DEVELOPMENT OF STABILITY AND LOADING INFORMATION FOR SMALL FISHING VESSELS

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SUMMARY
In most countries there are no requirements for the stability of small fishing vessels. To introduce similar requirements to those applied to large vessels would penalise some sectors of the industry and make them less competitive. Some countries have introduced less stringent requirements, but these tend to be a compromise between providing a satisfactory level of safety, and minimising the impact on existing vessel types. This paper describes research conducted in the UK, which has led to outline proposals for the provision of guidance to fishermen regarding their level of safety. It is hoped that, given improved information, the industry will be able to maintain use of the existing fleet while becoming more aware of its limitations, perhaps with some improvement in the safety culture.

1. INTRODUCTION

A number of stability research projects were conducted recently for the Maritime and Coastguard Agency (MCA) in the UK. Although the projects had different objectives, and were targeted at different types of vessel, it is the author's belief that their findings are complementary in the context of safety in the fishing industry.

One project [Ref 1] was conducted with the objective of developing a method of providing loading guidance for fishermen on small vessels, for which no stability information currently exists. The project forms the basis of this paper. A related project [Ref 2] had a similar remit applied to larger vessels, for which stability booklets were available, but where simplified information was considered necessary. Both projects comprised phase 1 of the studies, with Phase 2 expected to be completed during 2005.

During the same period, another MCA research project studied the levels of safety provided by the minimum requirements of stability criteria. [Ref 3]. The project was aimed at vessels assessed under the IMO High Speed Craft Code but, since it comprised model tests on stationary vessels, the findings are applicable to all types of vessel.

Reports on each project are available on the MCA website: www.mcga.gov.uk

2. THE NEED FOR SIMPLE INFORMATION

2.1 Current Situation

The fishing industry is at, or near, the top of the list of the most hazardous occupations in most countries of the world. This statistic holds true for the full range of fisheries, from subsistence level operations in small craft to highly developed industrial operations. The fatality rate, world wide, is about 24000 per annum.

In terms of accidents in the fishing industry, capsizing and foundering are relatively rare events. In terms of fatalities they represent the greatest danger.

Stability booklets are of great value to the regulatory authorities, and to consultants who may be asked to advise on modifications. It is widely recognized however, that fishermen do not use stability information booklets as a means of ascertaining their level of safety on a regular basis. Most do not understand the presentations or their implications. It is understandable that fishermen frequently take the view that their vessel has passed the stability assessment, and therefore must be safe to operate.

Vessels under 12 metres in length make up about 80% of the UK fleet, and are not required to comply with any stability requirements or carry stability information. This situation is common throughout the world, although some countries do have requirements for small vessels, such as the Nordic Boat Standard applied in Iceland.

Stability has been the subject of extensive research throughout the world, and considerable effort has concentrated on the safety of fishing vessels. In the UK alone, there have been 5 other government funded research projects to study fishing vessel stability in the last 10 years [Refs 4 to 8], four of them specifically targeting small vessels. Despite this concerted effort, regulation of stability remains largely unchanged and casualties remain high.

2.2 Problems with Regulation

In many industries, accident rates have been reduced by a combination of regulation and a change to the safety culture. For the fishing industry, introduction of regulations alone is unlikely to have the desired effect for a number of reasons:

- The regulations may not address the hazards.

- The diversity of the fleet, environments and fishing methods may require complex regulation. This would be unrealistic with a large fleet and few surveyors.
- If standards are set high, existing vessels cannot comply and must be given exemption. If they are set low enough to include existing vessels, new vessels will be built to the required minimum standard. In either case, safety may not be improved.
- Prescriptive regulations introduced to one region put that fleet at an economic disadvantage, particularly in the modern global market. Industrial and political pressures are immense, and the resulting hostility degrades respect for the value of the requirements.
- With such a large fleet, the administrative costs of implementation and surveying would be high.
- The industry may adjust to minimise the effects.

The latter has been the case in the past, as demonstrated convincingly by Figure 1, which shows the tendency for large powerful vessels to be built just below the 10 metre limit, above which, catch restrictions become far more onerous. Some of these 'rule beaters' have proportions outside the normal envelope and give particular cause for concern. Some operate offshore with heavy trawl gear, and probably are more vulnerable than larger vessels conducting similar operations. There is no justification for them being exempt from stability assessment. Project 529 recommended that the requirements for larger vessels be extended to encompass these rule beating vessels, perhaps using the product of length, beam and depth to set the lower limit.

2.3 Problems with Safety Culture

When a vessel capsizes there are unlikely to be survivors, and so fishermen tend not to learn from the experience. Their only experience is of not capsizing, regardless of how they load and operate their vessel. Fishermen may blame the misfortune of others on an unseaworthy vessel, bad practice or freak conditions, and usually as a one-off incident that will not happen to them.

It is widely believed that a history of safe operation is evidence of safe practice. This is a fallacy, implying that all vessels are safe until the day they capsize, at which time they become unsafe.

Fishermen have an intuitive feel for the stability of their vessel. They know that overloading, adding weights high up, or applying large heeling moments can be dangerous. They may claim to be the best qualified to understand the dangers of their operations. For some aspects that may be the case, and if they understand the danger but fail to take appropriate precautions there is little that can be done without a change to the safety culture.

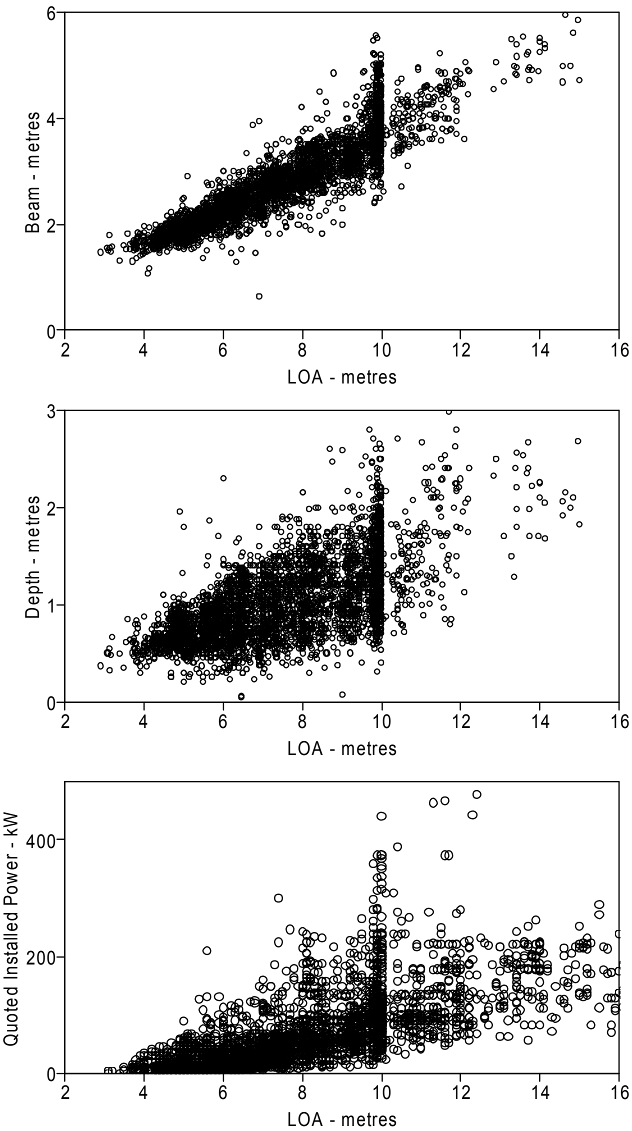

Figure 1: Characteristics of the UK small vessel fleet

2.4 The Value of Information

Fishermen resent the imposition of restrictions on their operations, and want to remain responsible for their safety. Unfortunately, they have no information on their level of safety with regard to stability, and so should not be blamed for pushing their vessel too far.

Some vessels are mush less safe than others, but if they are operated with caution in sheltered conditions they may maintain an adequate level of safety. They need not necessarily be prevented from operation but their limitations must be made clear to the fisherman.

If the information is also made clear to the crew, by posting it clearly on the vessel, they may be less inclined to accept a skipper's disregard for safety. If the information is made clear to the family and wider community, by marking a minimum recommended. freeboard for example, other pressures may be brought to bear on the fisherman. This might help to improve the safety culture within a community.

		Pelagic Trawling	Demersal Trawling	Beam Trawling	Dredging	Netting	Potting
Regular, transient hazards	**Handling the gear**			Boarding the gear	Boarding the gear		
	Boarding the catch	Lifting cod end from high block	Lifting cod end from high block		Boarding the gear. Blocking freeing ports		
Occasional, prolonged hazards	**Handling abnormal loads**		Lifting cod end from block high & aft or offset	Lifting from derrick block high & outboard	Lifting from derrick block high or outboard		
	Coming fast		Moment applied under way or in tideway	Moment applied under way or in tideway	Moment applied under way or in tideway		
	Freeing fastened gear		Moment applied high & aft or offset	Lifting from derrick block high & outboard	Lifting from derrick block high & outboard		Moment applied high & offset
	Overloading the boat	Bulk fish. Reduced freeboard & cargo shift	Bulk fish. Reduced freeboard & cargo shift		Shellfish on deck. Reduced freeboard & cargo shift	Net bins on deck. Reduced freeboard & cargo shift	Moving pots. Reduced freeboard & stability
Progressive, permanent hazards	**Modifying the gear**	Larger nets, drums or doors	Larger nets, drums or doors	Longer or heavier beams or derricks	Longer or heavier beams or derricks	Repositioned or more powerful net haulers	Repositioned or more powerful pot haulers
	Modifying the boat	Many possibilities	Many possibilities	Many possibilities	Many possibilities	Many possibilities	Many possibilities

Table 1: Operational hazards

Fishing Method	Number of vessels (1997)	Casualties Jan 91 – Feb 97	Casualty Rate per 1000/year
Beamers & Dredgers	262	13	8.1
Trawlers	938	7	1.2
Potters	1275	8	1.0
Netters & Liners	2641	5	0.3
Hand Gears	1441	0	0.0
Total	6557	33	0.8

Table 2: Under 12 m casualties by fishing method

3. IDENTIFYING THE HAZARDS

If information on safety is to be of any value it must address the particular hazards that are relevant to the vessel, its operation and environment.

3.1 Operational Hazards

In UK waters alone there are a wide variety of vessel types, employing a range of fishing methods, in conditions ranging from calm sheltered waters to the open ocean. One might argue that each vessel is unique in terms of the combination of these aspects, but it is possible to categorise the hazards in a number of ways.

Table 1 presents typical hazards for 6 common methods of fishing. They are grouped according to their frequency and duration. Hazards that occur regularly tend to be of short duration, so that the probability of a stability incident resulting from them is kept low. Hazards of longer duration tend to occur less frequently. Some, however, are of a permanent nature, at least in terms of the fishing operation, and may be progressive, perhaps due to an accumulation of small changes.

All of these hazards are under the direct control of the crew, and can be avoided or reduced. General advice on their effects may be contained in the stability book, but they are not normally addressed as part of the stability assessment.

Some administrations require the more frequent hazards, such as boarding of the gear, to be assessed against the criteria and, in the UK, similar requirements are imposed on other types of working vessel. In most countries, including the UK and Iceland, fishing vessels are exempt from such scrutiny and, in many cases, have insufficient stability margin to comply with the minimum requirements when handling their gear, even when it is empty. This is particularly true of beam trawlers and scallop dredgers, as discussed in Ref 4, and demonstrated by the casualty data for small vessels presented in Table 2. The stability curves for a UK beam trawler are presented in Figure 2. With the fishing gear supported from the derricks, which are raised to 45 degrees, the residual stability is reduced dramatically. If one trawl contains a large weight of sand or debris, the residual stability may be negligible.

In the Nordic Boat Standard, vessels fitted with lifting gear must comply with a maximum heel angle limit when lifting, but there is no requirement for the residual stability with the lifting moment applied.

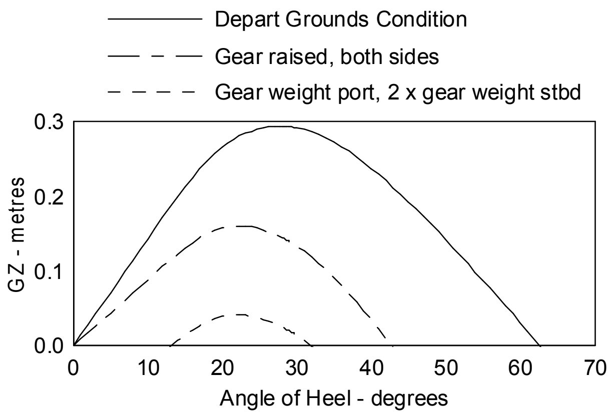

Figure 2: The effects of gear handling on the stability of a beam trawler

3.2 Environmental Hazards

The environmental hazards most likely to be encountered are: wind heeling, shipping water, loss of stability on a wave, rolling in waves, impact from breaking waves, icing and flooding.

These differ from the operational hazards in that the crew have only indirect control over them. They can, for example, maintain secure closures to prevent downflooding from shipped water, and keep the vessel head to severe seas to reduce the possibility of loss of stability on a wave, or being heeled to a large angle by a breaking wave. The crew can be provided with warnings and advice on ways to minimise the dangers but they cannot necessarily avoid the hazards.

This has been recognised in Iceland, with IMA´s weather and sea state information system, which helps fishermen to identify and avoid areas where hazardous waves are likely to be encountered. [Ref 9].

4. SMALL CRAFT REGULATIONS

4.1 Fishing Vessels in Other Countries

Typically, administrations either apply standard IMO criteria to all fishing vessels, or just to the larger vessels with no stability regulation of small craft. The only countries found to have specific requirements for vessels under 12 metres, that were not the IMO criteria, were those of France, New Zealand, Russia and the Nordic countries. It is understood that requirements are under development in Canada.

France imposes minimum freeboards for decked vessels. Undecked vessels have maximum weight limits and requirements for reserve buoyancy, with a simple formula for vessels without hydrostatic data. There is a minimum GM requirement, for which a roll test may be used, and restrictions on reduction of freeboard due to lifting. Only decked vessels are permitted to operate towed gear, and are subject to restrictions on propulsive power and the minimum GM when handling the gear.

New Zealand restricts the operation of towed gear to decked vessels that comply with standard IMO criteria, and have adequate range of stability. Non-decked and partially decked vessels are restricted to enclosed waters or inshore limits and must be fitted with reserve buoyancy. Freeboard requirements are applicable to all decked and non-decked vessels. Simplified requirements apply to vessels less than 6 metres in length, operating in enclosed waters or within 2 miles of the shore. A simple heel test is conducted, with an angle limit, and minimum heeled freeboard for decked boats.

The Russian regulations apply to vessels of between 4.5 and 10 metres in length. There are freeboard and GM requirements, and minimum angle of downflooding and range of stability apply to decked vessels. For vessels equipped for towing or lifting, there are heel angle and freeboard limits when handling the gear and suffering a shift of the gear or catch. Undecked vessels have restrictions on: permissible wave height, residual freeboard, beam, roll period, bow height, distance from shore and speed. Stability is considered sufficient for rough water if the freeboard requirements are met when the vessel is heeled by a transverse shift of the design load.

The Nordic Boat Standard limits the maximum load, having regard to the freeboard, strength and stability. Minimum freeboards are assigned to both open and closed boats. For vessels equipped for lifting there is a heel angle limit. There is a GM requirement and, for decked vessels, GZ and range of stability requirements. There is an option for physical measurement of GZ. A heel test is required for open boats, with freeboard and heel angle limits. Norway and Iceland apply this standard to vessels of 6 to15 metres.

The Nordic Boat Standard, and the requirements of Denmark, New Zealand and Russia, all include a minimum range of positive stability for decked vessels. New Zealand and Russia require a range of not less than 60°, while Denmark and the Nordic Boat Standard require 70°. In all cases it is assumed that all watertight closures are secured.

The Nordic boat standard, France, New Zealand and Russia all require load lines.

4.2 Other Small Vessels in UK

Small commercial vessels, other than fishing vessels, must comply with the appropriate MCA code of practice. For workboats, this includes minimum freeboard and a load line, and standard IMO requirements for the GZ curve. A vessel equipped for lifting must comply with heel angle, freeboard, GZ curve and range of stability requirements with the maximum lifting moment applied.

Operation of non-commercial vessels is unregulated, but the European Directive applies when a new vessel is placed on the market. This includes a requirement for adequate buoyancy and stability that will normally be met by compliance with the International Standard ISO 12217. The requirements vary depending on the anticipated environmental conditions, they differ for boats above and below 6 metres in length, and compliance may be shown by calculations or physical tests. The standard sets out to ensure that the boat can carry a maximum designated load, with adequate stability to handle offset loads, and adequate freeboard to any downflooding openings.

4.3 Summary

Whilst most countries do not regulate small vessels, those that have imposed regulations on their industry fall into two groups: those applying standard IMO criteria and those that have developed specific small craft requirements. For the latter, there is a common theme, with minimum freeboard, range of stability, and ability to withstand heeling moments applied by the fishing operations generally considered to be important.

5. HOW SAFE ARE IMO CRITERIA?

The first stability criteria to be widely adopted were those developed by Rahola in the 1930s, and they continue to form the basis of the IMO requirements for most vessels. They require vessels to maintain a minimum level of stability, and are seen by many as providing a working solution, but have a number of limitations:

- They measure stability in the absence of heeling moments, so residual stability is not addressed.
- They have a statistical, rather than technical, basis.
- The sample vessels available to Rahola were not representative of the wide variety of size and form to which the criteria are now applied.
- There is no regard for the size of vessel or the seastate in which it operates, so large vessels in sheltered areas require the same GZ values as small vessels in exposed waters.

In 2002, Francescutto [Ref 10] described the proposals and limited progress that have been made in this field, and promoted an analytical approach, relying on the ever more sophisticated computer tools available for modelling ship responses to waves. Such an approach may never be suitable for small fishing vessels however, which lack the necessary drawings and budgets.

MCA Research Project 509 [Ref 3] recently provided information on the levels of safety provided by stability criteria. The study concerned high speed craft, but comprised model tests on a wide range of vessel types, intact and damaged, when stationary in waves. Unlike most experimental work on stability, the models were configured to match the criteria, rather than ballasted to actual vessel conditions. The findings are considered applicable to all types of vessel, and particularly to fishing vessels, which frequently operate with residual stability that is close to, if not below, the minimum requirements.

Figure *3* reveals that the minimum wave heights required to capsize models that just complied with the criteria were surprisingly low, and within the normal operating environment of typical vessels. The tests were conducted to determine the worst combination of heading and wave period for each model configuration, and therefore represent "optimised" data in terms of minimum wave heights to capsize.

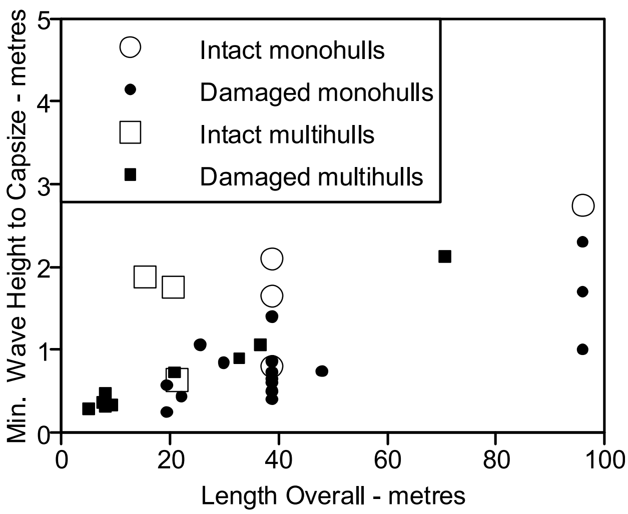

Figure 3: Capsize test results for models of vessels that just comply with IMO criteria

6. ALTERNATIVE SAFETY ASSESSMENT

The study revealed that the stability parameters used in conventional criteria are not necessarily the best measure of safety from capsizing in waves. The range of stability proved to be the most important, with the maximum righting moment of secondary value. The requirements for minimum GM values, angles of maximum GZ, and areas under GZ curves appear to provide a level of safety in most cases by controlling parameters that tend to be related to range and righting moment. Figure 4 illustrates a strong linear relationship found between the minimum wave height to capsize and the residual stability, defined as a function of the range and maximum righting moment.

The data for monohulls and multihulls, intact and damaged, upright and heeled, all fell within a common envelope. It appears that all floating bodies may be judged simply on their size and residual stability.

The experiments highlighted the importance of the size of the vessel relative to the waves, which is not addressed by contemporary regulations, with constant GZ requirements for all combinations. The study concluded with a proposal for a radical change to stability assessment, using a formula to relate residual stability and the beam of the vessel to the anticipated operating environment.

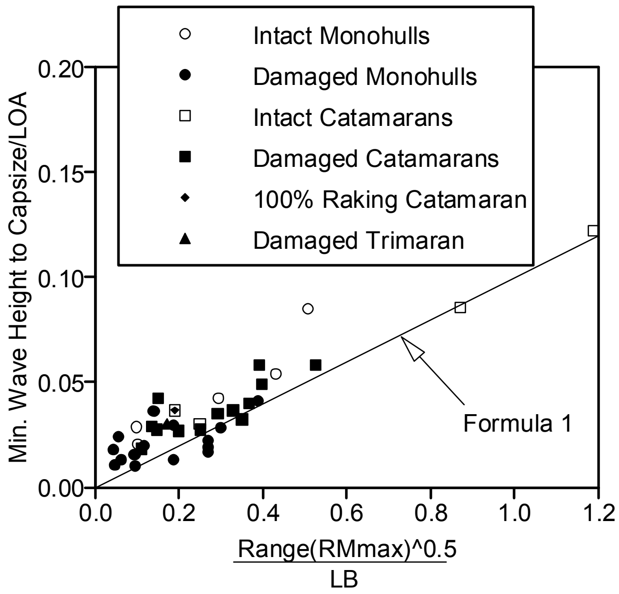

Figure 4: Variation of wave height to capsize with stability

The line labelled Formula 1 on Figure 4 represents a fit to the experimental data, defining the minimum wave height to capsize as:

$$\text{Formula 1:} \qquad \text{WaveHeight} = \frac{\text{Range}\sqrt{\text{RMmax}}}{10\,\text{Beam}}$$

Where the range of stability and maximum righting moment are determined for the residual curve after taking account of any anticipated heeling moments.

Some real fishing vessel casualties are plotted for comparison with the experimental data on Figure 5. They indicate much higher wave heights, but the data were derived from eyewitness accounts of the approximate wave heights at the time of the casualty. Such accounts frequently overestimate the seastate, particularly when a casualty occurs, but of course the wave that caused the capsize might have been somewhat greater than the estimated significant height. The data, therefore, can only be regarded as approximate. One might expect them to lie above the envelope of model data because they do not necessarily represent the minimum wave heights to capsize.

Formula 1 could provide the basis of an alternative method of stability assessment, using wave statistics to relate the minimum height to capsize to the significant height of the seastate, or the forecast of dangerous waves such as provided by the IMA.

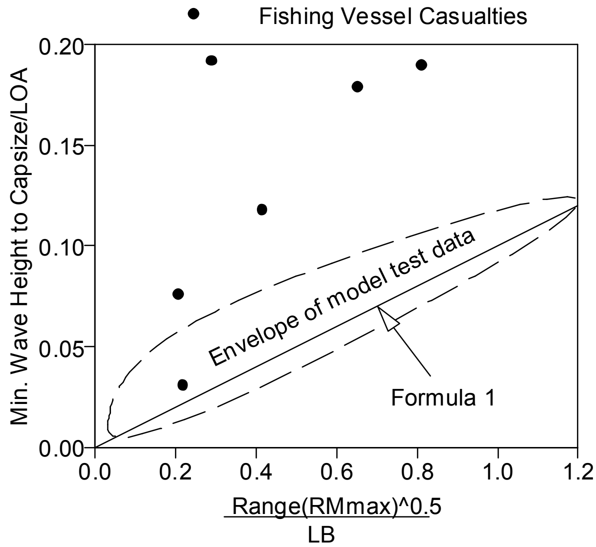

Figure 5: Relationship between tests and real casualties

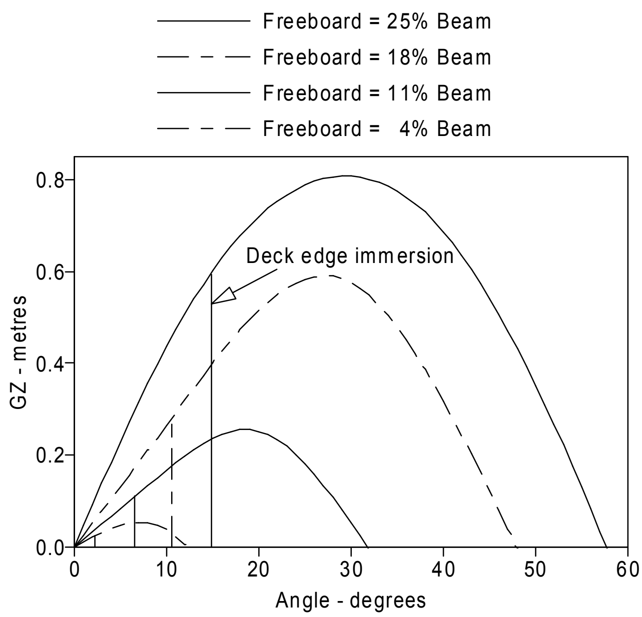

Figure 6: The relationship between freeboard and stability

This method also relies on conventional calculation of the stability and so would only be suitable for the larger fishing vessels, but it provides a valuable insight into the parameters of most importance for all vessels.

It is interesting to note the similarity between these findings and the requirements of most regulations developed recently for small fishing vessels in various countries, as summarised in section 4.3. Freeboard, range of stability, and the maximum righting moment may be assessed independently, but are intimately related, as Figure 6 illustrates.

7. SIMPLIFIED INFORMATION FOR LARGE VESSELS

7.1 Information Displays

Some countries have recognised the need for simplified information, and a number of methods are in use or proposed. They include the Stability Notice, which is compulsory in Norway and recommended in Iceland. The simple format of this single page poster appears to be an excellent means of conveying the relevant information to the whole crew.

In the USA, a more complex method of presentation described as a Safe Loading Matrix is under development [Ref 11]. The matrix combines details of the loading of the vessel in terms of the tank contents and quantity of catch, and assigns a colour code to indicate the level of safety for each combination. It is only suitable for vessels with full stability information, and this makes it less suitable for the smallest vessels. An example is shown in Figure 7.

7.2 Vessel Monitoring

Both types of presentation described above have been combined with monitoring of the vessel, with draught and roll period monitoring in Iceland, roll angle and period monitoring by a group in Canada. This is a further refinement that is less suitable for small vessels.

The Icelandic system of draught and roll period measurements has been complemented by a method of estimating the height of wave required to cause capsize [Ref 9]. This assesses the risk of capsize by steep or breaking waves, and has a rather different basis to that described in section 6. The safety of the vessel in the absence of transient or occasional heeling moments is addressed, and so it is likely that a breaking wave would be required to cause a capsize.

7.3 Heeling Moment Monitoring

In some countries almost all beam trawlers, and many other vessels, are equipped with a warp tension monitoring system. The systems range from a simple load cell at the lifting block with a display in the wheelhouse, to a highly developed system integrated with the winch and engine controls. The latter provides the benefits of automated pay out of the winch and reduction of engine revolutions or propeller pitch in the event of a sudden increase in warp tension, as would occur when coming fast. Because they give early warnings of increasing load, the trawls tend to be recovered before they contain excessive sand, stones or other debris, and so heavy lifts are not undertaken. Whilst they are designed as an aid to efficiency, they provide valuable information on the heeling moment being applied, and that is the greatest hazard for beam trawlers.

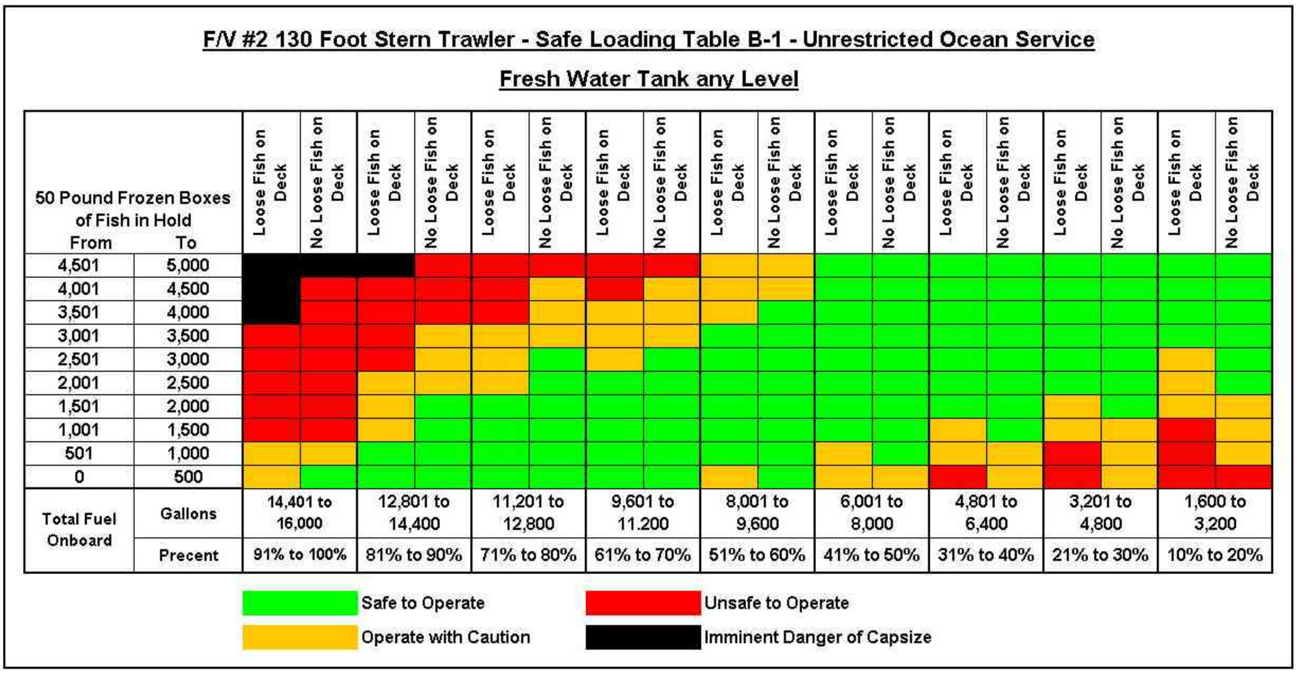

Figure 7: Example of a Canadian Safe Loading Matrix

As Table 1 shows, overloading represents only one of many potential hazards. Only the warp tension monitoring system enables assessment of the heeling hazards. Monitoring of the heel angle, as in the Canadian system, is not sufficient because, with both port and starboard warps overloaded the situation is hazardous but the heel may be negligible. The potential for monitoring systems to address the hazards is illustrated by Table 3. In particular, this highlights the limitations of vessel monitoring alone, without providing information on the heeling loads, or considering the residual stability with the moments applied.

	Pelagic Trawling	Demersal Trawling	Beam Trawling	Scallop Dredging
Handling the gear	Not required	Not required	Load monitoring	Load monitoring
Boarding the catch	Load monitoring	Load monitoring	Not required	Load monitoring
Handling abnormal loads	Not required	Load monitoring	Load monitoring	Load monitoring
Coming fast	Not required	Load monitoring	Load monitoring	Load monitoring
Freeing fastened gear	Not required	Load monitoring	Load monitoring	Load monitoring
Overloading the boat	Vessel monitoring	Vessel monitoring	Not required	Not required

Table 3: Use of monitoring systems to address operational hazards

8. APPLICATION TO SMALL UK VESSELS

Without stability data or documentation, most methods being developed for large vessels have limited application. The exception is the Stability Notice, which does not necessarily rely on precise stability calculations.

It should be possible to develop guidelines on the minimum requirements for loading and handling small vessels, having due regard to their adopted fishing method. The following preliminary recommendations have been derived from the studies conducted so far.

8.1 Freeboard and Loading

It is clear that the loading and freeboard of a vessel are fundamental to its safety. Increased freeboard gives greater maximum righting levers and range of stability, and reduces vulnerability to water on deck, downflooding and the effects of accidental flooding. For small boats, it may not be worthwhile to introduce a complicated derivation of a minimum value, because there is no such thing as a minimum 'safe' value. Greater freeboard will always provide greater safety.

A typical minimum value adopted in some countries for decked vessels is 0.2 metre, and this might provide a useful basis for the UK fleet, with a greater value for open boats. It may be appropriate to relate the minimum freeboard to the beam, to ensure an adequate angle of deck edge immersion and residual stability

If a mark were clearly visible on the outside of the hull, the fishermen and their community would be able to monitor the loading of the vessel on departure and arrival. The dangers of loading the vessel beyond this mark would need to be made clear, and, it is hoped, pressure from members of the crew, family and the wider community might help to bring about a change in the safety culture.

In some cases it may be more useful to advise a maximum load, for example, in the case of a potter, where the number of pots carried may represent the greatest hazard and is clearly defined. A value could be determined simply from the principal dimensions of the vessel and its unladen freeboard.

8.2 Applied Moments

It is recommended that a maximum safe lift be advised for all vessels fitted with lifting devices. A distinction should be made between the lifting devices associated with different fishing methods. Where more than one lifting point is used, or where vessels are fitted with moving derricks, such as beam trawlers, a combination of lifting situations may need to be considered.

It is anticipated that the assignment of specified maximum lifts would be related to the resultant angle of heel and/or the reduction in freeboard. For example, immersion of the deck edge would be readily observed and might represent a dangerous situation.

8.3 Stability Notice

As for the larger vessels, the guidance information should be presented clearly on a single page, preferably in a pictorial form that the crew will readily absorb. The format used in Iceland and Norway should be suitable, and could be modified to incorporate advice on lifting where that represents a hazard. See Figure 8.

The notice should include information on the minimum freeboard or maximum load, and the maximum lift or minimum residual freeboard when lifting. It should also include advice on maintaining adequate stability, which is relevant to the vessel and its operation.

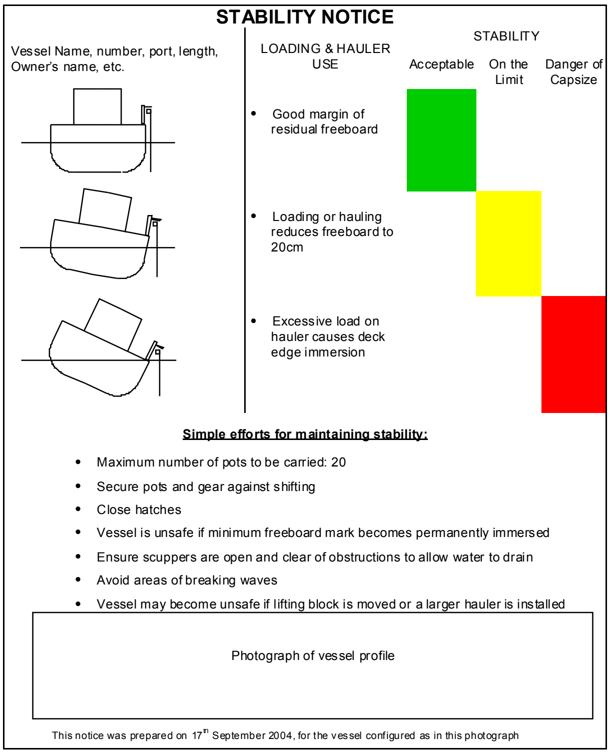

Figure 8: Example Stability Notice for a small potter

The notice should be dated, and the inclusion of a photograph would help to highlight modifications to the vessel, or its gear, that might have affected its stability. It should be posted in a prominent position in the wheelhouse.

8.4 Future Developments

More detailed studies are now required to derive more precise guidelines for the preparation of Stability Notices, particularly where stability data are not available. To this end, it is anticipated that the MCA will fund a second phase of their Research Project 529.

It is hoped that the experimental capsize studies conducted on other vessel types will be extended to include small fishing vessels. The type of criterion proposed in section 6 might then be validated for these vessels, and perhaps simplified for use when stability data are not available.

9. CONCLUSIONS

It is very difficult, and may be unnecessary, to impose prescriptive regulations on a fleet of small vessels. It may be preferable to provide simple information that will enable the operators to evaluate their level of safety in terms of the vessel, its operation and the local environment.

Safety of the vessel is variable, may be inadequate, and is under the control of the fisherman. This message must be conveyed clearly to fishermen.

Safety from capsize is closely related to the size of the vessel in relation to the seastate, and the residual range of stability with operational heeling moments applied. The latter is heavily dependent on the residual freeboard. Their relatively small size, and frequent application of large heeling moments, are significant factors contributing to the vulnerability of fishing vessels. It is essential that their residual stability is addressed by regulatory minimum requirements where appropriate, and their vulnerability conveyed to the fishermen.

All fishing vessels should carry a Stability Notice, but this need not require complex analysis of the stability. It should convey recommendations on the minimum freeboard or maximum load, and the maximum safe lift. The detailed format of these notices is the subject of ongoing projects for the MCA.

In the UK, current stability regulations apply to vessels over 12 metres, but there are a number of vulnerable vessels under 10 metres, which operate similar gear, and in the same environment as larger vessels, that should be assessed on an equivalent basis.

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11. KEYWORDS

Fishing Vessel
Stability
Stability Information
Stability Criteria
Stability Regulation
Stability Monitoring
Capsize