Allocation of Responsibility Inappropriate	1	1
Communication	2	2
Competence and Skill	2	2
Equipment Badly Maintained	16	16
Equipment Design - Manufacturer	2	2
Equipment Misuse	2	2
Equipment not Available as Needed	9	9
Equipment Poorly Designed for Operational use	3	3
Inadequate Resources	3	3
Incorrect Installation/Defective Equipment	2	2
Management and Supervision Inadequate	1	1
Non-compliance	8	8
Perception of Risk	7	7
Performance Affected by Ship Movement/Weather Effects	3	3
Personnel Unfamiliar with Equipment/Not Trained in use	5	5
Poor Decision-Making/Information use	3	3
Poor Housekeeping	1	1
Pressures – Organisational	1	1
Procedures Inadequate	7	7
Training	1	1
Training, Inexperience, Knowledge	6	6
Training, Skills, Knowledge	2	2
Unsafe Working Practices	4	4
Violation of Procedures	4	4
(blank)	22	22
Total	117	117

	Factor	
Human Factor Classification	Human Factor	Total
Company and Organisation	6	6
Crew Factors	14	14
Equipment	35	35
External Bodies Liaison	14	14
Individual	22	22
None/Undetermined	22	22
Working Environment	4	4
(blank)		
Total	117	117

Table A7: Listing and Capsize - Breakdown of Accident Factors

	Factor Classification						
How/Why	Cargo	Design & Construction	Environmental	External Causes	Failure of Equipment &/Or Structure	Human Factor	Total
Beaufort Scale			8				8
Communication						1	1
Competence and Skill						2	2
Current			1				1
Design Inadequate		9					9
Equipment Design - Manufacturer						2	2
Equipment Misuse						2	2
Equipment not Available as Needed						3	3
Equipment Poorly Designed for Operational use						5	5
Ergonomic Failure		2					2
Item Failure					1		1
Non-compliance						7	7
Overloaded	3						3
Perception of Risk						6	6
Personnel Unfamiliar with Equipment/Not Trained in use						1	1
Poor Decision-Making/Information use						3	3
Poor Housekeeping						1	1
Procedures Inadequate						2	2
Solid Movement	2						2
Stability Defect		9					9
Training						1	1
Training, Inexperience, Knowledge						5	5
Training, Skills, Knowledge						1	1
Underwater Obstruction				8			8
Unsafe Working Practices						2	2
Violation of Procedures						1	1
Working Environment/Workplace						2	2
Total	5	20	9	8	1	47	90

Table A8: Listing and Capsize - Breakdown of Human Factors

	Human Factor Classification						
How/Why	Company and Organisation	Crew Factors	Equipment	External Bodies Liaison	Individual	Working Environment	Total
Beaufort Scale							
Communication				1			1
Competence and Skill					2		2
Current							
Design Inadequate							
Equipment Design - Manufacturer				2			2
Equipment Misuse			2				2
Equipment not Available as Needed			3				3
Equipment Poorly Designed for Operational use			5				5
Ergonomic Failure							
Item Failure							
Non-compliance				7			7
Overloaded							
Perception of Risk					6		6
Personnel Unfamiliar with Equipment/Not Trained in use			1				1
Poor Decision Making/Information use					3		3
Poor Housekeeping						1	1
Procedures Inadequate		2					2
Solid Movement							
Stability Defect							
Training		1					1
Training, Inexperience, Knowledge					5		5
Training, Skills, Knowledge	1						1
Underwater Obstruction							
Unsafe Working Practices		2					2
Violation of Procedures					1		1
Working Environment/Workplace				2			2
Total	1	5	11	12	17	1	47

Table A9: Fires and Explosions - Accident Factors

	Factor Classification				
How/Why	Design & Construction	External Causes	Failure of Equipment &/Or Structure	Human Factor	Total
Constructional Defect	1				1
Design Inadequate	1				1
Equipment Badly Maintained				1	1
Equipment Design - Manufacturer				1	1
Equipment Misuse				2	2
Equipment not Available as Needed				1	1
Equipment Poorly Designed for Operational use				1	1
Fire		1			1
Incorrect Installation/Defective Equipment				5	5
Item Failure			16		16
Layout Unsuitable for Task				1	1
Material Failure			5		5
Material Select Defect	1				1
Non-compliance				3	3
Operator Error			1		1
Personnel Unfamiliar with Equipment/Not Trained in use				2	2
Poor Housekeeping				1	1
Pressures – Organisational				1	1
Procedures Inadequate				3	3
System Defect	1				1
System Failure			3		3
Training				3	3
Training, Inexperience, Knowledge				1	1
Training, Skills, Knowledge				1	1
Unsafe Working Practices				5	5
Vibration			1		1
Total	4	1	27	33	65

Table A10: Fires and Explosions - Human Factors

	Human Factor Classification						
How/Why	Company and Organisation	Crew Factors	Equipment	External Bodies Liaison	Individual	Working Environment	Total
Constructional Defect							
Design Inadequate							
Equipment Badly Maintained			1				1
Equipment Design - Manufacturer				1			1
Equipment Misuse			2				2
Equipment not Available as Needed			1				1
Equipment Poorly Designed for Operational use			1				
Fire							
Incorrect Installation/ Defective Equipment				5			5
Item Failure							
Layout Unsuitable for Task						1	1
Material Failure							
Material Select Defect							
Non-compliance				3			3
Operator Error							
Personnel Unfamiliar with Equipment/ Not Trained in use			2				2
Poor Housekeeping						1	1
Pressures – Organisational	1						1
Procedures Inadequate		3					3
System Defect							
System Failure							
Training		3					3
Training, Inexperience, Knowledge					1		1
Training, Skills, Knowledge	1						1
Unsafe Working Practices		5					5
Vibration							
(blank)				1			1
Total	2	11	7	10	1	2	33

Table A11: Vessel Losses - Technical Factors

How/Why	Cargo	Design & Construction	Environmental	External Causes	Failure of Equipment &/Or Structure	Total
Beaufort Scale			14			14
Constructional Defect		1				1
Corrosion					5	5
Design Inadequate		14				14
Fire				1		1
Item Failure					17	17
Material Failure					7	7
Operator Error					2	2
Other Vessel				3		3
Overloaded	4					4
Rope				2		2
Solid Movement	2					2
Stability Defect		11				11
Structural Failure				1		1
Structure Failure					8	8
System Defect		3				3
System Failure					9	9
Underwater Obstruction				7		7
Vibration					2	2
(blank)			1	2	3	6
Total	6	29	15	16	53	119

Table A12: Vessel Losses - Failure of Equipment

What	Total
Bilge/deckwash System	1
Bottom Shell	5
Bow	2
Cargo handling System	1
Electrical - Distribution Network	1
Electrical Installation	1
Electrical Prime Mover	1
Emergency Elect Generation	1
Fire-Fighting System	4
Fishing Gear	1
M.E. Component	1
M.E. Fuel System	4
M.E. SW Cooling System	12
Not Known	7
Side Plating	2
Side Shell	1
Stern	2
Weather Deck structure	1
(blank)	5
Total	53

Table A13: Vessel Losses - Human Factors

How/Why	Company and Organisation	Crew Factors	Equipment	External Bodies Liaison	Individual	Working Environment	Undetermined	Total
Allocation of Responsibility Inappropriate		2						2
Communication	1	1		2	1			5
Competence and Skill					6			6
Equipment Badly Maintained			15					15
Equipment Design - Manufacturer				5				5
Equipment Misuse			8					8
Equipment not Available as Needed			15					15
Equipment Poorly Designed for Operational use			10					10
Fatigue and Vigilance					7			7
Health: Drugs/Alcohol					2			2
Inadequate Resources	2							2
Incorrect Installation/Defective Equipment				7				7
Layout Unsuitable for Task						1		1
Management and Supervision Inadequate		3						3
Non-compliance				24				24
Perception of Risk					18			18
Performance Affected by Ship Movement/Weather Effects						3		3
Performance Affected by Visual Environment/Visibility						2		2
Personnel Unfamiliar with Equipment/Not Trained in use			9					9
Poor Decision Making/Information use					7			7
Poor Housekeeping						2		2
Pressures - Organisational	2							2
Procedures Inadequate		12						12
Training		5						5
Training, Inexperience, Knowledge					13			13
Training, Skills, Knowledge	4			1				5
Unsafe Working Practices		14						14
Violation of Procedures					7			7
Working Environment/Workplace				2				2
Undetermined							1	1
Total	9	37	57	41	61	8		214

Table A14: Injuries to Fishermen - Causal Factors

Cause	Total
Access problems Embarking/Disembarking	2
Alcohol	11
Burst Pipe	3
Carelessness/Negligence of Accident Victim	199
Door or Hatch Not Secured	17
Electrical Faults	1
Failure of Deck Machinery or Equipment	45
Failure of Engine Room or Workshop Equipment	5
Failure to Comply With Warnings/Orders	23
Failure to Use Protective Clothing or Equipment	18
Fatigue	6
Involving Lifting Gear and Equipment	101
Involving Mooring or Towing Gear and Equipment	30
Involving Other Fishing Gear and Equipment	157
Involving Trawl Boards	31
No Known cause	64
No means of Access Used	2
Other	111
Person Lifting or Carrying Awkwardly	23
Sea Washing Inboard	48
Ship Movement	140
Slippery Surface	48
Unfenced Opening	5
Unsecured Non-Fishing Gear/etc on Deck	12
Total	1102