Report on the investigation of the capsize

and loss of the 9.8m stern trawler

Bounty

4 miles off Berry Head, South Devon

on 23 May 2005

Marine Accident Investigation Branch
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Extract from

The United Kingdom Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2005 – Regulation 5:

"The sole objective of the investigation of an accident under the Merchant Shipping (Accident Reporting and Investigation) Regulations 2005 shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

NOTE

This report is not written with liability in mind and is not intended to be used in court for the purpose of litigation. It endeavours to identify and analyse the relevant safety issues pertaining to the specific accident, and to make recommendations aimed at preventing similar accidents in the future.

CONTENTS

GLOSSARY OF ABBREVIATIONS AND ACRONYMS

DARDNI	-	Department of Agriculture and Regional Development for Northern Ireland
DSC	-	Digital Selective Calling
EPIRB	-	Emergency Position Indicating Radio Beacon
GPS	-	Global Positioning System
GRP	-	Glass Reinforced Plastic
HRU	-	Hydrostatic Release Unit
kg	-	Kilograms
kW	-	Kilowatts
MCA	-	Maritime and Coastguard Agency
MOU	-	Memorandum of Understanding
MSN	-	Merchant Shipping Notice
OAN	-	Operational Advice Note
RFA	-	Royal Fleet Auxiliary
RIB	-	Rigid Inflatable Boat
RNLI	-	Royal National Lifeboat Institution
RPM	-	Revolutions-per-minute
UTC		Universal Co-ordinated Time
VHF		Very High Frequency

Figure 1

Figure 2

Bounty

SYNOPSIS

At about 0930 on 23 May 2005, the small fishing vessel *Bounty* capsized and sank in Lyme Bay. The vessel had her trawl caught on a seabed obstruction at the time. The two crew members found themselves in the water, with lifebuoys, but were able to board the vessel's liferaft and were rescued about 5 hours later.

Bounty had departed Brixham earlier that morning for a day of bottom trawling. The weather was initially fine, but deteriorated as the day progressed. The snagging occurred during the first trawl while the vessel was stern to the wind and sea. Engine power was used to try to free the vessel, but a wave broke over the stern and swamped the working deck. The floodwater was trapped within the vessel's shelter and did not have time to clear through her freeing ports. The vessel listed to port and then wallowed for about 20 seconds before capsizing.

The crewman, who was at the stern, jumped overboard as the vessel listed to port. The skipper, who was at the forward end of the working deck, thought about retrieving lifejackets from the wheelhouse, but decided there wasn't time and evacuated through a hatch in the starboard side of the shelter as *Bounty* was capsizing.

Bounty inverted fully and then sank by the stern. Two lifebuoys floated clear and the crew used these as buoyancy until the liferaft surfaced and inflated. The two survivors boarded the liferaft, and although only about 4 miles from shore, they had to wait nearly 5 hours, until 1428, before they were seen and rescued by the crew of the Royal Fleet Auxiliary vessel *Black Rover*. The survivors were subsequently landed ashore at Portland.

There are currently no minimum requirements for stability, freeboard and loading of small fishing vessels. *Bounty* had inadequate freeboard. The lack of freeboard, and the consequent lack of buoyancy aft, were contributory in causing the wave to break over the stern. The lack of suitable minimum freeboard requirements has been recognised in numerous accidents previously investigated by MAIB and, consequently, action is already being taken to improve regulation in this respect.

Bounty had been built at about the time of the introduction of the MCA's Small Fishing Vessel Code and the Seafish Construction Standards of 2001. The Code required compliance with Seafish standards, but only regarding the construction of the hull. Seafish standards for outfit are only recommendatory. The freeing ports on *Bounty* were of inadequate size and did not meet the current Seafish minimum standard. However, freeing ports are considered part of the outfit, and therefore the minimum standard was not compulsory. In any case, the MAIB believes the existing minimum standards for freeing ports are insufficient where an enclosed shelter is fitted, and a recommendation has been directed to Seafish in this respect.

The benefit of carrying a liferaft was graphically demonstrated in this case as it almost certainly saved two lives. The owner/skipper was not obliged to carry one; the fact that he did, showed a good attitude to safety. The value of liferafts on small fishing vessels has already been recognised, and their free issue by various branches of government is currently being arranged. MAIB fully supports these initiatives.

During the investigation, MAIB discovered *Bounty* had not been inspected by the MCA until more than 3 years after she had been built, shortly before the vessel was sold on to new owners. MAIB believes it would be beneficial if all new small fishing vessels are inspected before entering service. A recommendation has been made to the MCA in this respect.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *BOUNTY* AND ACCIDENT

Vessel details

Registered owner	:	David Wilson
Port of registry	:	Teignmouth
Flag	:	UK
Hull type	:	Kingfisher 33
Built	:	Kingfisher Boats, Cornwall and Seaway Marine, MacDuff, she was completed in 2002
Construction	:	GRP hull, aluminium shelter
Length overall	:	9.8m
Net tonnage	:	10.00
Engine power and/or type	:	Daewoo diesel, 228kW (De-rated from 265kW)
Service speed	:	8.5 knots
Other relevant info	:	Single net trawler

Accident details

Time and date	:	Approximately 0930 on 23 May 2005
Location of incident	:	About 4 miles south-east of Berry Head
Location of rescue	:	50° 15N 003° 12W
Persons on board	:	Two
Injuries/fatalities	:	None
Damage	:	Loss of vessel

Photographs of *Bounty* are shown in **(Figures 1 & 2)**.

1.2 BACKGROUND

Bounty was purchased by her second owner at the end of March 2005, and she was sailed from Troon to her new home port of Teignmouth. The new owner had taken the boat out on a trial fishing trip in Scotland to assess her suitability before purchasing her. After returning from Scotland, the new owner spent several days carrying out maintenance onboard followed by several short days at sea within Lyme Bay, an area he knew well, to further familiarise himself and the crewman with the boat.

Regular fishing trips followed which usually spanned about 12 to 16 hours during daylight and comprised three trawls, each of about 3 hours duration. At the time of the accident, the owner and his crewman had been fishing in earnest with *Bounty* for about 2 months.

1.3 SKIPPER AND CREWMAN

Bounty carried a crew of two, one of whom was the owner/skipper. He had gained considerable experience over the 19 years that he had been involved in commercial fishing which, although mainly potting, had included work on scallop dredgers, and trawlers that were larger than *Bounty.* The skipper had previously owned a 10m (32 foot) Cygnus fishing vessel, which he had used as a crabber for about 10 years.

Although not required on *Bounty* under *The Fishing Vessel (Certification of Deck Officers and Engineer Officers) Regulations 1984,* the skipper held a Deck Officer Certificate of Competency (Fishing Vessel) Class 2, which he had gained in 1998. He had also attended the mandatory courses in basic survival at sea, basic fire-fighting and prevention, basic first-aid and safety awareness.

The crewman had about 12 years' fishing experience, mainly on 12m (40 foot) crabbers operating from the Channel Islands; this included time spent operating his own fishing vessel. He had been working with the skipper of *Bounty* since mid 2004. *Bounty* was the first trawler that he had worked on. The crewman had also completed all the mandatory basic safety courses.

1.4 NARRATIVE

All times are UTC +1

The skipper and crewman slept on board *Bounty* on the night of 22-23 May 2005, and prepared to sail the following morning after having had several days rest. They watched the weather forecast on a breakfast TV weather broadcast and decided that the weather would be suitable for fishing. Tide tables were carried on board, and the skipper was aware of the predicted tidal stream.

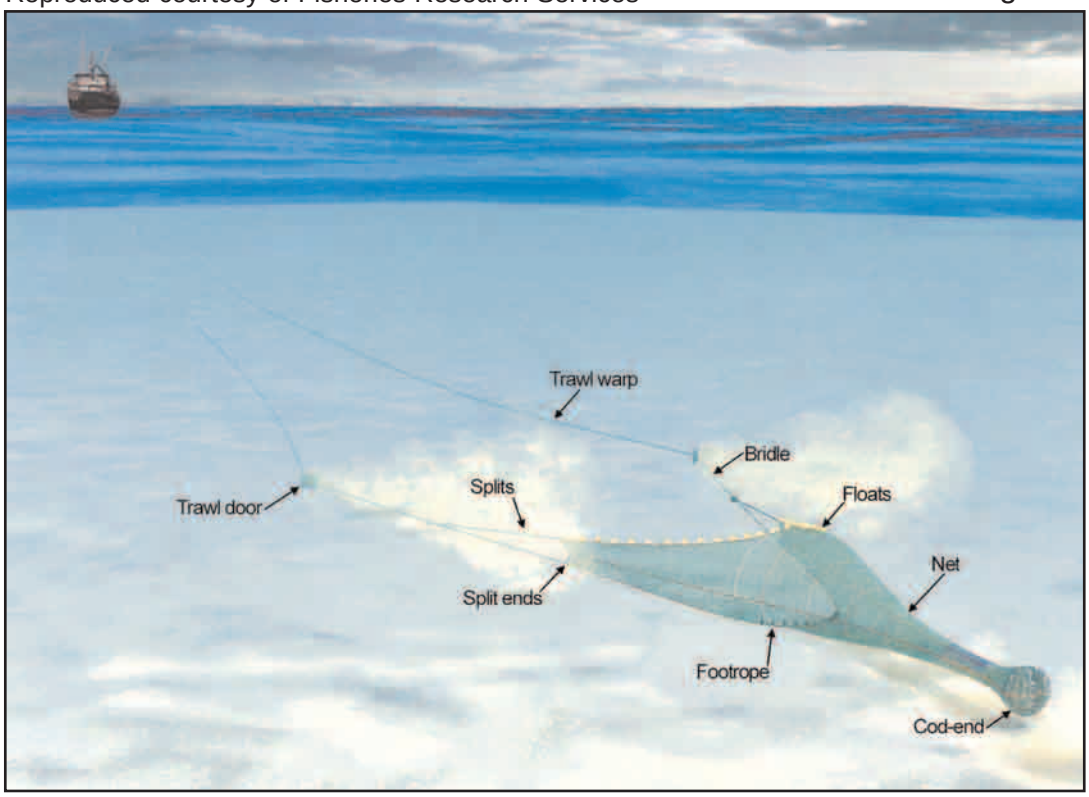
Bounty sailed from Brixham at 0500 on 23 May for a day of trawling for lemon sole. The skipper was at the helm and the crewman was resting in the forward cabin under the wheelhouse until he was required. The skipper took *Bounty* out

on a course of about 160°(T) until she reached a distance of about 5 miles from Berry Head. The weather conditions were good, with a clear sky. The port net was shot away at about 0700 and trawling began.

At about 0930, during the first trawl, while towing in a north-easterly direction with a moderate wind from their stern, *Bounty* began to slow down. She eventually stopped. The skipper recognised that the trawl had snagged on a fastener and he woke the crewman. Although neither the skipper nor the crewman knew what the fastener was, they were not unduly concerned as fasteners were encountered about once a week. An up-to-date Admiralty chart was displayed on the fish plotter, overlaid with fishing information showing seabed obstructions, good trawling tracks, etc. The display did not indicate the presence of any seabed obstacles in the area of the fastener. The water depth was about 55m (30 fathoms).

The skipper set the engine control to dead slow ahead and engaged the autopilot to keep the vessel steering in the same direction as she had been towing. He then went into the shelter and operated the hydraulic winch to heave back and bring the trawl warps **(Figure 3)** on board. The trawl doors were then stowed, and the trawl winch was used to start hauling the bridles. The trawl winch was braked when some of the bridle had been wound in, and then, with the crewman standing aft of the net drums, the skipper returned to the wheelhouse. He used a burst of ahead power, about 1500rpm, in an attempt to pull free from the fastener. *Bounty* was effectively anchored to the seabed with

Figure 3



her stern facing the weather and tide. A wave broke over the stern and, at about the same time, the skipper reduced power and took the engine out of gear. The wave swamped the shelter deck. The skipper returned to the shelter and disengaged the brakes on the trawl winch, releasing the load on the bridle wires. But *Bounty* did not recover; she wallowed on her port side for a matter of seconds, with the floodwater trapped in the shelter, before capsizing.

The crewman had been drenched when the wave came on board. He climbed on the port bulwark as the list and depth of floodwater on board increased. He then jumped overboard. The skipper thought about trying to retrieve the two inflatable lifejackets from the wheelhouse, but decided there was insufficient time. He made his escape through the fish hopper access hatch on the starboard side **(Figure 2)**. There was no opportunity to send a distress message.

As the skipper climbed out of the hatch, *Bounty* continued to roll onto her port side and capsize. The skipper was able to remain on the vessel's upturned hull, and he waved to his crewman to swim back. The stern began to sink before the crewman could reach *Bounty*, and, shortly after, the vessel disappeared below the surface, leaving both men in the water. They were wearing tee shirts, tracksuit trousers, oilskin bottoms, boots and no lifejackets. The time was about 0945.

The two lifebuoys which had been stowed on the wheelhouse top floated to the surface and provided useful buoyancy for the survivors. The liferaft appeared on the surface a little time later, and began inflating. The skipper and crewman swam to it and climbed in. The roof was deflated, so they pushed it up and then bailed the raft out. They looked for the knife to cut the painter, but it was missing. They plugged a hole in the floor, sponged out the remaining water, took seasickness tablets and launched the drogue. After wringing out their wet clothes, they let off a red hand-held flare, which was part of the liferaft equipment. They could see the shore, including a clear view of Brixham, so they did not expect to be in the liferaft for very long.

Some time later, a small aircraft flew over the raft and the skipper attempted to fire the second of the three flares. This failed to ignite, and the aircraft had gone before the last flare could be used. They decided not to set off the final flare until a potential rescuer was close.

In the afternoon, they were seen from the Royal Fleet Auxiliary (RFA) vessel *Black Rover.* A rescue boat was launched from this vessel and they were recovered from the raft at 1428. They were taken aboard *Black Rover* and subsequently landed ashore at Portland.

1.5 ENVIRONMENTAL CONDITIONS

When *Bounty* left Brixham at 0500 on 23 May, there was a westerly wind of force 2 to 3 and fine conditions. At the time of the accident, the sea conditions had increased to moderate with the wind from roughly south-west. By 1300, the wind at Berry Head was recorded as a south-south westerly force 5, gusting 6.

The predicted tidal stream at the time of the accident was north-easterly at a maximum speed of between 1 and 2 knots.

1.6 *BOUNTY*

1.6.1 Hull and outfit

Bounty was a commercial fishing vessel based on a GRP K33 hull built by Kingfisher Boats, Cornwall. The hull design has been in existence for about 17 years. It had a full bodied form to provide a large working deck area and good stability characteristics.

Kingfisher Boats were guided by Seafish Construction Standards when building the hull, which included the frames and engine beds, but the hull was not surveyed or certificated by Seafish. The hull was transported to Seaway Marine, MacDuff, for outfitting. Seaway Marine had outfitted approximately 30 boats since 1975, of which about 10 were small fishing vessels. No drawings of the outfit arrangements were produced for *Bounty.* Fitting out usually followed the particular requirements of the individual purchaser, and the arrangement of the wheelhouse, working deck, engine room etc were unique to each vessel. The stability and freeboard of individual vessels was not usually calculated; this was in common with other builders of small commercial fishing vessels.

Bounty was issued with a Builders' Certificate in December 2001.

1.6.2 Original owner

Bounty entered into service in January 2002, and she was registered in Peterhead. The original owner operated the vessel as a prawn trawler, usually around the Clyde estuary. He fitted all the safety equipment on board, including the liferaft which was not required under the Small Fishing Vessel Code. MAIB has no record of any incidents occurring to the vessel during this ownership.

1.6.3 General layout

Bounty **(Figures 1 & 2)** had a wheelhouse forward and a working deck aft. An aluminium shelter was attached to the wheelhouse and extended aft to the two net drums; it covered most of the working deck. Access to the wheelhouse was through a doorway above a raised step from the working deck on the port side.

The vessel had three compartments within the hull: a small cabin at the forward end, which was accessed from the wheelhouse; an engine room situated beneath the wheelhouse and the working deck, which was accessed by a hatch in the wheelhouse deck; a fish hold aft of the engine room, which was accessed by a hatch in the working deck.

The engine room and fish hold hatches were not fitted with securing devices to ensure that they remained weathertight. The Seafish Construction Standards recommend that securing devices are fitted as part of the vessel outfit.

1.6.4 Wheelhouse

The wheelhouse was equipped with two GPS receivers (Furuno and MLR), a Robertson autopilot, a Furuno fish finder, a Litton track plotter, a Furuno radar, a Fishmaster plotter and three fixed Sailor VHF radios (although none of them were capable of transmitting a DSC signal). A Channel 16 radio check was made to Brixham coastguard by the skipper on the morning of 23 May, which the coastguard had replied to.

There was a sliding window in each side of the wheelhouse, which could provide escape in an emergency. There was a hatch in the foredeck that could also be used as an escape from the small cabin.

1.6.5 Engine room and fish room

The engine room was fitted with a 265kW (at 2000rpm) six cylinder Daewoo diesel main engine, which had been permanently de-rated to 228kW. This provided an 8.5 knot cruising speed at 1600rpm, and maximum speed at 1900rpm. Information about the K33 on the Kingfisher Boats website indicates a suitable engine power range of 90 – 135kW.

The bilge pumping arrangement included two electrically powered automatic pumps and an engine-driven pump normally used for the deck wash, but which could be switched to bilge pumping. The automatic pumps were controlled by a three way switch (auto/off/on) in the wheelhouse, and a lamp would illuminate to indicate when either of the pumps was running. The automatic function was triggered by a float switch or moisture sensor that would activate when the level of water in the bilges reached a certain level. One electric pump was located in the engine room, and the other was located in the fish room. There was also a hand bilge pump rigged to pump from the engine room.

1.6.6 Working deck

The trawl winch, net drums and associated hydraulic equipment were supplied by Rapp Ecosse UK, and consisted of the following:

- A two drum trawl winch with a core pull of 5.3 tonnes and a weight of 1280kg; direct drive low speed/high torque motor and a manual brake and clutch for each drum. It had a wire capacity of 695m with 12mm wire. A

manual control valve and spooling valve were mounted at the winch. The trawl winch was large for this size of vessel. For comparison, another vessel with a K33 hull was fitted with a trawl winch of 2 tonnes core pull, and a further such vessel was fitted with a trawl winch of only 1 tonne core pull.

- Hanging blocks were suspended from gallows at the aft end **(Figure 4)**. The warps/bridles/splits **(Figure 3)** were led over the hanging blocks and then down through the shelter top via two pulleys to the trawl winch **(Figure 5)**.

- Two split net drums, each with a core pull of 2.1 tonnes, and a weight of 780kg; direct drive low speed/high torque motor without clutch or brake. The nets were wound onto the net drums, after being detached at the split ends, they were hauled over a roller attached to the top of the transom bulwark **(Figure 4)**.

Figure 4

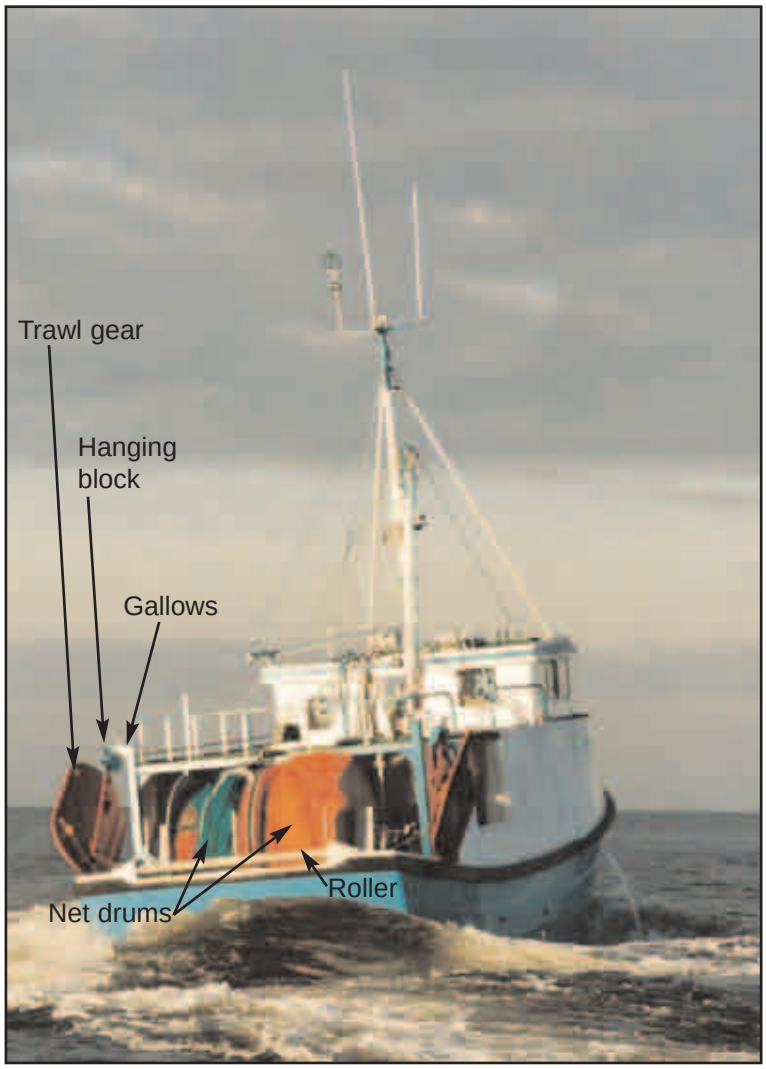
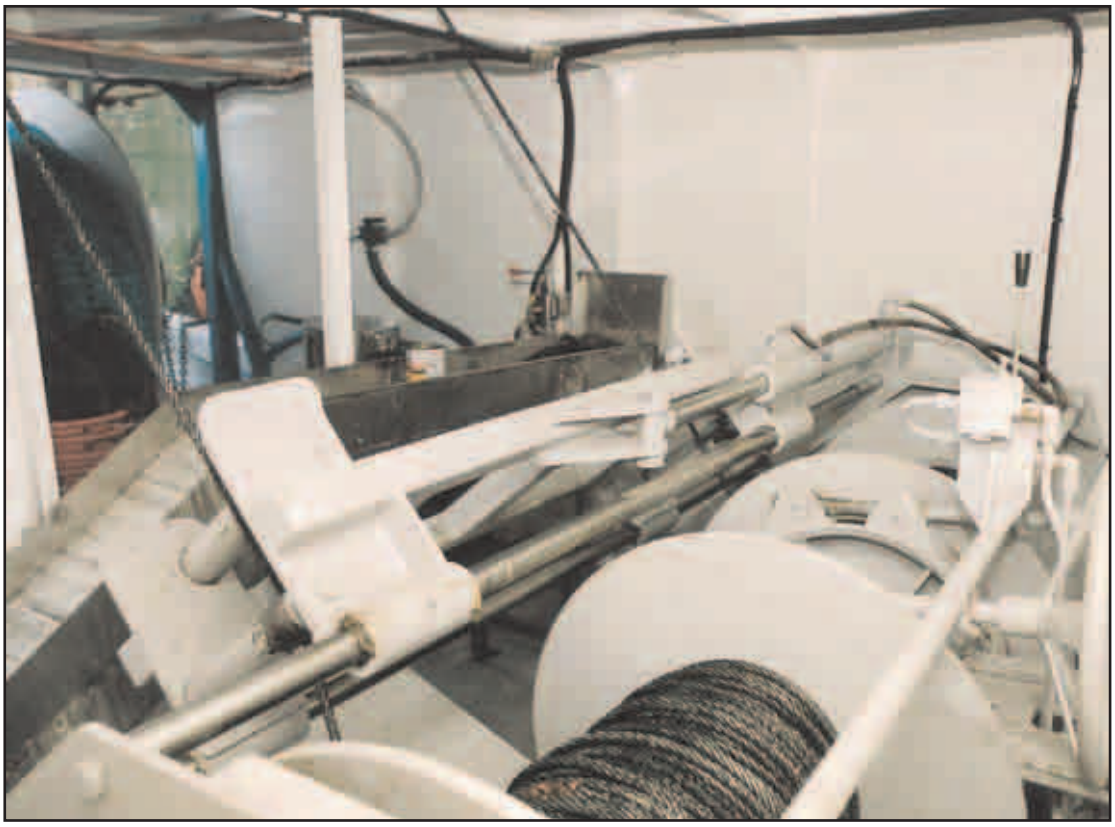


Figure 5



Trawl winch

The original prawn nets did not suit the new skipper's fishing methods. The new trawl gear that he fitted consisted of two 15 fathom Granville French trawls and the foot ropes of both nets were fitted with rubber discs or "rock hoppers". The new nets weighed roughly the same as the nets that were removed. The bridles were 120 fathoms long 18mm combination rope. Two size 8 Bison trawl doors **(Figure 4)** were carried, and they had a mass of between 310kg and 410kg, depending on the additional weights used.

The size of the nets and gear was based on the vessel horsepower and the power of the winch and net drums. Shackles connecting the various parts of the gear were designed to be the weakest links and should have failed first if excessive load was exerted.

1.7 REGULATIONS AND CONSTRUCTION STANDARDS

1.7.1 *The Code of Practice for the Safety of Small Fishing Vessels*

In April 2001, the MCA's *Code of Practice for the Safety of Small Fishing Vessels* came into force. It is commonly referred to as the Small Fishing Vessel Code. It was developed in collaboration with the industry and was issued as part of MSN 1756(F). It was applicable to fishing vessels under 12 metres registered length, but in November 2002 the Code was amended to include vessels up to 15m length overall, and checklists were added to cover these longer vessels.

The Small Fishing Vessel Code requires vessels be inspected at least every 5 years. During the intervening periods, owners should conduct an annual self-certification check, and sign a form to show that their vessels comply with the Code. The inspections are conducted using a checklist which is focussed on the type and condition of safety equipment fitted to the vessel. There are currently no freeboard, stability or loading requirements for fishing vessels less than 12m registered length.

The Small Fishing Vessel Code requires the hulls of new vessels, defined as those built after 1 April 2001, to be constructed to Seafish or equivalent standards. The hull of *Bounty* was built before this date and a Seafish certificate was not issued.

The Code says that an inspection must have been carried out by the MCA before a new vessel comes into operation.

MCA sent copies of the Code to a number of boat builders during the consultation phase prior to its implementation; however, Seaway Marine was not one of those included. *Bounty* was not inspected by MCA before she was put into service by her original owner.

Weaknesses in the current Code have been recognised by the MCA, and a revised Small Fishing Vessel Code is expected to be published in early 2006. The revision contains a requirement for the outfitting of new vessels to comply with the Seafish Construction Standards, including those for freeing ports, but there are no plans to include requirements for freeboard, stability or loading in this revision. Seaway Marine has been added to the distribution list for the revised Code.

1.7.2 Seafish Construction Standards

Seafish Construction Standards have been under development since the 1970s, but it is only since the MCA's Small Fishing Vessel Code came into force that part of it has become mandatory for these vessels.

The Sea Fish Industry Authority produced Construction Standards for new small fishing vessels in June 2001. These standards were aimed to complement the MCA's Small Fishing Vessel Code, because the MCA Code required hulls to be built to Seafish standards.

The Seafish Construction Standards begin by stating that:

> *… designers, builders, operators and owners should ensure that they comply with the requirements of Merchant Shipping Notice MSN 1756(F) ...*

Within the Introduction, Seafish make it clear that the only mandatory requirement for new vessels to operate under the Code is compliance with the hull construction minimum specifications. Other areas covered by the standards, including vessel outfit, are only recommended practice.

The Seafish Construction Standards for under 15m fishing vessels were revised in November 2004 (after *Bounty* was built).

1.8 FISHING VESSEL INSPECTIONS

1.8.1 Inspection regime

Inspections of small fishing vessels are usually carried out by Coastguard sector managers, but they can call on MCA fishing vessel surveyors as required. In addition, Seafish currently inspect about 60 of the 150 – 200 new small fishing vessels that are built each year. Of those inspected, about 70% are hull only inspections.

To be able to operate a new fishing vessel legally, an owner is required to register the vessel with the Register of Shipping and Seamen. Registration can currently be gained by the production of a Builder's Certificate, and does not require the production of a Seafish Hull Construction Certificate, even though it is mandatory to have obtained one. This loophole in the registration process has been recognised by the MCA and, when the revised Code comes into force, a Seafish certificate covering both hull and outfit will be required before a new small fishing vessel can be registered.

A Memorandum of Understanding (MOU) between MCA and Seafish, finalised in October 2005, will enable Seafish surveyors to carry out complete inspections of new small commercial fishing vessels, including the checks required by the MCA.

1.8.2 Inspections of *Bounty*

Bounty was not inspected by a Seafish surveyor during her outfit, but was inspected after she had been completed at the same time as her tonnage was measured. The Seafish inspection revealed that overboard discharge valves had not been fitted. However, the outfit was outside the remit of the Seafish inspection, and any improvements suggested did not have to be acted upon, and overboard discharge valves were not fitted.

The vessel was inspected by MCA at Troon on 16 February 2005. The second owner did not know about this inspection and, as far as he was aware, the inspection carried out at Teignmouth on 13 May 2005, was the first inspection of the vessel by MCA. The Teignmouth inspection followed the Small Fishing Vessel Code checklist and preceded a change in the fishing vessel number.

1.9 FREEBOARD

1.9.1 Definition

Freeboard is the distance from the waterline to the weather deck. On *Bounty,* the bottom of the freeing ports was level with the weather deck (working deck).

1.9.2 Requirements

There are no requirements for minimum freeboard in the Small Fishing Vessel Code or within Seafish standards.

1.9.3 Hull builder's freeboard

Kingfisher Boats supplied a K33 hull for *Bounty*. The lines plan produced by Kingfisher shows the maximum draught as 1.5m, which means that the freeboard should be at least 500mm. The lines plan enabled a computer definition to be compiled by the MAIB using a stability software package. Once the hull was defined, hydrostatic information was produced, which allowed displacements to be determined for various waterlines.

1.9.4 Comparable standard

There is a minimum freeboard requirement for workboats, which is shown in the MCA's Harmonised Small Commercial Vessel Code. A workboat of the same length as *Bounty* would need a freeboard of at least 415mm. *Bounty* would have needed to displace no more than about 15 tonnes to meet this standard.

1.9.5 Freeboard on sea trials

Photographs taken on builder's sea trials **(Figures 6 & 7)** show the position of the waterline at the fore and aft ends. This waterline was marked on the lines plan, and it was found that the minimum freeboard was about 240mm in the region of the middle freeing port **(Figure 8)**. *Bounty* displaced about 20 tonnes at this waterline.

1.9.6 Freeboard at the time of accident

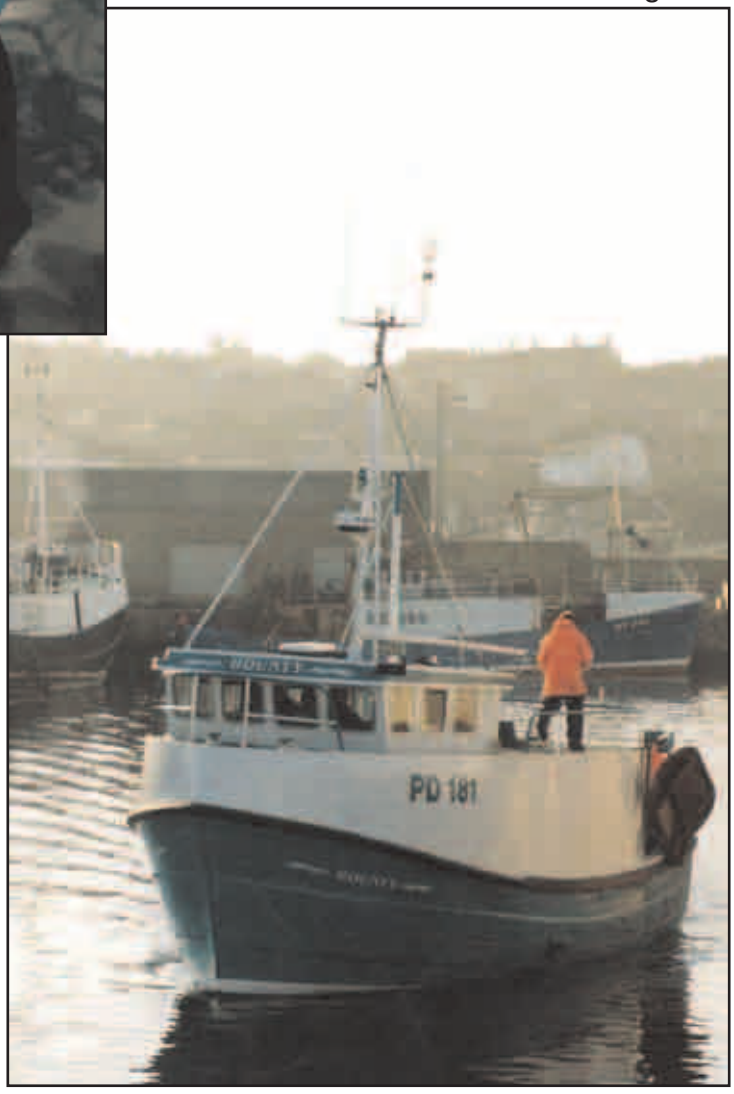
The wreck of *Bounty* has not been recovered, so it could not be used to estimate her displacement at the time of the accident.

A stainless steel conveyor **(Figure 9)**, weighing 100-200kg was fitted to *Bounty* at the time of the sea trials, but this had been removed and was not on board at the time of the accident. Ships and boats tend to increase in weight as they grow older, due to an accumulation of stores, equipment, paint etc. The skipper recalls that the freeboard was less than that shown in **Figure 8**, which indicates that the weight growth exceeded the weight loss which was caused by the removal of the conveyor.

Figure 6

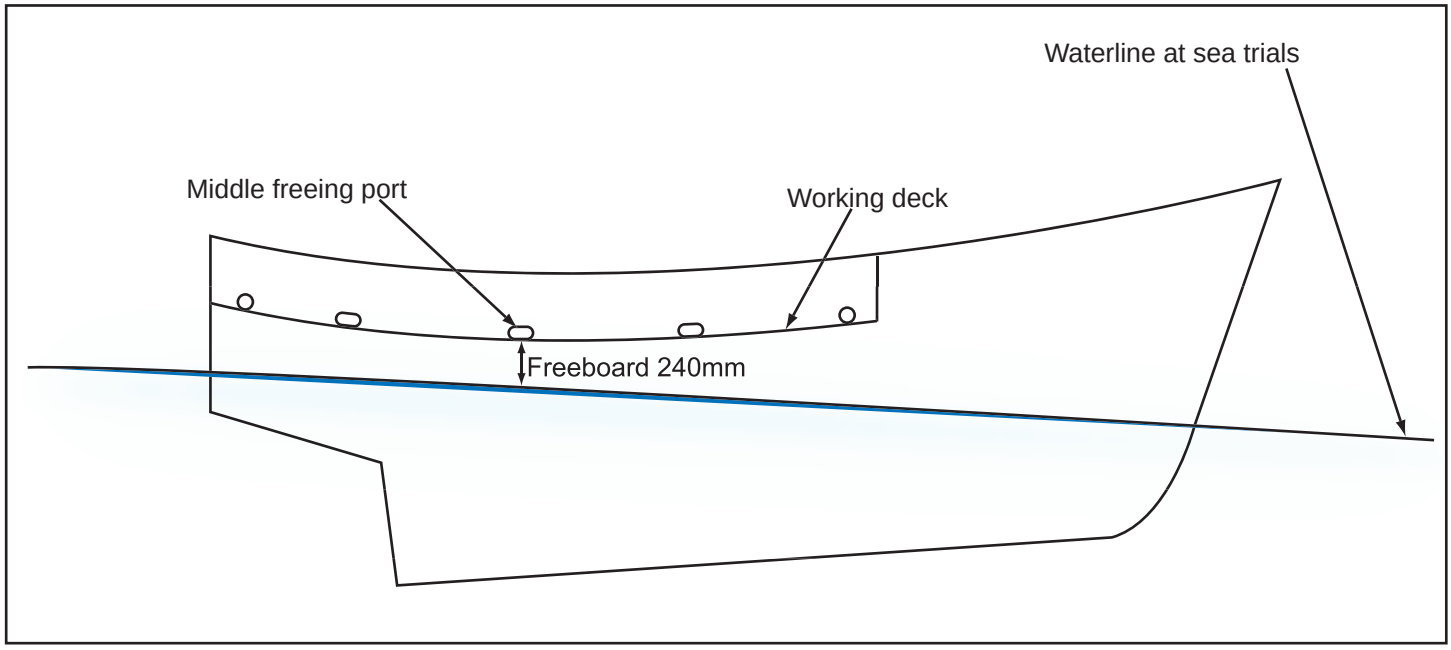
Waterline aft

Figure 7



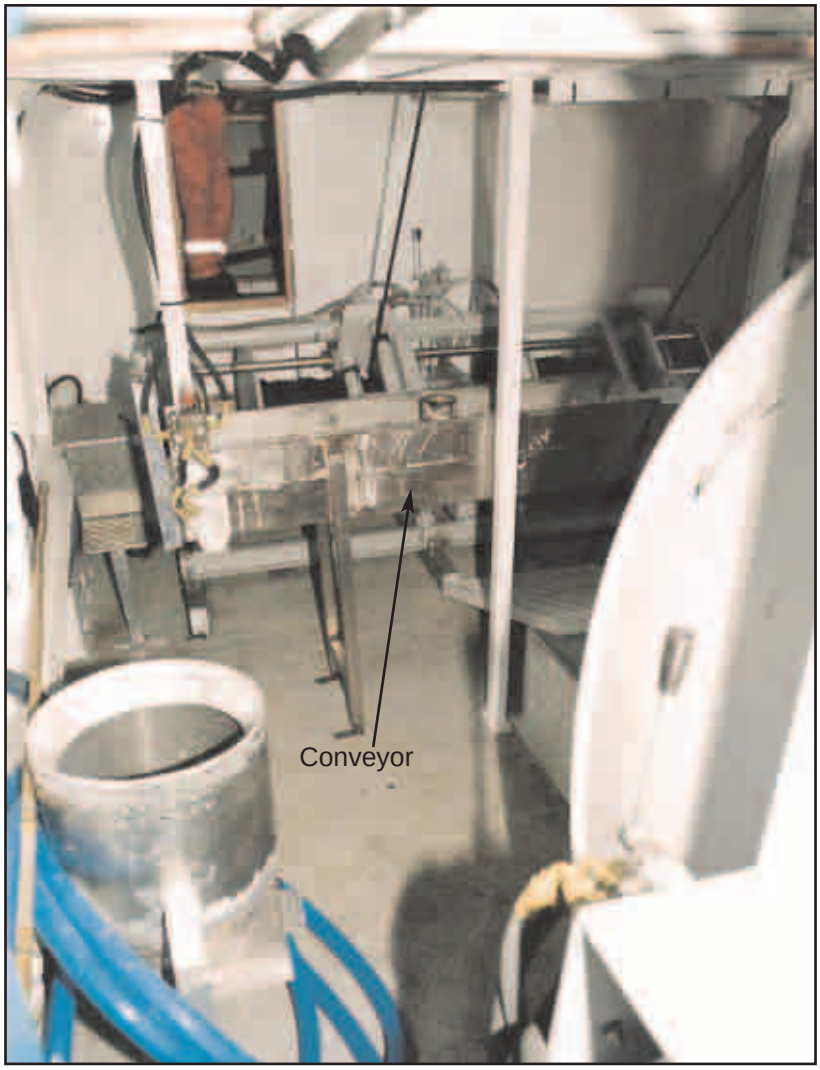
Waterline forward

Figure 8



Freeboard diagram (not to scale)

Figure 9



1.10 FREEING PORTS

1.10.1 Freeing ports as fitted

Bounty had five freeing ports on each side which were kept clear by the crew. The freeing ports were openings in the bottom of the bulwarks that were level with the weather deck and allowed water to drain off this deck. A 2 inch (50.8mm) hole saw was used to cut the fore and aft freeing ports. The 3 freeing ports in between consisted of 2 x 50.8mm holes that were joined together with straight cuts made with a jigsaw. The freeing ports on the port side are shown in **Figure 1**; there were similar freeing ports on the starboard side **(Figure 2)**. No freeing ports were cut through the transom. For the slot freeing ports, the distance between the hole centres has been estimated as 140mm, and on this basis the total area of the freeing ports was 0.063m^2.

1.10.2 Seafish standard

The Seafish Construction Standards for fishing vessels less than 15 metres overall length requires the minimum area for freeing ports on each side of a weather deck to be not less than 3% of the bulwark area. On this basis, the minimum total area of freeing ports for *Bounty* is estimated as 0.218m^2. However, as the standard for freeing ports comes under outfit requirements, there was no obligation to comply. The Seafish standard applies to open weather decks, and the weather deck on *Bounty* was largely enclosed by a shelter.

1.10.3 MCA draft Operational Advice Note (OAN)

MCA is currently drafting an OAN that is based on an earlier internal MCA memorandum which was compiled to deal with enclosed weather decks. The earlier memorandum was applied to fishing vessels over 12 metres registered length.

The draft OAN contains a method for calculating the size of freeing ports in shelters open at the aft end, similar to that on *Bounty*:

As = 0.04 x a x ls in m^2

(As = the required area of freeing ports;
a = the width of the opening at the aft end;
ls = the length of the shelter)

Applying the draft OAN to *Bounty* would require freeing ports with a minimum total area of about 0.654m^2 for the shelter. In addition, the freeing ports for the open weather deck area would need to be about 0.060m^2, applying the current Seafish standard.

1.11 LIFERAFTS AND EPIRBS

Bounty was supplied with a liferaft, which was stowed on the port side of the wheelhouse roof in a fibreglass canister. The previous owner had lashed it down to its wooden bracket because it had inflated unintentionally during his ownership. Ten days before the accident, on 13 May, an MCA surveyor inspected *Bounty* at the skipper's request. One of the deficiencies noted, concerned lashings on the liferaft which would have prevented it floating free. The skipper promptly rectified the fault by fitting a Hydrostatic Release Unit (HRU).

The Small Fishing Vessel Code recommends that liferafts are carried, but it is not a requirement. The liferaft that was installed on *Bounty* saved the lives of the two crew members. The liferaft was on hire from Aberdeen Inflatables, and had been passed on with the vessel to the new owner. It was a four man Offshore Xtra liferaft manufactured in August 1998 by Eurovinil SpA of Italy, a subsidiary of RFD. It was last inspected and certificated in September 2004 and the certificate was due to expire in September 2007. The inspection and test report indicated that the knife was present at this time, and the three red hand-held flares had an expiry date of August 2008.

The revised Small Fishing Vessel Code recommends that EPIRBs are carried, but *Bounty* did not have one fitted.

1.12 FASTENERS

Becoming snagged on an underwater obstruction occurs regularly when bottom trawling. The lower edge of the mouth of the trawl is kept on, or near the seabed by a weighted footrope **(Figure 3)**, and a relatively slow towing speed is used. Heavy rubber discs or rock hoppers incorporated into the footrope are used when trawling over a rough seabed, and these were fitted to the nets on *Bounty.* The frequency of snagging will depend on the type of seabed, topography of seabed, trawl design, rigging, vigilance, knowledge of the skipper and the weight of the gear.

The skipper of *Bounty* knew the area in which *Bounty* became fast, but was not aware of any obstruction which could have been the cause of the snagging on this occasion.

Guidance on snagged fishing gear has been provided by the RNLI Sea Safety Liaison Working Group:

- *If towed gear becomes fast on the seabed or any other obstruction – reduce engine power immediately.*
- *Contact Coastguard whenever you come fast on the seabed so that they can keep in regular contact with you – if no response is received, Coastguard will initiate enquiries to establish the safety of the vessel.*

- *If possible, handle heavy lifts, such as those generated by fastened fishing gear, near the vessel's centreline at bow or stern.*
- *Before attempting to recover fastened fishing gear ensure that all weathertight doors and hatches are closed and each member of the crew has put on their lifejacket.*
- *Remember that the* ***lives of the crew and the vessel are always more valuable than fishing gear or lost time.*** *If in any doubt, run off or cut away fastened gear, buoy off and return later with assistance for retrieval.*

Marine Guidance Note 265(F) published by MCA also provides information on the hazards of recovering fouled or fastened gear when trawling, and warns of the following: *"the potential failure of wires and machinery due to additional loading and the resulting excessive rolling or dangerous list that may occur; a serious reduction in the stability reserves of the vessel when hauling and working the winches hard*."

1.13 OTHER SMALL FISHING VESSEL LOSSES

Three other fishing vessel accidents, which involved poor stability or freeboard standards in small fishing vessels, have been investigated by MAIB recently:

Charisma, which capsized in January 2002 with the loss of one crew member. A heavy load of mussels was carried on deck and the manual bilge pump was missing with poor sealing of the open overboard discharge pipe. The heavy load submerged the discharge pipe, which led to flooding.

Kirsteen Anne, which sank in December 2002 with the loss of two lives. Poor stability was caused by modifications made since she was built, including increased weight of fishing gear. Undetected flooding also contributed to her loss.

Amber, which sank in January 2003 with the loss of the skipper. Her stability was compromised when a rock was caught in her net and by extensive modifications.

Investigation reports for these accidents can be viewed on the MAIB website at www.maib.gov.uk.

These cases led to a recommendation being made to MCA to develop a stability, freeboard and loading standard for small fishing vessels. MCA has commissioned a research project to look at these aspects, and this is expected to be completed by March 2006.

After the loss of *Bounty,* an MAIB database search was carried out. Between January 1991 when MAIB's database was established, and the capsize of *Bounty,* 64 UK fishing vessels under 12m in length have capsized resulting in 38 fishermen losing their lives. A significant proportion of these losses was related to inadequate stability or freeboard.

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

2.2 DISPLACEMENT

The minimum freeboard applied to workboats is considered to be a reasonable standard to provide a safe amount of reserve buoyancy. The freeboard is a function of the position of the weathertight deck and the vessel's displacement/draught. *Bounty'*s displacement of about 20 tonnes, was at least 5 tonnes too heavy to meet the standard for a workboat of a similar size. Her quantity of outfit materials and equipment was extensive and included:

- A large engine that was outside the size range recommended by the hull builder.
- A heavy trawl winch with substantial hauling capacity.
- Two net drums containing heavy nets.
- A shelter enclosing most of the working deck.
- An extensive suite of wheelhouse equipment.

Examination of Kingfisher's website shows examples of vessels with K33 hulls. None of those illustrated are fitted with shelters, and they do not have such an extensive outfit as *Bounty*. Shelters provide protection from the weather, but the weight of such structures reduces freeboard.

Building a vessel to a limited length has the advantage of minimising the number of MCA regulations that have to be met, and more crucially, an owner of a vessel of less than 10 metres in length does not have to buy a fishing quota. Owners of under 10 metre fishing vessels often try to pack the maximum fishing capacity into this short length. Vessels such as this are usually referred to as "Rule Beaters". *Bounty,* at 9.8m in length, met this description.

Outfitting vessels to meet a maximum fishing capacity has safety implications. *Bounty* was carrying fittings and equipment that were too heavy, and her freeboard was inadequate as a result.

2.3 FREEBOARD STABILITY AND LOSS SCENARIO

Bounty was effectively anchored to the seabed by her fishing gear before the accident. She needed buoyancy to break free from the fastener, but inadequate freeboard meant that her stern was vulnerable to waves approaching from aft. A wave came over the stern and swamped the working deck. This caused a large free surface of water, which had a destabilising effect. The floodwater on the working deck was located fairly high up, which added to the destabilising effect.

The vessel jumped forward when the skipper used the burst of engine power, which he believed indicated success in partially breaking the gear free on the starboard side. However, as a result, the port bridle had more tension, and this caused the vessel to list to port. A wedge of floodwater gathered on that side when the shelter was swamped. *Bounty* wallowed on her port side for about 20 seconds and then she capsized and sank.

Recognising that there were problems with small fishing vessel stability, in 1993 the forerunner organisation to the MCA wrote to all owners of such vessels. This followed the sinking of an under 10 metre vessel on only her third voyage when lives were lost. The Small Fishing Vessel Code was being developed at the time, and it was anticipated that a standard on stability, freeboard and loading would be included. The letter recommended that the over 12 metre stability standards be applied until the Code came into force. However, when the Small Fishing Vessel Code came into force, no such standard was included, due to pressure from the fishing industry. The continued loss of life associated with stability problems on small fishing vessels clearly indicates that corrective action is urgently needed.

MAIB reports on the loss of other small fishing vessels have resulted in recommendations to MCA on stability, freeboard and loading standards. As a result, the MCA commissioned a research project to establish whether a simplified stability requirement could be applied. This work was necessary because applying the stability requirements for large fishing vessels was considered to be impractical, as they entail extensive stability calculations, production of stability books, regular stability tests, etc, which are thought too onerous to apply to small vessels.

The research project is well underway, and the work so far has indicated that a stability standard based solely on type of vessel and freeboard is possible. It is envisaged that small fishing vessels will, in future, have to meet minimum freeboard requirements, as is currently the case with workboats. MAIB supports the research, and the application of a freeboard requirement will substantially improve the safety of small fishing vessels. It should be progressed and brought into force as soon as possible, as currently there is nothing to stop small fishing vessels being built with inadequate freeboard.

2.4 FREEING PORTS

The area of freeing ports in *Bounty'*s bulwarks was inadequate. It was less than a third of the minimum 3% of the bulwark area as recommended in the Seafish standard.

Floodwater would have discharged more quickly if the Seafish standard for freeing ports had been complied with. A better floodwater discharge rate from the working deck might have prevented *Bounty* from capsizing.

A revised Small Fishing Vessel Code is being progressed by MCA and, when this comes into force, new small fishing vessels will have to comply with the outfit requirements in the Seafish Construction Standards including those concerning minimum area for freeing ports. There is currently nothing to stop small fishing vessels being built with inadequate freeing arrangements, and the revision should therefore be progressed and brought into force as soon as possible.

Although the application of the revised Code will help, it will not solve the problems associated with the entrapment of water where shelters are fitted. If *Bounty* had been fitted with freeing ports meeting MCA's draft OAN requirements for an enclosed area of working deck, the discharge rate of the floodwater would have been larger, and increased the likelihood of the boat surviving.

If the draft OAN standard was applied to *Bounty,* the required area of freeing ports would be large. However, one way of reducing the required area to a more manageable one would be to divide the shelter with a transverse bulkhead. This additional bulkhead could have been installed forward of the net drums with suitable access openings. Such a bulkhead would substantially reduce the required area for freeing ports inside the shelter, as well as helping to prevent floodwater entering the shelter if a wave were to break over the stern.

Seafish should consider including similar requirements in its Construction Standards.

2.5 SECURING DEVICES ON HATCHES

The fitting of securing devices to engine room and fish hold hatches is included in the Seafish outfit standards, and therefore will become a requirement when the revised Small Fishing Vessel Code comes into force.

The engine and fish room hatches on *Bounty* were not fitted with securing devices, and it is likely that these hatches fell off during the capsize, allowing floodwater to enter these spaces, which increased the rate at which the vessel foundered.

2.6 SEAMANSHIP

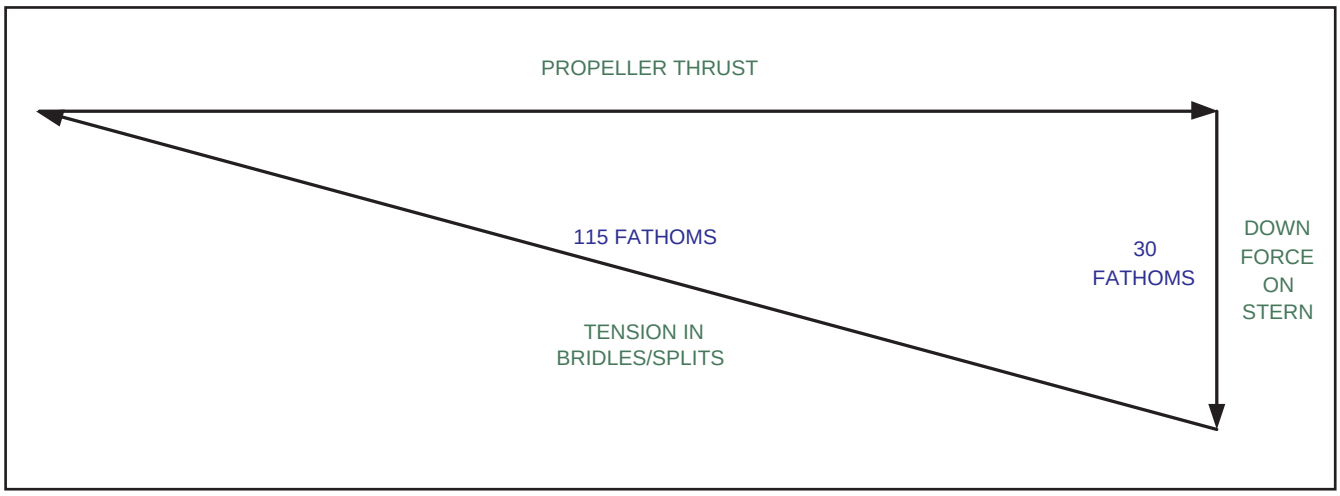
Snagging is a regular and accepted risk for bottom trawlers. In the majority of cases, crews will routinely release their vessels from the fastener, without incident, and resume fishing.

The snagging occurred while *Bounty* was towing with the tide and wind astern. The wind was generating sea waves which were approaching her stern. Weather conditions were worsening.

The skipper tried to break off the fastener with the wind and sea astern, to save time and avoid putting a twist in the wires. Dead slow ahead power was applied, and the autopilot was set to keep *Bounty* on the correct heading. The trawl winch was used to haul the vessel back towards the fastener, the trawl warps were wound onto the winch, and then the trawl doors were brought on board **(Figure 3)**. About 37m (20 fathoms) of the bridles was wound in before the trawl winch was braked. About 183m (100 fathoms) of bridle was still out. The splits were about 27m (15 fathoms) long. On the assumption that the trawl footrope had become fast, the distance from *Bounty* to the fastener was about 210m (115 fathoms). The depth of water was about 55m (30 fathoms).

The skipper then used a substantial burst of engine power to try to break free. The 1500rpm that was used was similar to the power applied when cruising at a speed of 8.5 knots. The thrust from the propeller would have been balanced by the tension in the bridle wires and the buoyancy of the stern, as shown in the force diagram **(Figure 10)**. The use of engine power forced the stern down, and assisted in allowing the wave to come aboard.

Figure 10



The skipper was relatively new to *Bounty* and he had come fast only about 7-8 times in her. He had used the same technique to free *Bounty* successfully in the past, except on two occasions. On the first occasion, the gear wouldn't come free, so he steamed back in the opposite direction. This worked, but it took over an hour to sort out the twisted gear before he could resume fishing. The weather was calm at the time. On the second occasion, *Bounty* was towing against the tide, and after coming fast the skipper stopped the engine and let the tide carry the gear off the fastener.

At the time of the accident, it was the first time that the skipper had come hard fast on *Bounty* with significant waves approaching the stern. *Bounty*'s inadequate freeboard meant that she did not have sufficient buoyancy to ride over the approaching waves when her stern was held by the fastener.

The skipper's usual method of freeing his gear was often successful, quick and easy but using a substantial amount of engine power was unwise. In view of all the prevailing factors, including the vessel's limited freeboard and the fact that she was stern-to the wind and waves, it might have been more prudent to have chosen a safer, albeit slower, method. As an alternative to the method tried, the skipper could have moved head to sea and/or waited until slack water.

Guidance is available on fasteners from the RNLI and MCA as stated in Section 1.12. Fishermen would do well to follow this guidance, which includes, for example, donning lifejackets and warning the coastguard when coming hard fast. If *Bounty* had called the coastguard when it became apparent that it was not going to be easy to free the gear, rescue might have been swift in the event of a capsize.

2.7 LIFERAFTS AND EPIRBS

The provision of a liferaft was not a statutory requirement for a fishing vessel of *Bounty*'s size, and the new owner was under no obligation to retain the liferaft that was fitted after purchasing her. When the MCA surveyor highlighted the problem with the lashing arrangement, the owner had the option of removing the liferaft. But he did not do so. Instead, he fitted the liferaft correctly with an HRU, and his life and that of the deckhand were undoubtedly saved as a result.

The accident highlighted some problems with the liferaft:

- The knife was missing; it is possible that this was dislodged as the crew boarded.
- There was a hole in the floor; it is possible that the damage was caused when the liferaft inflated.
- One flare did not ignite; the flare was subsequently discarded and it is therefore not possible to be certain why it did not ignite.

Despite the problems, there is insufficient evidence to seriously question the manufacture or servicing of the raft.

In the event, as is so often the case in accidents investigated by MAIB, there was no time to pass a distress message. The time to rescue would have been considerably shorter if an EPIRB had been fitted.

2.8 MCA INSPECTIONS

Bounty went into service in 2002, by which time the Small Fishing Vessel Code had been in force for about 9 months. *Bounty* was not inspected by MCA until 16 February 2005, when several deficiencies were noted. She had probably been operating with deficiencies for about 3 years. MAIB believes that MCA should aim to inspect all new small fishing vessels before they go into service. This will be especially important when the revised Code is published, because compliance with Seafish outfit requirements will need to be checked as well, and ultimately, compliance with a freeboard standard may also need to be verified. These initial inspections may be delegated to Seafish.

The MCA is aware of this issue, and plans to ensure that vessels are seen by linking registration with the issue of the safety decal. The safety decal is a sticker that should be attached to a vessel to show that the Small Fishing Vessel Code has been complied with. It is intended that it will not be possible to register a fishing vessel unless an inspection has taken place and a decal has been issued; this will be a very important link, because fish cannot be sold legally from an unregistered fishing vessel.

2.9 LIFEJACKETS AND ESCAPES

Self-inflating lifejackets were stowed in *Bounty*'s wheelhouse. The carriage of such lifejackets in a readily accessible position should be applauded, but it is far better if they are worn all the time when working on the open deck. Self-inflating lifejackets are compact and can be worn constantly without undue discomfort; many fishermen have realised this and have taken to wearing them. Fishing vessels can capsize rapidly, and there is rarely time to grab lifejackets, even when they are stowed in an accessible position. It is especially important that lifejackets are donned after coming fast, when there is a real danger of capsizing.

The skipper was on the working deck when *Bounty* capsized, and he rightly made his escape through the hatch in the starboard side of the shelter. Had he been in the wheelhouse at the time, he would probably have used the sliding window on the starboard side, or escaped via the accommodation and the hatch in the foredeck. Adequate means of escape are very important when a vessel capsizes rapidly; this is especially important on vessels like *Bounty* that are enclosed with extensive shelters.

2.10 WEATHER FORECAST

The skipper based his decision to proceed to sea from a breakfast TV weather broadcast. This is insufficient; a local inshore marine weather forecast should have been obtained. Such a forecast could have been obtained by telephone or fax from Marinecall. Each day at 0600, Brixham Coastguard also makes a forecast. It makes an announcement of this just before, on VHF Channel 16, stating which channel to tune into for the information. The BBC also broadcasts shipping forecasts on Radio 4 long wave.

2.11 FATIGUE

The skipper and crewman had several days rest before the accident, and the fishing trip was in its early stages. There is no indication that fatigue was a factor in this case.

SECTION 3 - CONCLUSIONS

3.1 SAFETY ISSUES

The following safety issues have been identified during the MAIB investigation. They are not presented in any order of priority:

1. *Bounty* was carrying fittings and equipment that were too heavy, and her freeboard was inadequate as a result. [2.2]

2. *Bounty* needed buoyancy to break free from the fastener, but inadequate freeboard meant that her stern did not have enough buoyancy to rise to the waves approaching her stern. [2.3]

3. Currently there is nothing to stop small fishing vessels being built with inadequate freeboard. [2.3]

4. The area of freeing ports in *Bounty*'s bulwarks was inadequate. [2.4]

5. There is currently nothing to stop small fishing vessels being built with inadequate freeing ports. [2.4]

6. Although the application of the revised Code with respect to freeing ports will help, it will not solve the problems associated with the entrapment of water in shelters. [2.4]

7. The engine and fish room hatches on *Bounty* were not fitted with securing devices, and it is likely that these hatches fell off during the capsize. This allowed floodwater to enter these spaces, which increased the rate at which the vessel foundered. [2.5]

8. The technique used by the skipper to break free from the fastener would have saved time if the gear had come free, but using a substantial amount of engine power was unwise with the benefit of hindsight. [2.6]

9. The time to rescue would have been considerably shorter if an EPIRB been fitted. [2.7]

10. This accident has clearly demonstrated the benefit of carrying a liferaft rigged with an HRU. [2.7]

11. *Bounty* had not been surveyed by the MCA until she had been in operation for about 3 years. She had probably been operating with deficiencies for this time. [2.8]

12. Self-inflating lifejackets should be worn all the time when working on the open deck of small fishing vessels. Fishing vessels can rapidly capsize and there is rarely time to grab lifejackets. [2.9]

13. Adequate means of escape are very important when a vessel capsizes rapidly; this is especially important on vessels like *Bounty* that are enclosed with extensive shelters. [2.9]

14. The crew of *Bounty* should have obtained a local inshore marine weather forecast before setting sail. [2.10]

SECTION 4 - ACTION TAKEN

MAIB has recently published a combined report on the fatal accidents involving the small fishing vessels *Kathryn Jane*, *Emerald Dawn* and *Jann Denise II*. This document contained a recommendation to MCA to work with other appropriate government departments to make free issue of key lifesaving appliances more widely available.

The Department of Agriculture and Regional Development for Northern Ireland (DARDNI) has organised the free issue of liferafts and EPIRBs to small fishing vessels in the province, and a similar initiative has provided this equipment in Wales as well. Owners of small fishing vessels in Scotland should receive their liferafts and EPIRBs shortly, and it is expected that these items will be supplied in England in the near future.

MCA is conducting a revision of the Small Fishing Vessel Code and is progressing research into stability standards for small fishing vessels. The research is expected to lead to minimum freeboard standards for this type of craft.

SECTION 5 - RECOMMENDATIONS

The Maritime and Coastguard Agency (MCA) is recommended to:

2006/111 Inspect all new small fishing vessels for compliance with the Small Fishing Vessel Code before they go into service.

The Sea Fish Industry Authority is recommended to:

2006/112 Revise its construction standards requirement for freeing ports in the sides of shelters of small fishing vessels to align these with the MCA's draft OAN requirements or an equivalent standard for enclosed areas of working decks.

Marine Accident Investigation Branch
February 2006