SEAFISH
the authority on seafood

Industry Advisory Note

January 2011

Potting Safety

The Marine Accident Investigation Branch (MAIB) report *Analysis of UK Fishing Vessel Safety 1992 to 2006*[1] found that a higher than average man overboard fatality rate was attributed to parts of the potting sector. The report recommended Seafish research potting methods and procedures.

This advisory note summarises the available information on potting related incidents and provides guidance on safe practices.

Fatalities in the Potting Sector

MAIB has been recording accident data since 1991. During the period 1st Jan 1991 – 31st Dec 2009, the deaths of 54 fishermen from the potting sector were recorded. This represents an average of 2.8 fatalities a year during this 19 year period.

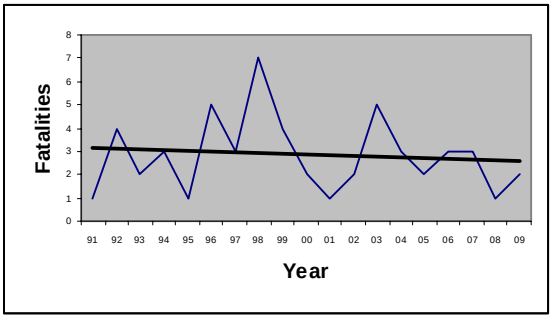

Figure 1: UK Potting Fatalities 1991 - 2009

The figure above shows that the fatality rate has remained consistent with no significant improvements being achieved. Further improvements in safety practices are needed to reduce the loss of lives within the sector.

It is estimated that the number of UK full- and part–time fishermen engaged in potting is 4,600[2]. This equates to an average fatality rate of one per 1,618 fishermen each year.

Clearly too many lives are being lost and this warrants a closer re-examination at available data to try and ascertain why accidents are occurring in the sector and what actions may be employed to reduce the accident rate.

It can be seen from the table below that nearly half (46%) of deaths in this sector are due to fishermen going overboard. This is much higher than for the catching sector overall for which a third of all fatalities between 1992 and 2006 resulted from fishermen going overboard[1].

Table 1: Summary of Fatalities on Potting Vessels reported to MAIB References:

Incident Type	Fatalities Rate 1991 -2009	% of Fatalities 1991 -2009
Person Overboard	25	46.3
Flooding/Foundering	12	22.2
Capsize/Listing	10	18.5
Missing Vessel	4	7.4
Accident to Person	1	1.9
Collision	1	1.9
Grounding	1	1.9
Total	***54***	**100**

1. http://www.maib.gov.uk/cms_resources.cfm?file=/FishingVesselSafetyStudy.pdf
2. Calculated from 2,599 vessels actively engaged in potting in 2008 using average crew numbers recorded in England and Wales for each category.

Size Category	Av. Crew	Vessels	Totals
10m & under	1.6	2,285	3656
10 – 15m	2.5	264	660
Over 15m	5.7	50	285

Pot fishing hazards

The main potting hazards that may result in a fatality or serious injury include:

- **Snagged in rope when shooting**

A loop or bite of rope caught around a limb during shooting will result in serious injury or death. The limb is likely to be severed or the person will be dragged overboard and, even if wearing a lifejacket, likely to be pulled down by the weight of pots attached to the rope. Accidents have also occurred due to a loop of rope snagging a pot and carrying it overboard, striking a crewman on its passage.

- **Pots out of sequence**

Stacking pots in a rigid sequence is essential where pots remain attached to the back rope and all involved in the shooting operation need to be totally certain of the sequence. Problems can occur if a pot is stacked out of sequence to enable it to be repaired prior to shooting, or if the vessel motion causes stacked pots to fall. Should an incorrect pot be selected, the correct pot will be pulled from the stack as the back rope tightens and 'fly' across the deck, quite likely striking the man holding the incorrect pot at the rail.

- **Trips and falls**

The most common accident in any workplace, but on a fishing vessel it can be fatal if the person falls overboard and in potting, a simple trip and fall could be disastrous during the shooting operation.

- **Vessel overloading**

The overloading of a fishing vessel with pots, either by having too many on a string or when moving strings to new fishing grounds, can put the vessel at risk of capsize and foundering, and her crew at risk of drowning.

- **Struck by pot or anchor at the davit block**

Failure to stop the hauler can result in a pot, or perhaps an anchor, hitting the davit block and possibly swinging over the top to strike the crewman.

- **Fatigue**

Not a potting specific hazard but fatigue is a common hazard in the catching sector. Working in a physically demanding job for long hours ultimately leads to fatigue, and this increases the risk of an incident occurring. Anecdotal evidence from industry suggestions many more pots are being worked than 10-15 years ago and in many cases have doubled. This will undoubtedly increase levels of fatigue within the sector.

- **Crew competence**

Owing to reduced or static levels of income in the sector it may be more difficult to attract and retain experienced and competent crew. Inexperienced crew are more likely to be involved in an accident.

- **Operating single-handed**

Problems with recruitment and low returns force more fishermen into working single-handed. This practice may increase the risk of accidents and certainly reduces the chances of rescue should an accident occur.

These hazards do occur and injuries and deaths can be the result.

Hazard reduction methods

Some suggestions for reducing the risk of hazards and accidents occurring are detailed below:

1. Detachable Pots - Toggle System

This system, originally devised by Trevor Bartlett (Devon) for use on his 18m potter *Euroclydon* and now in use on most of the larger potting vessels, is a major advance in pot fishing safety. The key to the system is a toggle clip which connects into a loop to join together the two-piece leg rope at a point quite close to the pot.

By slipping the toggle clip out of the loop, the pot can be detached from the back rope, enabling it to be stored anywhere and without worrying about sequence. On hauling, the pots are lifted on board as normal, but once on board, the toggle is disconnected and the loop, which it fits into, is slipped over a vertical steel pole.

Figure 1: Detaching the pot from the main ground rope onboard 16m Dartmouth based vessel *Excel*

The size of the eye splice is critical to this shooting system. If the opening of the eye splice is too loose the pots may become unattached when hauling or shooting and be lost. If it is too tight it will be a struggle to unattach when hauling and attach the strop to the toggle when shooting.

Figure 2: Placing the eye splice on the pole ready for shooting.

Putting each eye splice on the pole ensures each of the strops is kept in the correct sequence for shooting back.

The pot, now separate from the back rope is emptied, baited and stacked. The back rope, as normal, is allowed to pile up on deck and the loop, of each disconnected leg rope, is dropped over the pole in sequence. Thus at the end of the haul, the back rope is in a pile on the deck with each leg rope leading to the pole. The pots are stacked securely out of harms way, wherever is convenient, as there is no need to keep them in sequence.

During the shooting operation, the pot is stood on a shooting table and the first leg rope loop removed from the pole. The toggle is slipped into the loop, thus connecting the pot which is pulled into the sea when the back rope tightens. The next pot is placed in position and connected to the next leg rope from the pole. Shooting proceeds with one

man connecting the toggles and one or two men bringing the pots to the shooting table.

Figures 3: Attaching the pots to the ground rope whilst shooting.

Aside from the ability to stack the pots out of sequence, the system gives more compact storage of the back rope with all the leg ropes leading to the pole. Because the leg ropes are constrained to a narrow area it is easy to build a division to separate the rope from the deck area where the crew handle the pots. In addition, should a problem occur with the shoot, the leg ropes can simply be slipped off the pole as required to enable back rope to be paid away.

It is appreciated that deck space and crew numbers are limiting factors for many small boat operators to adopt this method. However, vessel operators are urged to consider the adoption of this system as the hazard of pots being dragged wildly across the deck is totally removed. If the limiting factor is deck space consider working shorter strings. See Figure 4.

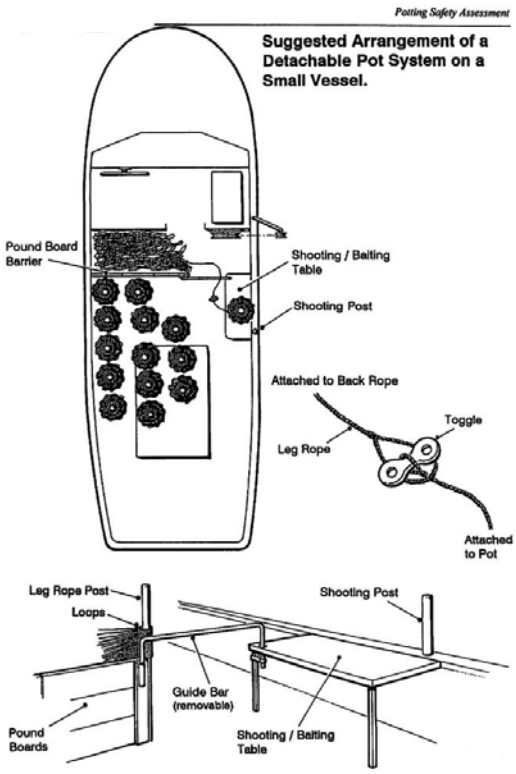

Figure 4: Suggested arrangement or a detachable pot system on a small vessel.

2. Rope Pounds or Divisions

Separating the crew from the back rope will resolve one of the most dangerous hazards; that of becoming snagged in the rope when shooting. The design of the barrier will depend on the layout of the vessel and the stacking of the pots but should endeavour to provide protection to all involved in the shooting operation. A sketch of a separation system devised by an Orkney skipper who introduced the system after the loss of one of his crewmen who became snagged in the rope is shown below in Figure 5.

This system as shown in Figure 5 uses a 600mm (2 ft) high pound board barrier to form a trough between the pound boards and the bulwark to contain all the 'tails' or leg ropes. A high wire mesh screen is set at the end of the pound boards to provide protection for the man who sets each pot in turn on the shooting table. Although the illustration shows a vessel with aft stowage of the pots, the concept can be applied to other layouts in order to keep the ropes clear of crewmembers.

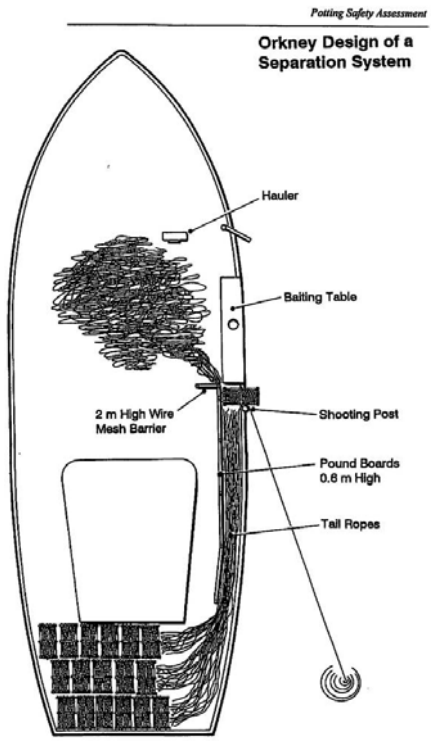

Figure 5: Orkney design of a separation system

3. Self Shooting Systems

There has been a number of varying self shooting systems developed to suit individual vessel layout and skipper preferences. The main difference between self shooting systems and the toggle system is that the pots remain attached to the back rope and as such great care needs to be taken to ensure pots are stacked in a precise pattern, and in a manner, that will not cause pots to be shot out of sequence. The main benefit of this system is reduced manual handling which in turn may reduce fatigue levels and the risk of accidents associated with fatigue.

Many self shooting systems shoot the pots through an opening cut into the transom. Figure 6 below shows pots being stacked during the hauling operation in preparation for shooting through the stern opening. This 12m vessel has a forward wheelhouse and the opening in the transom is permanent with a rail fixed across the top to help prevent crew from falling through the gap.

Figure 6: Stacking pots ready for shooting onboard the 14m Bridlington based vessel *Hollie J*

Figure 7 below shows the pots being shot away with minimal contact from the crew. A crew member can just be seen standing safely clear of the shooting area, watching to ensure the pots are shot correctly and ready to alert the skipper if there is a problem.

Figure 7: Self shooting through the stern opening

Similar systems to above have been developed on vessels with aft or mid-ship wheelhouses where the pots are stacked forward of the wheelhouse and shot through an opening in the transom via a 'funnel' alongside the wheelhouse. Some openings in the stern have a gate that can be closed when not shooting for additional safety.

Figure 8 shows an example of a self shooting system on a smaller vessel. When working with 2 crew the deck hand can stand in safety behind the open door during shooting operations.

Figure 8: Salcombe based 19' vessel *Amelia Grace.*

As shown in Fig 9, the door should be closed when not shooting pots for additional safety.

Figure 9: Shooting door open and closed

This system has been designed to enable single handed operation. This system was developed by owner Dean Login utilising a quick release clip (see Figure 10 below) suspended from the aft gantry that can operated from the wheelhouse.

In preparation for shooting the first end weight is suspended below the water line (well clear of the prop) over the stern from the quick release clip. Once the first buoy rope has been shot away the skipper then retreats to the safety of the wheelhouse to steer the vessel. Once the vessel is in the desired position the skipper releases the first end weight from the wheelhouse by pulling a cord attached to the quick release clip which releases the weight suspended from it.

Figure 10: End weight quick release system

The combined weight of the first end and forward motion of the boat initiates the shooting process of the pots. The last end weight shoots automatically over the stern in the same manner as the pots do. Once the last end weight has been shot away all that

remains is the end buoy line and buoy that also exits the vessel through the shooting door cut into the transom without intervention.

After shooting away the first buoy rope the skipper enters the wheelhouse and is not required to step back onto the deck, and into the shooting area, for the remainder of the shooting operation. This is a 19' vessel shooting strings of 20 pots.

Where it is not possible to shoot over the stern, systems have been developed to allow self shooting from mid-ships.

Figure 11: Self shooting ramp mid-ships onboard the Bridlington based vessel *Nordstjerne*

Figure 11 above shows a system using a ramp to allow an adaptation of self shooting from mid-ships. During shooting operations a crew member rolls or places each pot in position at the foot of the ramp to ensure it is shot away without incident. Although this method requires some human intervention the effort required is minimal.

The self shooting systems shown here have been developed specifically for each vessel layout and to the individual skippers' requirements. Therefore these are examples only and any system adopted must be designed and developed to fit vessel and skipper requirements.

4. Automatic hauler stop

The concept is to have the hauler stop automatically when a pot or anchor comes up to the davit block. Various methods could be used to achieve an automatic stop:

- **Mechanical**

A spring loaded lever arm mounted on the davit block, such that, the pot or anchor would make contact with it as it neared the block. The lever arm would activate a cut-out valve to stop the hauler. The design of a mechanical stop would have to allow the free passage of the leg rope over the open side of the davit block.

- **Optical**

An optical sensor would be utilised to detect the approaching pot or anchor. This has the advantage that there will be no possibility of the leg rope fouling but, the reliability of an optical system with all the spray from the rope would have to be proven.

- **Proximity**

The robustness and reliability of a proximity probe switch could be exploited, not to detect the actual pot or anchor, but to detect a marker attached to the back line or leg rope. Stainless steel bands crimped around the rope would act as markers to be detected by the proximity switch mounted so that the rope passed close by. The switch may well be mounted on the hauler and the distance of the marker from the pot calculated accordingly.

- **Combined**

Perhaps the most advantageous method would be to combine the control possibilities with optical or proximity detection to offer a

fail safe mechanical stop. Such a combination would enable the pot hauler to be automated (stopping automatically whenever a pot arrived level with the rail.) Indeed, if it is possible that a system could be designed to haul the pots and place each one on a table or conveyor totally automatically. Such a system would greatly improve the efficiency of potting, as it would enable the crew to concentrate totally on emptying, re-baiting and stacking pots.

Whether the development of such an auto stop system could be justified on purely safety grounds is questionable. Only a few incidents occur from persons being struck by a pot or anchor at the hauler, and some fishermen report that if they are late stopping the hauler, the pot simply jams against the davit block with the rope slipping in the hauler vee wheels.

Perhaps the biggest justification for an automated hauler stop would be on the grounds of efficiency, as it could enable attention to be concentrated on the cleaning, baiting and stacking of pots. On those vessels where the hauler operator is also cleaning pots, and has developed the timing to know exactly when to be at the hauler control, there would be little advantage, other than being able to finish clearing the pot before restarting the hauler. However, in situations where a man is solely operating the hauler it would be a major advance.

An automated hauler stop does offer a further benefit. Extending the automation further, to include lifting the pot on board onto a table, would be very desirable. Such automation, although certainly possible, would require considerable research and development to achieve a suitable and reliable system able to cope with the marine environment and vessel motion. An essential factor, with any automation, would be how cost effective the system would be to the fisherman.

5. Potting Roller

Traditionally, a davit-mounted hanging block has been used to haul pots or creels over the vessel's rail, but a wide roller mounted on the rail is now being used with good results by several vessels. The idea was pioneered by Jersey fisherman Peter Gay on board his vessel *Loup de Mer* and has become popular on several under 10m vessels in Scotland. Seafish has worked with Joe Masson to improve the roller installation on his under 10m vessel *Goodway* operating from Fraserburgh.

- **Layout**

The general layout on the vessel is shown below. Ideally, to enable the vessel to be easily controlled the roller needs to be mounted well forward on the vessel's rail and in a reasonably horizontal position.

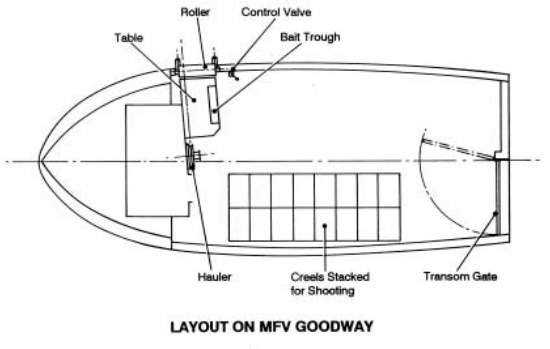

Figure 12: Roller layout on MFV Goodway

- **Roller Details**

The roller has a large diameter, necessary to smooth the passage of the pots over it and a length to accommodate the pots being used. On the *Goodway* the creels worked are 710mm x 460mm x 460mm (28 x 18 x 18inches) and the roller installed to haul these over is 273mm diameter by 850mm long. The width between the side rollers is 800mm, which gives a large clearance on the 460mm, (18inch) width of the creels.

Most pots/creels can be hauled over this size of roller, including 'inkwell' type pots, the critical factor being that there is clearance between the side rollers for the maximum dimension of the pot. Figure 13 shows the Seafish roller design with removable side rollers to avoid damage when mooring the vessel.

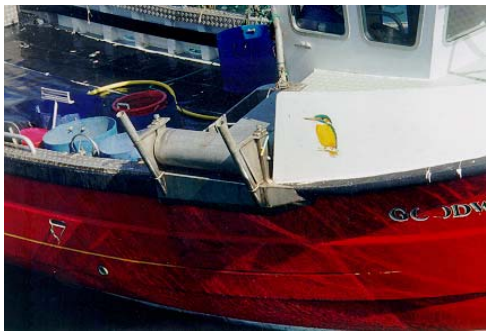

Figure 13: Seafish roller design

- **Hauler Control**

The pots/creels can be hauled over the roller at a modest speed, but it is essential that the hauler is slowed from high speed as each pot arrives at the roller. To achieve rapid smooth control a quarter turn rotary control valve is recommended. This should be mounted adjacent to the roller, readily accessible to the person standing at the roller but with the handle protected such that it cannot be accidentally caught by a rope or clothing.

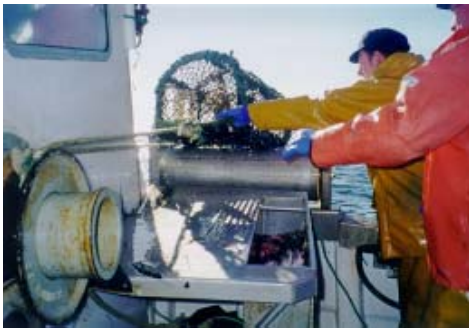

Figure 14: Hauling pots with roller

- **Safety**

The roller has the advantage over the davit block in that the manual effort of lifting the pots/creels inboard has been eliminated and therefore levels of fatigue reduced. The pots/creels pass over the roller directly onto the table and only have to be lifted once for stacking ready for shooting.

6. Other considerations

- **Stability Issues**

When loading, consideration should be given to the size and capabilities of the vessel and the weather conditions. The load should then be adapted as necessary. This may mean moving pots around the vessel to even out the weight of the load, reducing the number of pots on a string, or making additional trips to move a load.

- **Fatigue**

Fatigue is often a major factor in marine incidents. Fishing vessel owners and operators are urged to review the issues of fatigue on their vessels. They are also urged to take remedial measures to prevent fatigue such as:

- ✓ Scheduling watches
- ✓ Avoiding under-manning
- ✓ Not letting other activities intrude on rest and sleep
- ✓ Ensuring adequate meals are provided
- ✓ Using a team approach where possible to prevent a single person's fatigue from impeding safety

- **Crew Competence**

Fishing Vessel (Safety Training) Regulations require fishermen to undertake basic safety training. In addition to these courses, fishermen are also recommended to undertake the following Seafish courses that comprise the Under 16.5 m Skipper's Certificate.

1. Navigation/Bridge Watchkeeping
2. Engineering/Engine Watchkeeping
3. Intermediate Stability Awareness
4. GMDSS Short Range Certificate

Skills and knowledge learned on these courses will make a big contribution towards improving and maintaining safety levels on board. Vessel operators must also ensure crew receive adequate training and induction regarding use of machinery and systems particular to the vessel. Operational systems should be regularly reviewed and risk assessments carried out involving all crew members.

- **Risk Assessments**

Regular risk assessments are an essential tool for identifying potential hazards and dangers onboard a vessel. They focus attention on what actions and measures can be taken to reduce the likelihood of an incident occurring. Involving all crew members in this process will significantly enhance the benefits.

- **Drills**

Regular drills are the best way to ensure that all crew members are prepared to deal effectively with incidents (such as man overboard) when/if they occur. All crew should participate to ensure they are competent and confident in dealing with different incident scenarios.

Life saving appliances

Epirbs and life rafts are currently not mandatory on smaller vessels. As such only eight of the ten vessels that capsized or were missing during the period 1998-2008 were carrying life rafts and none were carrying Epirbs (see Table 2). If they had been, the crew's chances of survival would have been improved. Not all of these capsizes could be attributed to potting practices, but that they resulted in loss of life is sufficient justification to include them in this report.

Small vessel operators should consider carrying these items and installing man overboard (MOB) systems as they will greatly improve the chances of survival and aid swift recovery in a capsize scenario. Additionally handheld radios and PLBs (Personal Locator Beacons) should also be considered.

Of the nineteen fatalities in the same period resulting from MOB incidents, seventeen were known not be wearing lifejackets and two are believed not to have. Had these fishermen been wearing correctly fitted lifejackets or Personal Flotation Devices PFDs) their chances of survival would have undoubtedly been improved.

Table 2: UK Potting Vessel Fatalities 1998-2008: Safety equipment employed

Incident Type	No of Incidents	Fatalities	Lifejacket worn			Liferaft		Epirb	
			Yes	No	Not known	Yes	No	Yes	No
MOB	19	19	0	17	2	n/a	n/a	n/a	n/a
Capsize/Missing	10	14	0	12	2	2	8	0	10
Grounding/Collision	2	2	0	2	0	2	0	2	0
Totals	**31**	**35**	**0**	**31**	**4**	**4**	**8**	**2**	**10**

Of these nineteen MOB incidents it is known that eight were caused by entanglement in the ropes, the causes of seven were unknown as the fishermen were operating single handed or the bodies were not recovered. The remainder were caused by bad weather. The incident involving collision was due to inadequate watchkeeping.

Lifejackets are still not worn by many fishermen on deck. It is often claimed they are a potential hazard and/or cumbersome to wear. However some fishermen do wear them and wearing a lifejacket will undoubtedly increase a fisherman's chances of survival in an MOB situation. The design of constant-wear lifejackets is always improving.

During 2005 and 2006, the RNLI and Seafish conducted evaluation research into PFDs for their suitability in a commercial fishing environment. Trials found that a number of lifejackets readily available in the marketplace were appropriate for use in potting operations.

Conclusions

The fatal accident rate for UK fishermen for the decade 1996-2005 was 115 times higher than that of the general workforce, 81 times higher than in manufacturing and 24 times higher than the construction industry which is often considered the most hazardous occupation in the UK. While the fatal accident rate for almost all other UK occupations had fallen sharply over the last 30 years, there has been no discernable reduction in the fishing industry[3].

The continued high rate of accidents resulting in fatalities within the potting sector is a cause for concern. Fishing, and indeed potting, remains a highly dangerous occupation and it is unrealistic to imagine all hazards can be eliminated. However, by considering and adopting some or all of the suggestions listed it may be possible to reduce the likelihood of accidents occurring, and by providing non-mandatory life saving appliances, increase the chance of survival when unfortunately they do occur.

Vessel operators looking to modernise their vessels to improve safety, improve working conditions and purchase non-mandatory safety equipment may be eligible for grant aid towards the cost. See over for details.

[3] MCA Research Project 578, see: www.mcga.gov.uk

Further information

- **Toggle systems, rope separation pounds and automatic hauler**

For more detailed information regarding toggle systems, rope separation pounds and automatic hauler stops see Seafish Report No. SR524: *Potting Safety Assessment*. A copy of this report can be obtained from http://www.seafish.org/resources/publications.asp. Enter 'potting' in keyword search. *Please note that fatality data included in this report was later found to be under estimated.*

- **Potting roller**

For more detailed Information see Seafish Technical Information Sheet N0: 2001/02/ms *Potting Roller*. A copy of this report can be obtained from the Seafish website http://www.seafish.org/resources/publications.asp. Enter 'potting' in keyword search.

- **Seafish courses**

Those interested in these courses should discuss course and grant availability with their local Seafish Approved Training Provider. A list of training providers can be found on the Seafish website: http://www.seafish.org/sea/training.asp?p=ef154 or call Seafish Training on 01472 252302.

- **Risk assessment**

A standard risk assessment form for potting can be found on the Marine Services section of the Seafish website: http://www.seafishmarineservices.com/Safety.htm

- **Man Overboard Systems**

For information on MOB systems:
http://www.rnli.org.uk/what_we_do/sea_and_beach_safety/fishing_safety/mob/moredetails
http://www.seamarshall.com/

- **Life jacket research**

The results of this research can be viewed on RNLI and Seafish websites: www.rnli.org.uk/fishingsafety and http://www.seafish.org/resources/publications.asp. Enter 'lifejacket' in keyword search.

- **Grant aid**

Grants toward the cost of safety improvements/equipment may be available. For the latest information contact Seafish or your Fishermen's Federation or click on the links below to the UK Fisheries Departments.

England
http://www.marinemanagement.org.uk/fisheries/grants/index.htm
Scotland
http://www.scotland.gov.uk/Topics/Fisheries/grants-subsidies
Northern Ireland
http://www.dardni.gov.uk/index/grants-and-funding/fisheries-grants.htm
Wales
http://wales.gov.uk/topics/environmentcountryside/foodandfisheries/fisheries/europeanfundforfisheries/?lang=en

For further information contact:
T: 01472 252301
E: training@seafish.co.uk

Origin Way, Europarc, Grimsby DN37 9TZ

t: 01472 252302 f: 01472 268792
e: training@seafish.co.uk w: www.seafish.org SIN: http://sin.seafish.org