Report on the investigation of

the flooding and foundering of

fv Annandale (BF 89)

16 miles NNE of the Shetland Islands

on 23 March 2000

Marine Accident Investigation Branch
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(Accident Reporting and Investigation)

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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.

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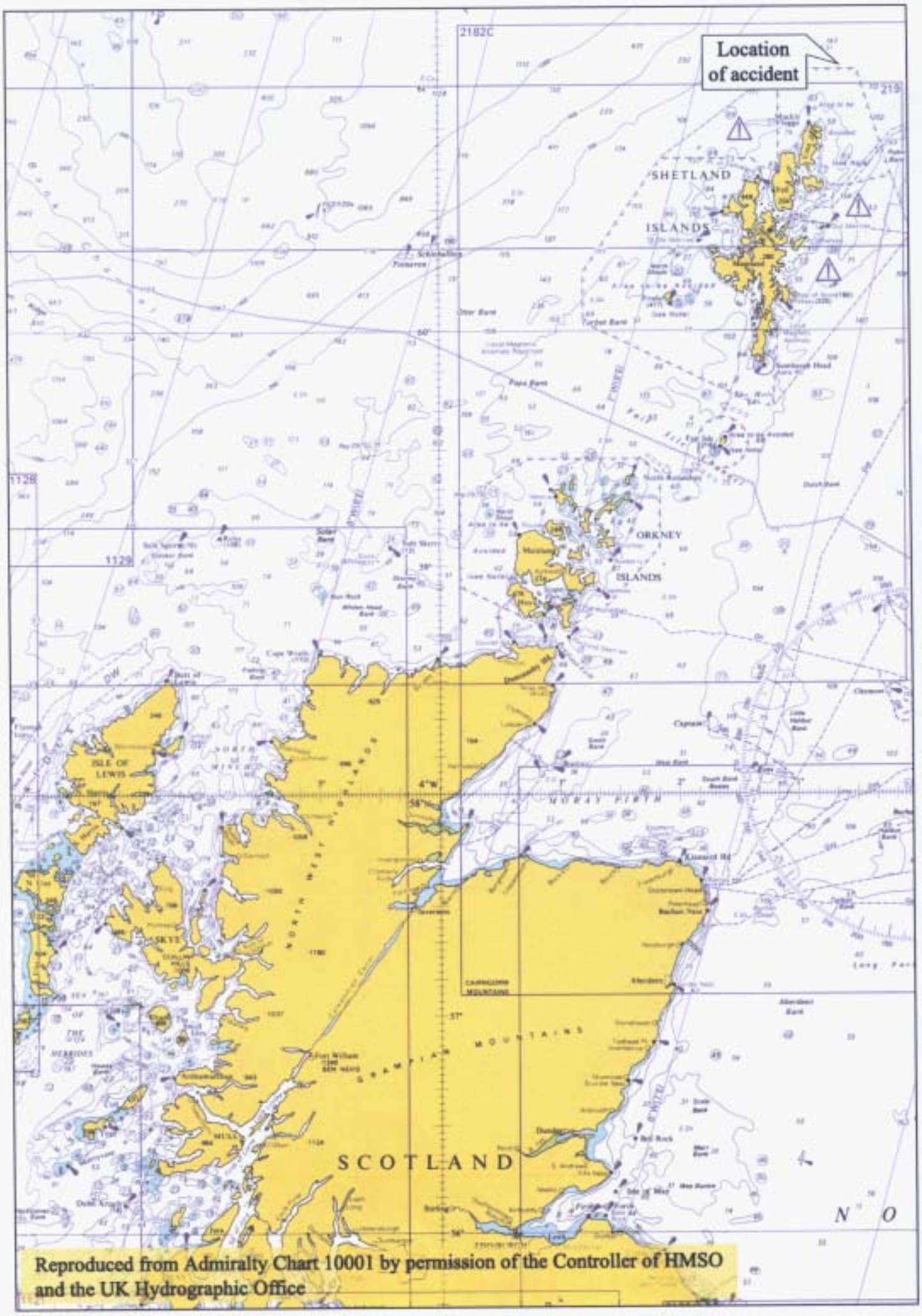
GLOSSARY OF ABBREVIATIONS

DETR	Department of Environment Transport and the Regions
EPIRB	Emergency Position Indicating Radio Beacon
kW	kilowatt
m	metre
MAIB	Marine Accident Investigation Branch
MGN	Marine Guidance Note
NNE	North-north-east
VHF	Very High Frequency



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SYNOPSIS

The accident was reported to the Marine Accident Investigation Branch (MAIB) on 23 March 2000, and an investigation began that day.

The 20-year-old Banff-registered steel fishing vessel *Annandale* was fishing 16 miles NNE of the Shetland Islands when she suffered flooding to the engine room. The flooding was not discovered until later, as her crew had been busy on deck repairing the fishing gear.

When the flooding was discovered *Annandale*'s mate called another fishing vessel in the area, *Endeavour*, for assistance. The coastguard intercepted this VHF radio call and offered help. However, *Annandale*'s skipper refused this assistance because water was coming aboard so quickly that their help would be too late to prevent her from sinking.

With the flooding in the engine room at an advanced stage, *Annandale* set course for *Endeavour*'s position. Nearly two hours after the call, her crew were transferred by liferaft from one vessel to the other, and *Annandale* was taken in tow. Shortly after the tow began, *Annandale* sank.

The most probable cause of the accident was a failure in the sea water inlet piping.

Contributory causes were:

- weakness in the piping because of advanced corrosion,
- failure of the engine room bilge alarm,
- the lack of a watertight bulkhead, and
- the skipper's decision to refuse assistance from the coastguard.

The investigation has resulted in recommendations to the Maritime and Coastguard Agency (MCA) to consider making it a condition of the four-yearly safety survey that an inspection report on engine room pipework, carried out by a competent person, is produced at the time of the survey as part of the certification.

PARTICULARS OF *ANNANDALE* (BF89) AND ACCIDENT

Vessel details

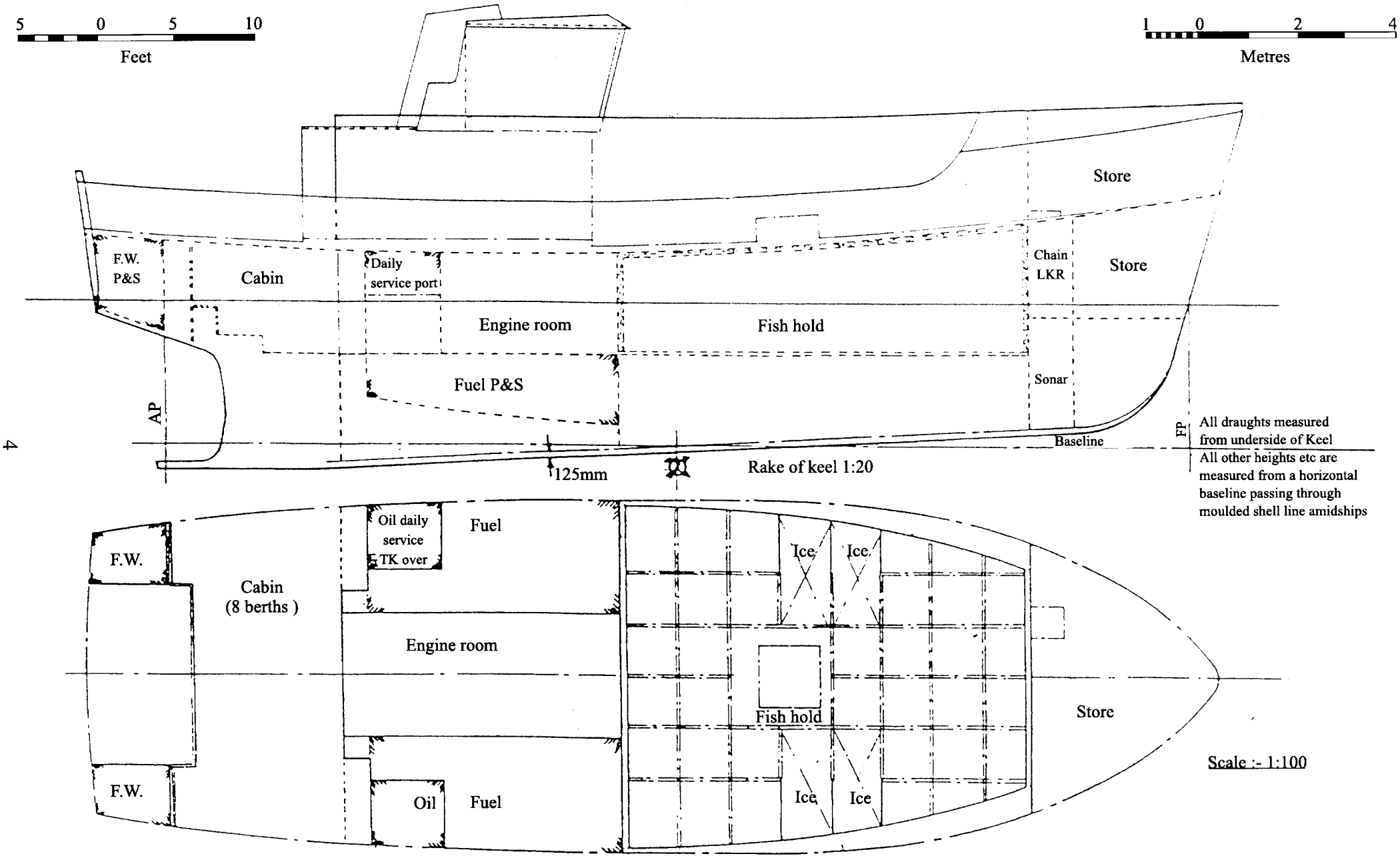
Registered Owners	:	Mr Scott Sheppard and others, Macduff, Banffshire
Manager(s)	:	United Fishselling Ltd, Buckie
Port of registry		Banff
Fishing number	:	BF 89
Type	:	Fishing vessel (stern trawler)
Built	:	1980 Bromborough, Merseyside
Classification society	:	N/A
Construction	:	Steel
Length overall	:	22.83m
Length registered	:	21.09m
Breadth	:	6.95m
Depth	:	2.01m
Engine power and/or type	:	470kW Caterpillar 3412 Single screw shaft

Accident details

Time and date	:	1656 on 23 March 2000
Location of incident	:	61°06.57'N 000° 38.63'W 16 miles NNE of the Shetland Islands
Persons on board	:	Four
Injuries/fatalities	:	None
Damage	:	Total loss

Figure 1

Annandale



Annandale BF89 - General Arrangement

Figure 2

SECTION 1 - FACTUAL INFORMATION

1.1 DESCRIPTION OF VESSEL

The 23m, steel fishing vessel *Annandale*, was built at the yard of McTay Marine Ltd, Bromborough. She was later fitted out at the Miller Yard, St Monance in 1981.

The vessel incorporated one deck above the waterline. Above deck, the wheelhouse was positioned aft of amidships and the main deck was enclosed by a three-quarter length shelterdeck.

Under deck, the accommodation was situated aft. Forward of this were the engine room, fishroom, chain locker and forepeak.

Bulkheads separated the engine from the cabin and fishroom. The bulkhead between the cabin and engine room was non-watertight. The bulkhead between the engine room and the fishroom was watertight.

Annandale held a valid Fishing Vessel Safety Certificate, issued on 25 October 1999.

1.2 BILGE PUMPING ARRANGEMENTS

Annandale was fitted with the following bilge pumping arrangements:

1.	Forepeak/chain locker	Manual *Whale* pump
2.	Fish room	Manual *Whale* pump/*Desmi* main engine-driven pump/*Desmi* auxiliary engine-driven pump
3.	Engine room	Manual *Whale* pump/*Desmi* main engine-driven pump/*Desmi* auxiliary engine-driven pump

Both the engine room and the fishroom were fitted with high level bilge float switches, with an audible and visual alarm in the wheelhouse. It is unknown when these alarms were last tested.

1.3 BACKGROUND

When built in 1980, *Annandale* was originally named *Traveller III* (FR 301). She was then sold and re-named *Dumnonia* (PZ 401) in 1986. The vessel was purchased by her current owners in 1994 and renamed *Annandale* (BF 89).

Annandale was engaged in twin rig trawling and at the time of the accident was working the fishing grounds north of the Shetland Islands. She normally operated with a 5-man crew which would spend two trips at sea followed by one trip off, each trip lasting approximately 10 days.

1.4 THE CREW

Annandale normally carried a crew of five: the skipper, mate, engineer and two deckhands. The skipper was part owner of the vessel.

After landing a catch in Lerwick on 16 March 2000, the engineer left the vessel to return home. A replacement was not found, thus reducing the crew to four.

The *Fishing Vessels (Certification of Deck Officers and Engineer Officers) Regulations 1984,* required the vessel to carry at least one holder of a Deck Officer Certificate of Competency (Fishing Vessel) Class 2.

The skipper, an experienced fisherman, had worked in the fishing industry on various vessels for over 15 years and was the holder of a Deck Officer Certificate of Competency (Fishing Vessel) Class 2.

The mate, also an experienced fisherman, had worked in the industry for 21 years. He was also the holder of a Deck Officer Certificate of Competency (Fishing Vessel) Class 2.

The remaining two deckhands were also experienced fishermen.

All crew members had undergone training in basic sea survival, fire-fighting and first-aid at sea.

1.5 ENVIRONMENTAL CONDITIONS

The weather reported throughout the incident was an east-south-easterly wind of force 2 to 3 with an easterly swell of 0.5m. Visibility was good.

1.6 NARRATIVE OF EVENTS

Annandale sailed from Lerwick, Shetland Islands on 16 March 2000, bound for the fishing grounds at Muckle Flugga.

On arrival at the grounds she fished continually without incident, apart from one day when she called into the port of Cullie-Voe, the Shetland Islands, to repair a trawl.

At approximately 1200 on 23 March, during the third tow of that day, the centre trawl warp connector parted, which necessitated the crew hauling the gear. It took approximately 3 hours to haul and then clear the gear, which had become foul. During this time none of her crew went in the engine room or the wheelhouse, as they were all busy on deck. It was routine practice for a least one crew member to visually check the engine room after every haul.

Once the fouled gear was clear, the skipper returned to the wheelhouse to engage the main engine and put the vessel on a course to shoot the nets. As he entered, he noticed a flashing light on the main engine warning panel; the light was indicating low gearbox oil pressure.

He left the wheelhouse immediately and hurried down to the engine room. As he entered he noticed water spraying off the deckhead, and the engine room had flooded to a height of approximately 1.7m above bilge level, halfway up the casing of the main engine. He hurried back on deck, where he found the mate; they both then returned to the engine room to investigate further.

The ingress of water was from the starboard side of the engine room, forward. The force of ingress was such that the water was hitting the engine room deckhead.

Due to the extent of flooding, the skipper instructed the mate to get the crew to prepare a liferaft, and try to contact any vessels in the vicinity.

The skipper then attempted to close both seacocks using spindle valves located on the port side of the engine room. He was unsure whether he actually did manage to close them, but his actions did not reduce the ingress of water. The main engine was still running, but it was impossible to locate the valve chest, to pump the bilges, as it was submerged. He did not try to start the auxiliary engine, which operated an independent bilge pump, or attempt to use the hand bilge pumps on deck.

When the skipper left the engine room for the wheelhouse, the level of flooding had risen an extra 0.3m.

The mate, who had already organised the crew in preparing a liferaft, had managed to contact the Peterhead fishing vessel *Endeavour* by VHF radio channel 16. She was fishing approximately 4 miles away. *Endeavour*'s skipper informed the mate they would haul their gear and steam towards *Annandale* to offer assistance.

At 1507, Shetland Coastguard intercepted the call and offered assistance in the way of pumps, to be flown out by helicopter, but the skipper declined. However, Shetland Coastguard routinely informed its rescue helicopter at Sumburgh to put pumps on board and to stand by.

The skipper set course, then steamed at full speed for *Endeavour*'s position, worried that *Annandale* might sink before *Endeavour* arrived on scene. By this time, all crew had donned their lifejackets and a liferaft had been made ready to throw over the side and inflate.

At 1513, Shetland Coastguard once again offered assistance, but again the skipper declined, pointing out that a helicopter was unlikely to arrive in time to prevent *Annandale* from sinking.

When *Annandale* was 1 mile from *Endeavour* her main engine stopped. The skipper and the mate returned to the engine room to investigate. The level of flooding had almost reached the top of the main engine casing. When they looked down into the cabin they also noticed that flood water was well above the deck boards in that compartment.

Annandale and Shetland Coastguard maintained contact throughout the incident, with the coastguard offering evacuation of the vessel by helicopter. The skipper advised that a helicopter was unnecessary, since they could easily evacuate to *Endeavour*, as she was nearly alongside.

At 1605 the skipper informed the coastguard that he and the crew were abandoning vessel by liferaft, and would shortly be picked up by *Endeavour*. From there an attempt would be made to take *Annandale* in tow.

Before the crew abandoned vessel, a tow line, which the crew had prepared earlier, was passed across from *Annandale* to *Endeavour*.

The first liferaft thrown overboard failed to operate when the painter was pulled. The other one operated satisfactorily and, once inflated, the crew boarded and were picked up by *Endeavour*.

At 1625, with all crew safely on board, *Endeavour* began towing *Annandale*, bound for Cullie-Voe.

The coastguard again offered to fly pumps out by helicopter to the stricken vessel, but were informed by her skipper that it would be too dangerous to put anybody on board. Instead the skipper requested pumps be flown to Cullie-Voe should the vessel reach there.

At 1656, while still under tow, *Annandale* slowly rolled to port, the tow line was cut and she gradually sank by the stern. Her EPIRB floated free, but did not activate. Although attempts were made by *Endeavour*'s crew to recover it, these were unsuccessful due to the high freeboard on the vessel.

Shetland Coastguard stood down the helicopter, and at 2000 that evening *Annandale*'s crew were landed at Cullie-Voe. The following day they returned to their home port of Buckie.

1.7 LOSSES OF FISHING VESSELS THROUGH FLOODING

Marine Guidance Note MGN 49(F) published by the MCA, and entitled *Losses of Fishing Vessels through Flooding* states in part:

Introduction

Inquiries in to the loss of fishing vessels have shown that:

- *the flooding was discovered too late for the cause to be located or any remedial action to be taken;*
- *in many cases not even the most basic action was taken to prevent further flooding;*
- *bilge level alarms were either not fitted or failed to give the intended warning;*
- *the carriage of a portable diesel driven salvage pump with an adequate length of suction hose could have saved many vessels.*

During operation

Do *ensure that all valves in seawater and bilge systems are regularly checked for correct operation.*

Do *regularly (preferably daily) test bilge level alarms by moving the float by hand to check that the visual and audible alarms actually work.*

Do *regularly (at least monthly) ensure all valves in the bilge system and all sea valves (and other valves that control the inlet and outlet of water through the hull) are free to move so they can be operated in an emergency.*

In an emergency

Do *try using the bilge pump or ejector and hand pumps when provided.*

Do *close all sea valves (and other valves controlling the inlet and outlet of water through the hull) when the cause of the flooding is not known or cannot be controlled.*

'Flooding' a safety leaflet also published by the MCA, contains the following advice:

Getting it right

- *making sure watertight bulkheads are kept watertight;*
- *ensuring seacocks are accessible and can be easily closed.*

Getting it wrong

- *making holes in watertight bulkheads when they can be avoided;*
- *forgetting to check all unattended spaces regularly.*

1.8 FISHING VESSEL (SAFETY PROVISION) RULES 1975

Part II, Rule 2 of the *Fishing Vessel (Safety Provision) Rules 1975* states:

(1) *The structural strength of every fishing vessel of 12 metres in length and over to which these rules apply and the number and disposition of bulkheads shall be adequate for the intended service.*

(2) *Every such vessel shall be provided with a watertight collision bulkhead in the fore part of the vessel and main and auxiliary machinery essential for the propulsion and safety of the vessel shall be situated in a watertight machinery compartment, except that vessels constructed substantially of wood may be provided with a wooden bulkhead or bulkheads of solid and substantial construction separating the fish hold from the rest of the vessel.*

1.9 THE VESSEL (SURVEYS)

Annandale was built while *The Fishing Vessel (Safety Provision) Rules 1975* were in force, and was surveyed in accordance with those Rules.

When built, she was constructed with three watertight bulkheads, and was subject to a survey carried out on 21 April 1981, before she began operating. She was granted three minor exemptions, but was not exempted from Rule 2(2) which required a watertight engine room.

Since then, *Annandale* had been surveyed in accordance with the Rules at four-yearly intervals. Her last survey was carried out on 25 October 1999 and was valid until 6 September 2003.

On 10 September 1999, *Annandale* was slipped at Macduff Shipyard, and a survey of the hull was carried out. As part of this survey ultrasonic testing was conducted. The hull was found to be in good condition, with no evident plate wastage. The minimum thickness of the hull plating was found to be no less than 5mm.

During the survey, all overboard inlet and discharge valves were opened for inspection and servicing. They were found to be in good condition. However, the survey in accordance with *The Fishing Vessel (Safety Provision) Rules 1975* was restricted to inlet, discharges and other opening and closing arrangements on board, and did not include inspection of engine room pipework.

The stern gland was opened and the tail shaft drawn. These were also in good condition.

1.10 FLOODINGS AND FOUNDERING

MAIB statistics show that from January 1990 until April 2000, 794 fishing vessels have been involved in reportable accidents as a result of flooding. Of these, 173 have resulted in foundering.

Where the causes are known (54% of them), they have been the direct result of hull or piping failure. The MAIB considers most of the others to be caused by sea water piping failure.

During the same period the loss of fishing vessels has accounted for 124 fatalities among fishermen. Of these, 71% were caused either by the vessel foundering or capsizing. Flooding and foundering accounted directly for 22% of lives lost. Of the remaining 49%, in the majority of cases, flooding was a contributory factor of the capsize.

In 1997 the Peterhead fishing vessel *Sapphire* flooded, then foundered, with the loss of four lives. In 1998 the Portavogie fishing vessel *Amber Rose*, and the Stornoway fishing vessel *Donna M*, flooded then foundered, with the loss of three lives.

1.11 RISK ASSESSMENT

In accordance with *The Merchant Shipping and Fishing Vessels (Health and Safety at Work) Regulations 1997*, a risk assessment on behalf of *Annandale* had been carried out. This was in the form of a standard SFIA (Sea Fish Industry Authority) pro-forma risk assessment document. It had been completed by a consultant ashore.

In the risk assessment document, hazards associated with the engine room included corroded pipes, loose fittings and worn seals. The consequences were identified as flooding and possible loss of the vessel, resulting in deaths.

Both the skipper and the crew were aware of the risk assessment and had read its contents. As a result of the risk assessment the skipper and crew had become more aware of the need for safer standard operating procedures on board the vessel.

1.12 THE COASTGUARD

The coastguard, part of the Maritime and Coastguard Agency, a government agency within the DETR, is responsible for responding to maritime emergencies 24 hours a day, with the sole purpose of minimising loss of life among seafarers and coastal users.

1.13 LIFESAVING APPLIANCES

Annandale was properly equipped with the mandatory lifesaving appliances for a vessel of less than 24.4m registered length, in accordance with *The Fishing Vessels (Safety Provisions) Rules 1975* and *The Fishing Vessels (Lifesaving Appliances) Regulations 1998.*

SECTION 2 - ANALYSIS

2.1 GENERAL

The MAIB is concerned a the high number of fishing vessels involved in flooding accidents, especially those which have led to the eventual loss of the vessel. In many cases the crews on board have narrowly escaped with their lives.

Fortunately in this particular case there was no loss of life.

Flooding could have been discovered earlier had the bilge alarm been operational, and been regularly tested, and if the skipper had not been absent from the wheelhouse for 3 hours. The wheelhouse should be manned at all times.

Although the flooding was not discovered until later, had the skipper and crew elected to take some basic action to prevent further flooding, and accepted the available help from the coastguard, *Annandale* might not have foundered.

2.2 SOURCE OF FLOODING

Having been alerted by the low oil pressure alarm, the skipper went down to the engine room and noticed there was a substantial ingress of flood water, forward, on the starboard side of the engine room.

The cause of engine room floodings can either be the result of direct breach in the hull, back flooding or a failure of the sea water piping.

It is reasonable to conclude that the flooding was not due to a breach in the hull plating, as the hull had been surveyed and found to be in good condition some six months beforehand.

Annandale did not normally suffer from leaks, and the bilge pumps in the engine room were only run when required. When the flooding was discovered the bilge pumps were not in use, so the possibility of any back-flooding through the bilge system can be discounted.

The skipper was unsure if he did manage to close the seacocks fully by operating the spindle valves; in any event this action did not prevent further flooding.

Considering the above, and without any evidence of a collision, grounding or any other form of contact, it is also reasonable to conclude that flooding was probably caused by the failure of the sea water piping due to corrosion. This being the case, the skipper must have been unable to fully close the seacocks, even though they should have been in good condition and fully operable, as they were surveyed at about the same time as the hull.

Piping failures are by far the main cause of all fishing vessel floodings where the cause has been identified. Steel hull plating failures occur infrequently. Corrosion is the most common cause of piping failures. Advanced corrosion of a section of piping was probably the underlying cause of *Annandale*'s flooding.

Recently four Scottish fishing vessels have been lost as a result of flooding caused by pipework failure. These were:

- *Sharona* (PD 185) and *Ocean Hunter* (PD 787) both in August 1999
- *Jasper III* (PD 174) in September 1999, and
- *Progress* (FR 103) in April 2000.

As a result of the investigation into the loss of *Jasper III* (PD 174), a recommendation was made to the MCA to review existing arrangements for the survey of fishing vessels, with regard to the inspection of engine room piping to reduce the possibility of serious defects being undetected during surveys.

This recommendation was rejected on the basis that the survey of engine room piping can be extensive, and pipes are difficult to trace and often inaccessible. It would also be far too time consuming for MCA surveyors to include survey of all engine room pipework. However, the MAIB firmly believes that until a suitable means of surveying engine room pipework on board fishing vessels is devised, a large number of flooding and foundering accidents will continue.

For this reason, a further recommendation has been addressed to the MCA to consider making it a condition of the four-yearly safety survey that an inspection report on engine room pipework, carried out by a competent person, is produced at the time of the survey, as part of the certification.

In the interim period between surveys, it is important that fishing vessel owners do not lose sight of their responsibility to keep their vessels well maintained at all times.

2.3 RISK ASSESSMENT

Risk assessments must be carried out according to statutory regulations, and owners have a duty to implement any necessary control measures to bring the risks to within acceptable levels. In this case, flooding of the vessel is clearly an identifiable risk, and the owner/skipper should have had suitable measures in place, including regular inspection and pressure testing of the pipelines.

A risk assessment had been carried out on board *Annandale*, but even though the skipper and crew had read it, and were aware of the need for safer standard operating procedures, any control measures that might have been implemented by them, failed to prevent the vessel from flooding and foundering.

Had the engine room pipework been checked periodically by a competent person, corrosion in the pipework could have been detected and the loss of the vessel been avoided.

2.4 HIGH-LEVEL BILGE ALARMS

The late detection of the flooding was due entirely to the failure of the high level bilge alarm.

Unfortunately, high level bilge alarm failure is a common occurrence in the fishing industry. This is due mainly to the lack of inspection and periodic maintenance of these devices. One of the main causes of this is the difficulty in accessing the sensor. Invariably, high level bilge alarms, because of their very nature, are located in areas which are difficult to reach, and because of this fishing vessel crews tend to overlook the importance of maintenance.

It is concluded that the failure of the high level bilge alarm on board *Annandale* was due to the reason stated above.

Had the high level bilge alarm been maintained in accordance with advice given in *Marine Guidance Note MGN 49(F)* and been operational, early detection of flooding would have occurred and could have prevented *Annandale* from foundering.

2.5 BILGE PUMPS

There were three separate means of pumping out the engine room:

- Main engine belt-driven bilge pump.
- Auxiliary engine-belt driven bilge pump.
- Engine room hand bilge pump.

When flooding occurred, the valve for the engine room bilge system was closed. To use the main engine belt-driven bilge pump, the valve on the valve chest would have had to be opened.

It would have been extremely difficult to locate and open the valve on the valve chest when it was submerged under 1.5m of bilge-contaminated water. Therefore, it is understandable that no attempt was made to use the main engine belt-driven bilge pump.

However, no attempt whatsoever was made to use the other two pumps. The auxiliary engine could have been started, enabling the bilges to be pumped out. In addition to this, the hand bilge pump could have been used.

Although it can not be said with any certainty that these pumps would have coped with the ingress of water, they might have kept the vessel afloat until help (which was available in the form of high capacity salvage pumps) arrived from the rescue services.

2.6 WATERTIGHT BULKHEADS

Annandale was required under *The Fishing Vessel (Safety Provision) Rules 1975,* to have a watertight machinery compartment. She did not meet this requirement as the flooding, observed by the skipper, spread aft into the cabin space, which meant the aft bulkhead in the engine room was not watertight.

It is not known why this bulkhead was not watertight. However, it must be concluded that maintenance and inspection of the watertight integrity was inadequate.

Although the Rules do not require fishing vessels to be able to survive flooding of the engine room, had the bulkhead, separating the engine room from the cabin, been watertight, progressive flooding into the cabin would have been avoided, and *Annandale* might not have foundered.

2.7 ACTION BY SKIPPER (COASTGUARD)

Shetland Coastguard intercepted the VHF radio call from the mate of *Annandale* to the skipper of *Endeavour* at 1507. Nearly two hours later, at 1656, *Annandale* sank.

During this time, the coastguard offered assistance in the form of salvage pumps on three separate occasions. Each time the skipper refused the offer, on the basis that *Annandale* was sinking too rapidly to make use of the pumps carried by the helicopter.

The last offer of help was made at 1625. At that time, because of the danger involved in putting crew back on board *Annandale* it was prudent of the skipper to refuse assistance. However, there was no reason why he should not have accepted help from the coastguard on the previous two occasions. It would have taken only about 20 to 25 minutes for the helicopter to be airborne, and arrive on scene.

At 1513, when the coastguard made the second offer of help, pumps could have been employed on board within about 30 minutes, which was 20 minutes before the skipper decided to abandon the vessel. This might well have been sufficient time, with the use of pumps, to prevent *Annandale* from foundering.

The skipper's decision to refuse assistance from the coastguard was probably a contributory factor into the loss of the vessel.

Skippers are well advised to accept advice and assistance from the coastguard as its officers have cumulative experience of many flooding and foundering incidents.

2.8 LIFESAVING APPLIANCES

The MAIB does not know why the first liferaft thrown overboard did not inflate, nor why the EPIRB failed to activate.

Both liferafts had been serviced in August 1999, and were 'in-date'.

The EPIRB on board was in-date at the time of the survey in October 1999, and when the vessel sank the float-free arrangement operated correctly.

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

1. *Annandale* might not have foundered had the crew taken a different course of action after flooding was discovered. [2.1]

2. The wheelhouse was left unattended for three hours. [2.1]

3. The cause of flooding was probably not a result of back-flooding through the bilge system. [2.2]

4. The cause of flooding was probably not a result of a breach in the hull plating. [2.2]

5. *Annandale* had not been involved in a collision, grounding or any other form of contact. [2.2]

6. The skipper was unable to close the seacocks fully. [2.2]

7. It is more than likely that *Annandale*'s sea water piping was subject to a degree of advanced corrosion. [2.2]

8. A risk assessment had been carried out and the crew was aware of it. [2.3]

9. The high-level bilge alarm in the engine room failed to operate. [2.4]

10. The failure of the bilge alarm was probably due to the lack of inspection and maintenance. [2.4]

11. A fully operational bilge alarm would have provided early detection of flooding. [2.4]

12. No attempt was made to use the auxiliary engine-driven pump, or the hand bilge pump. [2.5]

13. *Annandale* did not comply with Rule 2 of *The Fishing Vessel (Safety Provision) Rules 1975*. Her aft bulkhead in the engine room was not watertight. This was probably due to inadequate maintenance and inspection of its watertight integrity. [2.6]

14. A watertight bulkhead between the engine room and cabin might well have prevented *Annandale* from foundering. [2.6]

15. The skipper's refusal of help from the coastguard on the first two occasions was unjustified, however the reason for his refusal on the third occasion can be understood. [2.7]

16. With the use of salvage pumps from the coastguard, *Annandale* might well have been prevented from foundering. [2.7]

17. One of the liferafts failed to inflate. The reason for this is unknown [2.8]

18. The EPIRB failed to activate. The reason for this is also unknown. [2.8]

3.2 CAUSES

Annandale's loss was caused by flooding to the engine room, probably due to failure of the sea water piping.

3.3 CONTRIBUTORY CAUSES

1. Weakness in the sea water piping because of advanced corrosion.

2. The failure of the engine room bilge alarm.

3. The lack of a watertight bulkhead between the engine room and cabin.

4. The skipper's decision to refuse assistance from the coastguard.

SECTION 4 - RECOMMENDATION

The Maritime and Coastguard Agency is recommended to:

Consider making it a condition of the four-yearly safety survey for fishing vessels, that a competent person carries out an inspection report on engine room pipework at the time of the survey - before a Safety Certificate is granted.

Marine Accident Investigation Branch
March 2001