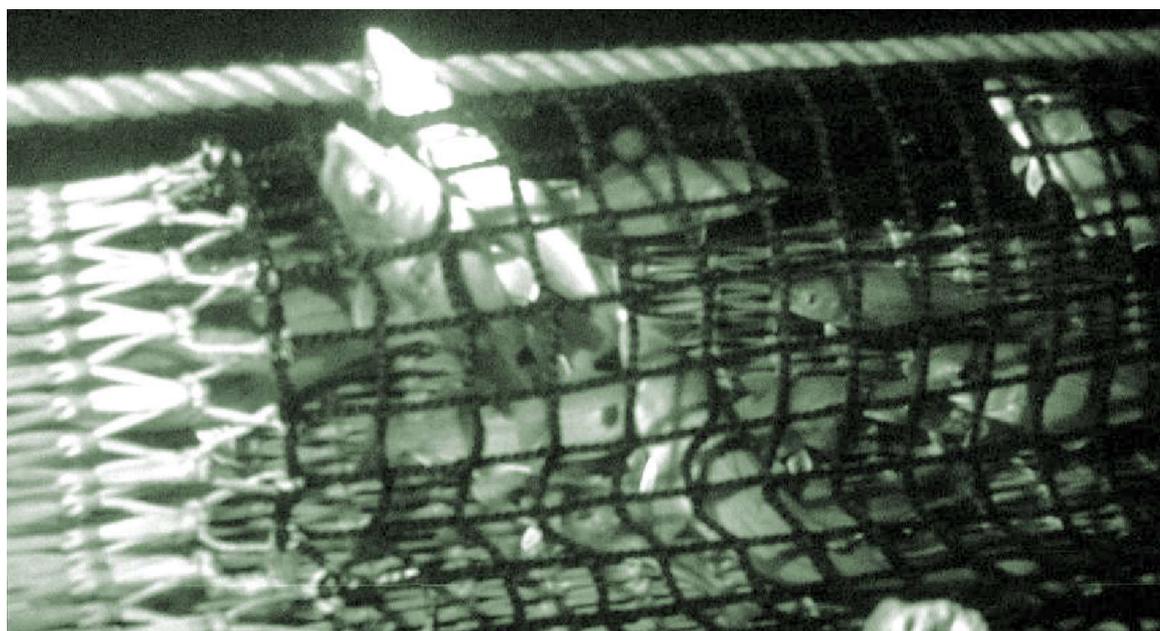




FISHERIES RESEARCH SERVICES

## SCOTTISH INDUSTRY / SCIENCE PARTNERSHIP (SISP) Report No 04/08

### **REVIEW OF TECHNICAL MEASURES FOR SCOTTISH MIXED DEMERSAL FISHERIES**



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**SISP**  
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**REVIEW OF TECHNICAL MEASURES FOR SCOTTISH MIXED  
DEMERSAL FISHERIES**

Project code MFP6Q05

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## INTRODUCTION

### Problem, Objective and Methods

Several key Scottish demersal fisheries can be described as “mixed fisheries” because they target a range of species (e.g. cod/haddock/whiting; *Nephrops*/whitefish; cod/monk/flats), often of quite different shape and size at maturity. This means that the size of animal which should be retained by a gear to create a sustainable fishery will differ from species to species. In addition non-target species may inhabit the same grounds as the commercially important species. Consequently each of these species should be subject to a different selection mechanism (e.g. a different mesh size). However, in most gears the catch is collected in a single codend with a mesh size which may be right for the main target species but is often too small for other species. Quota limits, market conditions or management rules such as minimum landing sizes or catch composition may also impose artificial constraints on the quantities of each species that are landed. For any of these reasons discarding may result.

One option to help solve mixed fishery problems is to implement closed areas or seasons although this can cause inefficiency in the operation of the fleet. The real time closure scheme introduced in Scottish fisheries in 2007 is one example. Another way to reduce the problem is through technical measures modifying gear design. Some are simple in concept and application. Many different devices such as the square mesh panel, grid, inclined panel or raised footrope have been tested in commercial and research trials in the past 15 years. Other solutions are more complex. For example, studies of a horizontal separator panel have shown that it is possible to separate some species during fishing. This would allow e.g. a different mesh size to be used for different groups of species, and so match the catch composition more closely to the required landings.

The aim of this project is to review the recent development work on gear designs and to identify some of the options for selectivity-related technical measures for each of the main Scottish mixed fisheries. Such devices are described and illustrated in this report. An important aspect of the project was to canvass industry opinion on the possible gear options so that an industry-wide view is obtained on their practicality, economic viability and effectiveness for specific gears used in individual fisheries throughout Scotland. The outcome of a series of meetings with industry is summarised.

Finally the major Scottish mixed fisheries are defined in terms of gear, target species, fishing areas and other relevant characteristics, and the particular problems associated with each fishery and options for technical solutions are discussed.

## INTENDED USE OF RESULTS

A new gear design must be appropriate to the specific circumstances of the fishery in which it is to be introduced. A review of technical measures for each Scottish mixed fishery will help to assess promising gear options and to identify which ones are more likely to be successful. There is management pressure to reduce discards, minimise the catch of some species and limit small mesh fisheries, for example. The use of novel fishing gear designs is one possible way to reduce these pressures and allow mixed

fisheries to continue. The aim is to maintain or improve the current opportunities for the catching sector while at the same time improving sustainability.

Cooperation between industry, management and science is important in developing a new attitude to conservation through the use of more selective gears. This project therefore fits perfectly with the aims of the Scottish Industry/Science Partnership (SISP). In the past 8 years, legislation aimed at improving selectivity has been brought in unilaterally by Scotland or UK, sometimes at the request of industry. The four main examples in the period 2000 to 2007 are:

1. *Nephrops* trawls  
Use of 4mm single twine instead of 5mm double twine – proposed by industry;
2. Trawls/seines of 70-119mm (with a few exceptions)  
90mm SMP at 15-18m instead of 80mm SMP at an indeterminate position;
3. Whitefish trawls/seines in Scottish waters or Scottish vessels anywhere  
Lifting bags banned unless fishing for *Nephrops*;
4. Twin rig trawls (UK)  
Must use 100mm mesh except 80mm allowed in Fladen area, in ICES IV south of 53°N, in ICES VI south of 56°N and in ICES VII.

It is hoped that this SISP project will provide information so that rational decisions can be made about further conservation measures for Scottish mixed fisheries in particular, e.g. through the Scottish Conservation Credits scheme which has been implemented during 2008 (Appendix 1). In this way further progress should be made towards sustainability while maintaining economic viability of the fleets.

## MEETINGS WITH INDUSTRY

A series of 5 meetings (Table 1) were held with industry representatives and skippers to identify mixed fisheries all around Scotland and to gauge views on potential solutions to problems such as discarding. Forms were distributed to skippers at the meetings asking for views on the suitability of specific technical options for their fishery.

**TABLE 1**

Locations and dates of industry meetings and main fisheries involved

<b>Fleet</b>	<b>Location</b>	<b>Dates in 2008</b>
Whitefish	Shetland	18 January
Nephrops	Inverness	1 February
Nephrops	Fraserburgh	2 February
Nephrops	Glasgow	23 February
Whitefish	Banff	29 February

The minutes of the meetings are attached as Appendices 2 to 6. The table below summarises the main points arising from them and from the forms completed by skippers.

**TABLE 2**

## Key Points from Industry Meetings

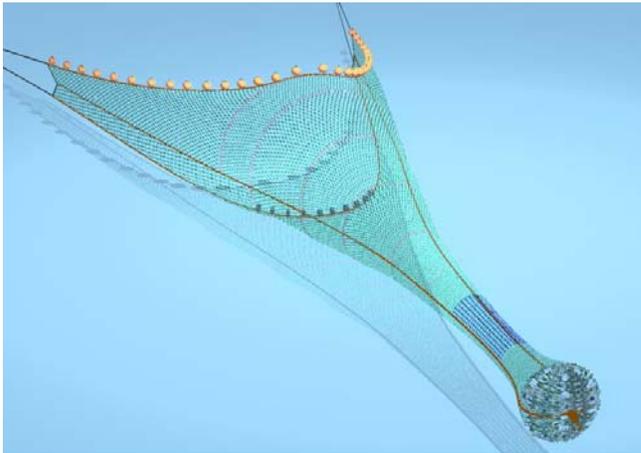
A tick (✓) indicates mainly agreement but a cross (x) indicates mainly disagreement with the point. Views were rarely unanimous. A blank simply means that the topic was not discussed at the meeting.

Subject	Points Raised	Response by the ports to the common themes				
		Glasgow	Banff	Fr'burgh	Inverness	Shetland
		Prawns	W/fish	Prawns	Prawns	W/fish
Discards as a driver of technical change	1. Additional clarification and information is required with regards to sectoral and seasonal disaggregation of discards information	✓		✓	✓	✓
	2. There is a basic need to take account of the causes of discarding when developing technical conservation measures (TCMs)	✓			✓	✓
Specific technical conservation measures	3. SMPs are a useful tool for increasing selectivity, particularly in fisheries using mesh sizes below 120mm	✓	✓	✓	✓	
	4. Positioning of the SMP has a key role in reducing whitefish discards but also limiting loss of <i>Nephrops</i> in prawn fisheries	✓	✓	✓	✓	
	5. Use of large mesh SMP's (>140mm) as an option in clean <i>Nephrops</i> fisheries	x	x	x	✓	
	6. The use of single/thinner twine to increase selectivity is sensible	✓		✓	✓	
	7. The use of grids /inclined panels as a TCM	x ✓	x	x	x ✓	
	8. The use of large mesh panels behind headline	✓ x	✓ x	✓ x	✓ x	
	9. Coverless trawls (headline & groundrope ~ equal length) can be useful as a selective device for whitefish in <i>Nephrops</i> fishery	✓	x	x	✓ x	
	10. The removal of lifting bags is a practical step toward better selectivity in <i>Nephrops</i> fishery		x	x		
	11. Codend mesh size >80mm for <i>Nephrops</i> selection	x		Possibly for larger vessels		
Management of technical change	12. Need for selectivity trials to cover all fleets and vessels	✓		✓	✓	
	13. Smaller vessels and/or seiners need to be treated as a special case when introducing TCMs	✓		✓	✓	✓
	14. Need for flexible choice of TCMs for individual fisheries	✓	✓			✓
	15. TCM legislation - need for clarification/simplification and a level playing field	✓		✓	✓	
	16. More complex gear designs to separate species may be needed	x	✓		x	✓

## DESCRIPTION OF TECHNICAL CONSERVATION MEASURES

During the meetings with industry to discuss technical measures for mixed fisheries, skippers were asked to fill in a survey of their views on technical options. A range of gear options is considered in this section with a summary of the points for and against their adoption put forward by the industry and also of any scientific findings and observations. Overall the most popular device to improve selectivity is clearly a square mesh panel, if put in the correct place and at the correct mesh size. Several devices were found to be unpopular or unsuitable for Scottish fisheries and are not put forward as options to solve mixed fishery problems.

### 1. Square Mesh Panels



A short section of square mesh netting is inserted in the top sheet usually near the extension/codend. The square meshes stay open and some roundfish species are able to escape more easily. Already used extensively in legislation.

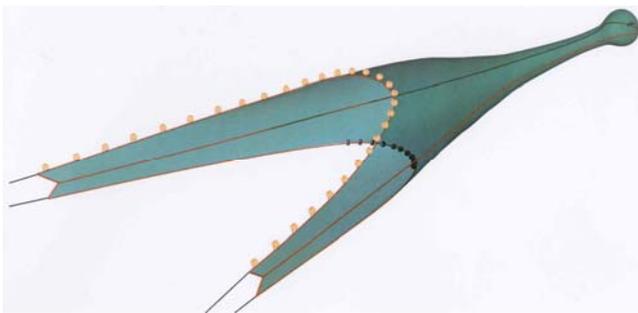
**For** - Simple to install – works for most roundfish species – not expensive – can control effect by changing mesh size and/or position.

**Against** - Not as strong as diamond netting – does not work for flatfish – very small fish can have difficulty

escaping – does not separate cod from haddock/whiting.

**Conclusion** – Effective and acceptable option for most roundfish when placed correctly with suitable mesh size.

### 2. Coverless Trawl



A reversion to a more traditional design of low headline trawl in which the headline is approximately the same length as the footrope hence the centre of the headline is above the centre of the groundrope. Fish which tend to rise in the net mouth as they tire therefore have

more time to rise over the headline and escape.

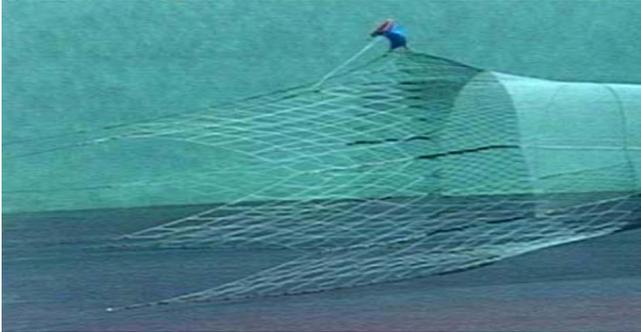
**For** - Escaping fish are not traumatised by passage through gear – reduces haddock/whiting discards – not expensive.

**Against** - Not effective for cod – net may be unstable in deeper water – releases 35% of marketable haddock/whiting – escape is not length-related.

**Conclusion** – Appropriate where the aim is a clean *Nephrops* fishery but does not help cod.

### 3. Cod Reduction Trawl (not yet tried commercially)

Picture of US-designed Eliminator trawl reproduced courtesy of Superior Trawl.



Large meshes in the forward part of the net (e.g. lower wings and belly) may allow additional escapes of cod, while haddock and whiting are not affected.

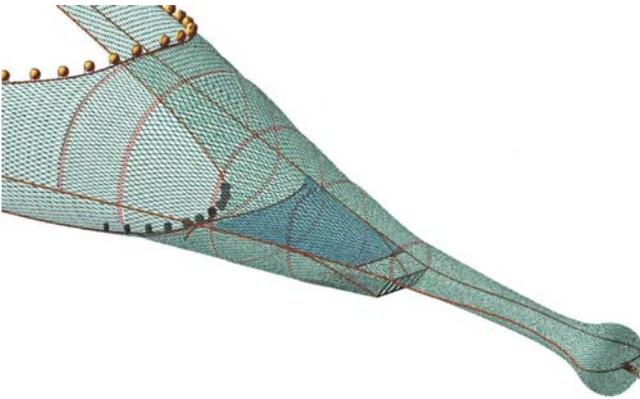
**For** - Should release cod but retain e.g. haddock/whiting.

**Against** - Other species (flats, monk) apart from cod may also escape.

**Conclusion** - Not proven

commercially but its simplicity is attractive.

### 4. Horizontal separator trawl (limited commercial trials)



A horizontal panel divides the trawl body into 2 unequal compartments. Haddock and whiting and saithe tend to rise and enter the upper compartment whereas cod, flatfish and monkfish will tend to stay low and enter the lower compartment. Cod can then be subjected to a different selection process from haddock and whiting.

**For** - Separates haddock/whiting

from cod.

**Against** - Expensive – complex design – difficult to mend – susceptible to damage – other species (flats, monk) may escape.

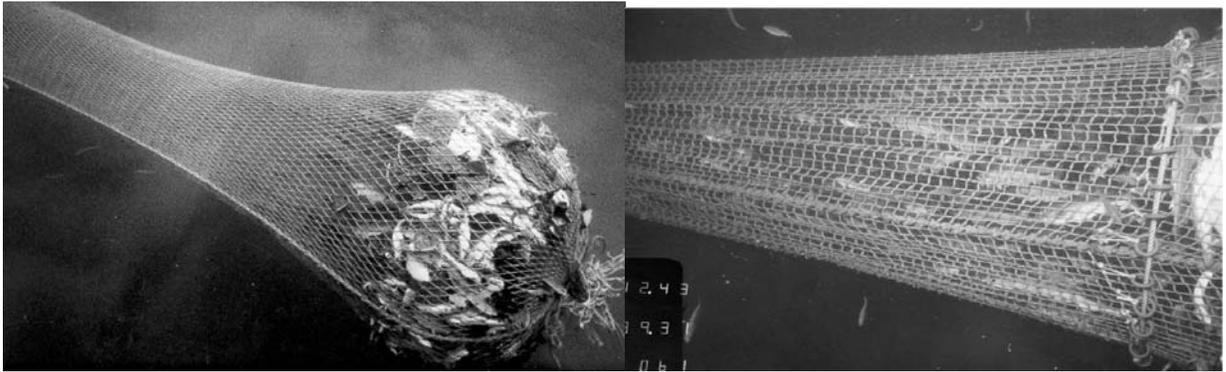
**Conclusion** – Not proven commercially, not a favoured option for releasing cod because of complexity although may be effective.

**5. Codend Design – Mesh Size, Mesh Shape, Open Meshes, Lifting Bag, Twine Thickness – Figures 5a-e**

**For** - Can all have a significant effect on selectivity – relatively cheap.

**Against** - Do not select by species, only by size of fish - changes in mesh size or shape or in twine need a new codend.

**Conclusion** – Suitable options for improving size selection only.

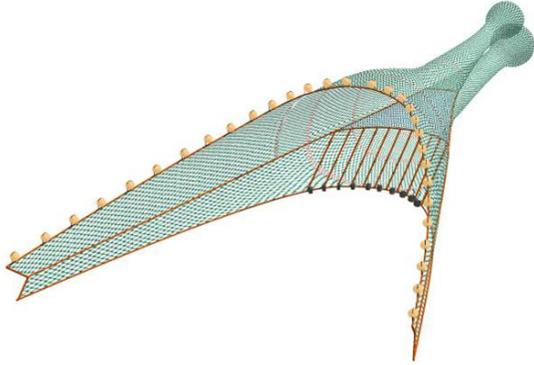


**Figures 5a and b:** Diamond mesh codend (left) showing restricted area of open diamond meshes just ahead of bulge of fish catch and typical bulbous shape compared to square mesh codend (right) with more open meshes along whole length.



**Figures 5c-5e:** Left - Narrow codend with fewer meshes around circumference attached to standard extension showing increased mesh opening. Centre - Lifting bag of double the mesh size on the outside of codend. Right - Two samples of netting with similar sized mesh but different twine thickness.

6. Rising Ropes (not yet tried commercially) – Figure 6



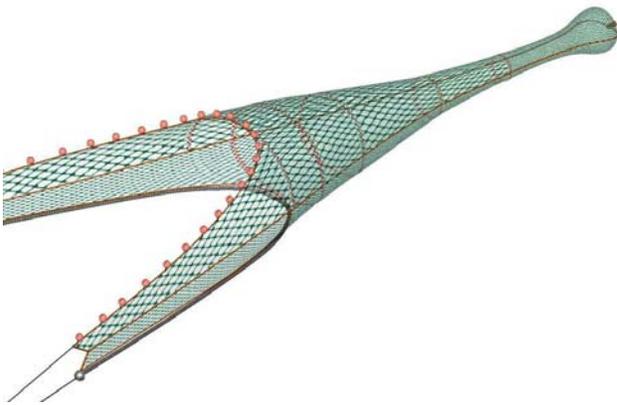
Cod and other roundfish tend to react to rising ropes and may not pass through them so that roundfish may be separated from some flatfish species and *Nephrops*. Differential selection mechanisms can then be applied to the different groups of species.

**For** - Can be used to separate cod (and other roundfish) from *Nephrops* and lemon sole – not expensive.

**Against** - Difficult to design, rig and maintain.

**Conclusion** – Not yet proven, obvious practical difficulties.

7. Large Mesh in Top Panels – Figure 7



Areas of larger diamond or square mesh netting are inserted in the top sheet to provide greater escape areas for fish as they fall back along the tapered body of the net towards the codend. Limited trials done so far.

**For** – less fuel used – easy to fit and repair – reduce catch of juvenile haddock, whiting.

**Against** – May lose prawns at selvages – some loss of marketable haddock, whiting – may distort net.

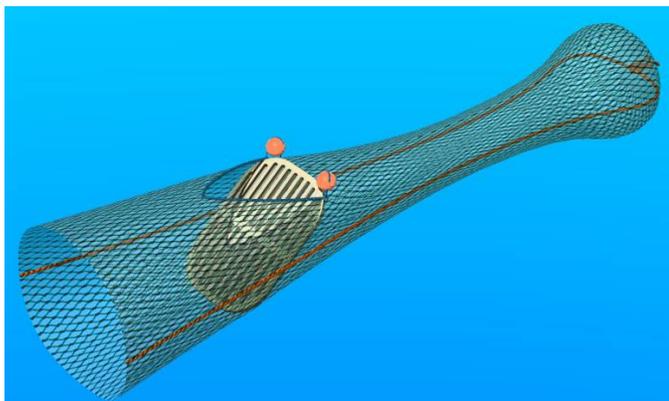
**Conclusion** – Is acceptable but may

be of limited effect.

8. Rigid or Flexible Grids – Figures 8a-b



**Figure 8a:** A French design of flexible grid to release *Nephrops* from the belly panel.



**Figure 8b:** A rigid grid to divert roundfish from a *Nephrops* or shrimp trawl.

A grid either allows smaller animals to escape while larger ones enter the codend (Figure 8a) or diverts larger fish out of the trawl allowing smaller ones to enter the codend (Figure 8b). In use in many countries (shrimp and *Nephrops* fisheries mainly).

**For** – effective size selector – can be used to sort species (e.g. fish from shrimp).

**Against** – may distort net – may release marketable fish – risk of being blocked with debris – expensive – difficult to handle with power-block.

**Conclusion** – Not a popular option in Scotland.

## **DISCUSSING THE ISSUES FOR EACH MAJOR SCOTTISH MIXED DEMERSAL FISHERY**

The main Scottish demersal fisheries (trawl and seine) have been identified in tables 3 to 6. Four general groups are considered – mixed whitefish, clean *Nephrops*, mixed *Nephrops*/whitefish and finally mixed groundfish fishery. These are then sub-divided into individual fisheries, defined by area, specific mesh size range or vessel size, for example. The following sections discuss each fishery in turn and put forward options for technical conservation measures to solve any problems caused by the mixed nature of the catches taken in these fisheries. No account is taken of changes to technical conservation measures that may be proposed by the European Commission during their on-going review in 2008-09.

### **1. Mixed whitefish fishery**

**Target species:** haddock, whiting, cod, hake, saithe, flatfish, monkfish.

**Discarding:** Non-commercial species and juvenile of target species.

**Gears:** Mainly demersal single trawls, other gears used are Scottish seine, twin-rig trawl and pair seine and trawl.

**Net designs:** High opening trawls, scraper trawls.

**Mesh size ranges:**

Four principal fisheries indicated by a mesh size range are discussed in turn to identify the problems and some options for technical solutions.

**TABLE 3**

Mixed whitefish fisheries

Area	Mesh size range and twine size	Gear	Management Option	Extra gear measures required	Species
(a) Inshore mainly	100-109mm / 5mm double	Seine	Derogation from 1-net rule	90mm SMP	Whiting, haddock, etc
(b) Rockall	100-109mm / 5mm double	Trawl		90mm SMP	Haddock, monk
(c) Offshore everywhere	120+mm / 5mm double	Trawl		None	Haddock, cod, whiting, hake, saithe, flats, monk
(d) Offshore everywhere	120+mm / 5mm double	Seine		None	Haddock, cod, whiting, hake, saithe, flats, monk

**1(a). Mesh size range 100-109mm – Fishery with Scottish seine and other gears**

Seiners in particular use this mesh size to target species in the long list (annex 1 of 850/98) to Turbot, including whiting but excluding cod on West coast grounds and excluding cod and haddock in the North Sea. Skippers are convinced that use of 120mm mesh in a Scottish seine loses significant amounts of marketable fish, such as haddock and whiting. They have been granted a derogation during 2008 from the one net rule imposed in February 2008, allowing them to carry a net with a 100mm codend (with 90mm square mesh panel) as well as a 120+mm mesh net, under certain conditions. Although the process of fish capture in a seine is quite different from a trawl, selectivity experiments and discard data from FRS observer trips do not indicate higher selectivity or lower discard rates for seines compared to trawls of the same codend mesh size. There are however, alternative explanations of the problem. If the population of fish being targeted is mainly in the length range around the minimum mesh size then an increase in mesh from 100 to 120mm would be likely to cause a major loss of the marketable component of the catch. For example, on inshore grounds compared to offshore grounds, there are relatively fewer large fish which would continue to be retained by 120mm. This could explain not only the poor level of marketable catch but also the continuing high discard rates (the ratio of discards to catch). To try to resolve this issue, further discard and selectivity data from the seine net fleet will be examined during the summer of 2008.

In the longer term while cod is still a recovery stock, use of either 100 or 120mm mesh codends will still cause too high mortality on immature cod below about 50cm. New seine net designs need to be developed to reduce cod mortality while maintaining marketable catch of haddock, whiting and other whitefish – see 1(c) below.

**1(b). Mesh size range 100-109mm – Rockall haddock fishery**

Currently 100mm codends may be used with 90mm square mesh panels. While this is mainly a haddock and monkfish fishery there are some discards of redfish (*Sebastes viviparus*) and gurnard (*Eutrigla gurnardus*), as well as juvenile haddock below 30cm. A move to a higher mesh size of at least 110mm has been discussed in recent years. Another option would be to adopt the 110mm square mesh panel for codends in the

range from 100 to 119mm as these seem to have suitable selection characteristics for haddock relative to the current minimum landing size of 30cm. However, it would be necessary to find out whether such a panel would also improve selection for the other discarded species or whether a larger codend mesh size (e.g. 120mm) might be more appropriate overall.

The Russian fleet adopts a different strategy using smaller mesh of 40-70mm and landing juvenile as well as adult fish. Waste is reduced by avoiding discards but it is not clear which strategy is more beneficial to the stocks in the long term.

### **1(c). Mesh size range 120+mm – the main whitefish trawl fishery**

For most species such as haddock, whiting, hake, flatfish, monk and saithe this mesh size is suitable and many skippers confirm that they seldom have significant discards. However, it is still too small for cod for optimum exploitation and while this stock is recovering. There are trials planned in 2008 for new designs of trawl which reduce cod mortality by allowing the escape of cod up to perhaps 50cm. The “Eliminator” trawl has been imported from the US (Beutel et al., 2006) and trialled by NFFO and CEFAS in England. This design may create a clean haddock, whiting and saithe fishery and dramatically reduce the catch of cod and other groundfish such as flats and monk. A trawl with an additional horizontal panel above the belly sheet is being developed in a research project in Scotland (Ferro et al., 2007) but is not yet at the commercial stage. It separates haddock and whiting into a top compartment and allows cod to be subjected to a different selection process in the lower compartment. A simpler design of trawl with large meshes in the lower wings and belly to release immature cod will be tested in Scotland during 2008. Another option is to increase the diameter and/or spacing of hoppers on the ground-gear, which has potential to release smaller sizes of ground fish.

The enhanced Conservation Credits Scheme in Scotland aims to promote the further development of such gears and to give incentives to their use.

### **1(d). Mesh size range 120+mm – the main whitefish seine fishery**

There is widespread concern amongst the seine net fleet that the 120+mm codend is too selective for haddock and whiting when attached to a seine net – see 1(a) above. Nevertheless, cod mortality is still too high for optimum exploitation and while the stock is recovering. Ideas for the development of seine net designs which have lower cod mortality are needed. Options for new trawl designs have been outlined in 1(c) above, although there is no certainty that the same solutions will be appropriate for the Scottish seine.

## **2. Clean *Nephrops* fisheries**

**Target species:** *Nephrops*.

**Occasional discarding:** Haddock, whiting, cod, flatfish, dogfish, skate.

**Gears:** Single or twin trawls.

**Net designs:** *Nephrops* trawls and scraper trawls. Also double bag trawls.

**Mesh size ranges:**

Three principal fisheries indicated by a mesh size range are discussed in turn to identify the problems and some options for technical solutions.

**TABLE 4**

Clean *Nephrops* fisheries

Area	Mesh size range and twine size	Gear	Management Option	Extra gear measures required	Species
(a) West coast – Minches, Clyde	70-79mm / 4mm single	Single prawn trawl	(i) Opt out of conservation credit scheme	90mm SMP	Clean <i>Nephrops</i> with occasional whitefish discarding
			(ii) Join conservation credit scheme	90mm SMP but from 1 <sup>st</sup> July, 110mm SMP	Clean <i>Nephrops</i> with occasional whitefish discarding
(b) Inshore with small vessels including under 10m	80-94mm / 4mm single	Single and twin-rig prawn trawl	(i) Opt out of conservation credit scheme	90mm SMP	Clean <i>Nephrops</i> with occasional whitefish discarding
			(ii) Join conservation credit scheme	90mm SMP but from 1/7/08 110mm SMP	Clean <i>Nephrops</i> with occasional whitefish discarding
(c) Main Fladen fishery	95+ mm / 5mm double	Single and twin-rig prawn trawls		90mm SMP	Clean <i>Nephrops</i> with some whitefish discarding

**2(a). Mesh size range 70-79mm - West coast clean prawn fishery with single trawls**

**2(b). Mesh size range 80-94mm – Fishery by single and twin-rig inshore vessels throughout Scotland**

- (i) Opt out of basic Conservation Credits scheme

Currently regulations require a 90mm square mesh panel to be placed at 15 to 18m from the codline. This gear has inadequate selection not only for cod but also for haddock and whiting, retaining, perhaps seasonally in some areas, undersized fish which are then discarded. However, fishermen are reluctant to alter the SMP in either mesh size or position in case prawns drop through the panel, for instance when the gear is twisted or on hauling in poor weather. Placing the SMP in the taper of the net is considered by many to be important to reduce the effect of twisting, but recent trials have suggested that the SMP does not work as well in the taper as in the straight extension. On the other hand some skippers are prepared to increase SMP mesh size beyond 90mm. There is a balance to be struck between the low risk of marketable prawns being lost and the benefit of reducing discards of juvenile roundfish through best choice of SMP. A considerable increase in SMP mesh size may be justified to ensure that all roundfish are allowed to escape whenever they are encountered in these clean prawn fisheries. To follow up on these issues, trials are being done in summer 2008 on SMP mesh sizes of 120, 160 and 200mm.

Some fishermen already use trawls with little or no cover (Figure 2) to reduce roundfish by-catch. Others are using larger mesh in the top sheet than is required by the current legislation

Both 70mm and 80mm codends are unselective for roundfish and also *Nephrops*. Tests have shown that mesh sizes below about 90mm rarely show length-related *Nephrops* selection. If an improvement in prawn selectivity is required for biological reasons, a codend mesh size of at least 90mm should be the aim, achieved in gradual steps. It is suggested that the maximum of 4mm single twine should continue.

A 110mm SMP at 15-18m from the codline is already an option in the basic Conservation Credits scheme and even more selective devices may be adopted in an enhanced CC scheme in future. The question remains whether a gradual move to the obligatory use of these gears with improved selectivity should be considered.

(ii) Join basic Conservation Credits scheme

The Conservation Credits scheme requires that these gears incorporate a 110mm SMP at 15-18m from the codline. While this may provide adequate protection for juvenile haddock and whiting, it is insufficient for optimum exploitation of the cod stock and larger SMP mesh sizes of up to 200mm should be considered.

As discussed in (i) above, *Nephrops* selection is poor in 70 and 80mm codends and an increase to 90mm in 4mm single twine may be appropriate if supported for biological reasons.

### **2(c). Mesh size range 95+mm – fishery by single and twin-rig vessels in the main Fladen fishery**

A sector of the *Nephrops* fleet, often targeting high quality catch, use larger mesh sizes to reduce discards and débris. At present a 90mm SMP is required but an increase to 110mm should be considered.

The selection of *Nephrops* in 95mm codends made of 5mm double twine seems to be no better than 80mm codends in 4mm single twine. If justified as a way to improve the structure of the *Nephrops* stock, a gradual increase in selectivity of these 95mm codends should be the aim, either by increasing mesh size from 95mm or reducing twine thickness from 5mm double twine.

### **3. Mixed *Nephrops*/whitefish fishery**

**Main target species:** *Nephrops*

**Commercial by-catch:** Haddock, whiting, cod, flatfish, monkfish

**Discarding:** Non-commercial species and juveniles of target species

**Gears:** Demersal single and twin trawls

**Net designs:** Dual purpose fish/prawn trawls

**Mesh size ranges:**

Four principal fisheries indicated by a mesh size range are discussed in turn to identify the problems and some options for technical solutions.

**TABLE 5**

Mixed *Nephrops* and whitefish fishery

Area	Mesh size range and twine size	Gear	Management Option	Extra gear measures required	Species
(a) West coast – Minches	70-79mm / 4mm single	Single dual-purpose fish/ prawn trawl	Opt out of conservation credit scheme	90mm SMP	Genuine mixed fishery targeting prawns and whitefish
			Join conservation credit scheme	90mm SMP but from 1 <sup>st</sup> July, 110mm SMP	Genuine mixed fishery targeting prawns and whitefish
(b) Larger vessel everywhere	80-94mm / 4mm single	Twin-rig dual-purpose fish/ prawn trawl	Opt out of conservation credit scheme	90mm SMP	Genuine mixed fishery targeting prawns and whitefish
			Join conservation credit scheme	110mm SMP from 1/2/08	Genuine mixed fishery targeting prawns and whitefish
(c) Main fishery at Fladen and west coast	95-99mm / 5mm double	Twin-rig dual-purpose fish/ prawn trawl	Opt out of conservation credit scheme	90mm SMP	Genuine mixed fishery targeting prawns and whitefish
			Join conservation credit scheme	110mm SMP from 1/2/08	Genuine mixed fishery targeting both prawns and whitefish
(d) Main Fladen fishery	100+ mm / 5mm double	Twin-rig dual-purpose fish/ prawn trawl		90mm SMP	Genuine mixed fishery targeting both prawns and whitefish

**3(a). Mesh size range 70-79mm: West coast mixed species fishery using single trawls**

**3(b). Mesh size range 80-94mm: Fishery mainly by larger vessels using twin-rig trawls at Fladen**

(i) Opt out of basic CC scheme

Currently regulations require a 90mm SMP to be placed at 15-18m from the codline. Gears with codends up to 94mm mesh which are targeting whitefish as well as prawns will have inadequate selection not only for cod but also for many other species present on the grounds, leading to substantial discarding of juveniles of target species and also of non-commercial species. However, fishermen are reluctant to alter the SMP in either mesh size or position in case prawns drop through the panel, for instance when the gear is twisted or on hauling in poor weather. There is a balance to be struck between the low risk of marketable prawns being lost and the benefit of reducing discards of juvenile roundfish through use of the SMP. An increase in SMP mesh size to 110mm would

provide selection for haddock and whiting appropriate to the current minimum landing sizes. However, selection of cod would still be inadequate – see (ii) below.

Both 70mm and 80mm codends are also unselective for *Nephrops*. Tests have shown that mesh sizes below about 90mm show little or no length-related *Nephrops* selection. If an improvement in selectivity is required for biological reasons, a codend mesh size of at least 90mm should be the aim, achieved in gradual steps. It is suggested that the limit of 4mm single twine should be retained.

A 110mm SMP at 15-18m from the codline is already an option in the basic Conservation credits scheme and more selective devices may be adopted in an enhanced CC scheme in future. The question remains whether a gradual move to the obligatory use of these gears with improved selectivity should be considered.

(ii) Join basic CC scheme

The basic Conservation Credits scheme requires that these gears incorporate a 110mm SMP at 15-18m from the codline (from 1 July 2008 for single-rig trawls). While this may provide adequate protection for juvenile haddock and whiting releasing most fish below about 30cm, it is insufficient for optimum exploitation of the cod stock. Because cod mature at a much larger size than haddock and whiting, recovery would be speeded up by releasing most cod below about 50cm. Alternative gear designs are required to achieve this, while maintaining the marketable catch of haddock, whiting and other roundfish. The solutions being considered for the main whitefish fisheries (see 1(c) above) are not suitable for these smaller mesh mixed fisheries which require prawns and marketable haddock and whiting to be retained while releasing cod. Real time closures may be the only option to minimise impact on cod for these gears until a radically new and probably more complex gear design is developed. See (i) above for comments on *Nephrops* selection.

**3(c). Mesh size range 95-99mm: Fishery mainly by larger vessels using twin-rig trawls at Fladen**

(i) Opt out of basic CC scheme

Currently regulations require a 90mm SMP to be placed at 15-18m from the codline. Gears with codends up to 99mm mesh which are targeting whitefish as well as prawns will have inadequate selection not only for cod but also for many other species present on the grounds, leading to substantial discarding of juveniles of target species and also of non-commercial species. Some fishermen are already using larger mesh sizes in SMPs of 100mm or more. An increase in SMP mesh size to 110mm would provide selection for haddock and whiting appropriate to their current minimum landing size. However, selection of cod would still be inadequate – see (ii) below.

The selection of *Nephrops* in 95mm codends made of 5mm double twine is probably no better than 80mm codends in 4mm single twine. If justified as a way to improve the stock structure, a gradual increase in selectivity of these 95mm codends should be the aim, either by increasing mesh size from 95mm or reducing twine thickness from 5mm double twine.

A 110mm SMP at 15-18m from the codline is already an option in the basic Conservation credits scheme and even more selective devices may be adopted in an enhanced CC scheme in future. The question remains whether a gradual move to the obligatory use of these gears with improved selectivity should be considered.

(ii) Join basic CC scheme

The Conservation Credits scheme requires that these twin-rig gears incorporate a 110mm SMP at 15-18m from the codline. While this may provide adequate protection for juvenile haddock and whiting, it is insufficient for a recovering cod stock. Because cod mature at a much larger size than haddock and whiting, recovery would be speeded up by releasing most cod below about 50cm. Alternative gear designs are required to achieve this, while maintaining the marketable catch of haddock, whiting and other roundfish. The solutions being considered for the main whitefish fisheries (see 1(c) above) are not suitable for these smaller mesh mixed fisheries which require prawns and marketable haddock and whiting to be retained while releasing cod. Real time closures may be the only option to minimise impact on cod for these gears until a radically new and probably more complex gear design is developed.

See (i) above for comments on *Nephrops* selection.

**3(d). Mesh size range 100+mm: Fishery mainly with twin-rig trawls to give more flexibility in catch composition**

Increasingly *Nephrops* trawls are being fitted with codends with mesh sizes larger than 100mm. This often reflects a desire to improve quality by reducing débris or increasing the size of prawns caught. There is also an advantage in that there is more flexibility in the catch composition that can be landed. The regulations require only that a 90mm SMP is fitted at 15-18m from the codline. Use of a 110mm SMP in the same position for all gears in the mesh size range from 100 to 119mm would reduce discards of many species and yet retain most marketable roundfish. Selectivity for cod would be inadequate, however - see comments in 3(c)(ii).

A 100mm codend should provide good selectivity for *Nephrops* at current minimum landing sizes of 20mm and 25mm for West and East coasts respectively.

**4. Mixed groundfish fishery**

**Target species:** Monkfish, flatfish (e.g. megrim), cod, ling, deepwater species

**By-catch:** Haddock, whiting

**Discarding:** Non-commercial species and juveniles of target species

**Gears:** Demersal single and twin trawls

**Net designs:** Scraper trawls

**Mesh size ranges:**

Two principal fisheries indicated by a mesh size range are discussed in turn to identify the problems and some options for technical solutions.

**TABLE 6**

Mixed groundfish fishery

Area	Mesh size range and twine size	Gear	Management Option	Extra gear measures required	Species
(a) West coast mainly	100-119mm / 5mm double	Single and twin scraper trawls		90mm SMP	Monk, megrim, flatfish, cod, ling and/or deepwater species
(b) North Sea and West coast	120+ mm / 5mm double	Single and twin scraper trawls		None	Monk, megrim, flatfish, cod

**4(a). Mesh size range 100-119mm: West coast fishery**

The regulations require only that a 90mm SMP is fitted at 15-18m from the codline. Many of the target species in a groundfish fishery may not escape well from square mesh panels in the top sheet. Use of a panel of 110mm mesh or larger would reduce or eliminate discards of species such as haddock, whiting and saithe and yet retain most marketable groundfish. However, a 110mm panel would not give adequate selectivity for cod - see comments in 3(c)(ii). Most skippers may use a codend mesh size of at least 120mm for this groundfish fishery – see 4(b) below.

**4(b). Mesh size range 120+mm: Main fishery targeting groundfish**

Generally this gear specification will give adequate selectivity for most commercial species, but not for cod. If new gear designs which release more cod up to about 50cm cannot be developed then real time closures may be the only means to reduce cod mortality.

**REFERENCES**

Beutel, D., Skrobe, L., Castro, K., 2006. Bycatch reduction in the directed haddock bottom trawl fishery. University of Rhode Island Fisheries Center Technical Report: 01-06

Ferro, R.S.T., Jones, E.G., Kynoch, R.J., Fryer, R.J., Buckett, B-E, 2007. Separating species using a horizontal panel in the Scottish North Sea whitefish trawl fishery. ICES Journal of Marine Science, 64: 1543-1550.

## APPENDIX 1

### LETTER TO VESSEL OWNERS ANNOUNCING TERMS OF SCOTTISH CONSERVATION CREDITS SCHEME

To the owners of vessels of over 10m, entitlement holders and other interested parties

1 February 2008

Dear Sir/Madam

#### **EFFORT CONTROL: DAYS AT SEA ARRANGEMENTS TO OPERATE FROM 1<sup>ST</sup> FEBRUARY 2008 FOR DEMERSAL TRAWLS OF MESH SIZE 70-99MM AND 100MM & OVER (not beam trawls)**

This letter provides **final** advice on the implications of the introduction, from 1 February 2008, of domestic effort management arrangements for demersal trawls of mesh size 70-99mm and 100mm & over (not beam trawls). **It is important, if you intend to carry either of these gears, that you read it carefully and understand what new domestic options are available to you.**

In our letter dated 24 January 2008, we explained that the Scottish Government intended to make use of the provisions laid down in point 8.5 of Annex IIa to this year's TAC and Quota Regulation to stimulate fishing practices that lead to reduced discards and lower fishing mortality of both juvenile and adult fish.

We are now in a position, as of 1 February, to launch the Scottish Conservation Credits Scheme. This Scheme has been developed with advice from a Steering Group made up of industry and conservation representatives. In this letter, we are setting out the details of the basic version of that Scheme. An enhanced version of the Scheme will come into effect later in the spring under which vessels will be able to secure additional days in return for further measures designed to reduce cod mortality and discards.

#### **Basic Scottish Conservation Credits Scheme**

**The Scottish Government Marine Directorate will, in return for respect of the conditions set out on page 2:**

- (a) grant a vessel a credit which will bring its allocation of days up to its 2007 allocation in Table 1 on page 3 of this letter;**
- (b) allow a vessel to be eligible to operate under hours at sea rather than days, based on its allocation of days being multiplied by 24 hours; and**
- (c) allow a vessel to apply for the enhanced measures to be developed subsequently by the Conservation Credits Steering Group (CCSG).**

The conditions are as follows:

### **Real Time Closures (RTCs)**

Vessels must respect the following RTC schemes:

(a) from 1 January to 30 April 2008, a vessel must respect the system of RTCs designed to protect spawning cod (the current scheme is described at Annex A).

(b) from 1 May to 31 December 2008, a vessel must respect the system of RTCs designed to protect juvenile/undersized cod (the species size, specification and precise geographical area will be agreed at a later date by the CCSG).

(c) vessels will make all reasonable endeavours to communicate to the Scottish Government Marine Directorate the discovery of aggregations of cod (contact details as at annex A).

### **Selectivity**

A vessel must respect a 'one net rule' so that it carries only one regulated gear mesh size per trip, as defined in Annex IIa. The CCSG is aware of the particular circumstances of seine netters and will consider by 1 April, on the basis of data on the relative performance of different gears in terms of whitefish selectivity, whether the application of this rule should be adjusted for those vessels.

In order to facilitate compliance with the one net rule, twin rig vessels using 80-99mm demersal gear will no longer be subject to different rules in different sea areas. Wherever they fish within the Scottish Zone they must use either 80mm x 4mm single twine with a 110mm square mesh panel (SMP) at 15-18m **or** 95mm x 5mm double twine with a 90mm SMP at 15-18m.

A single trawl vessel using 70-99mm demersal gear must from 1 July use **either** a 110mm SMP inserted at 15-18m from the cod line or one of the SMP options which will be available by then under the enhanced scheme.

### **Fleets**

A vessel must be part of a fleet which in 2008 conducts:

- two trials of gear designed to improve selectivity; and
- supplementary observation programmes, in addition to FRS annual discards survey, as agreed by the CCSG.

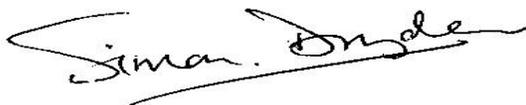
**Table 1: Basic annual allocations of days for UK vessels in the cod recovery zone operating under the Basic Scottish Conservation Credits Scheme:**

<b>Whitefish Demersal Trawls – mesh sizes 100mm and above (not beam trawls):</b>	
Gear types <b>4a.iv</b>	<b>155</b> days in North Sea
(Equal to or larger than 100mm and less than 120)	<b>144</b> days in the West of Scotland
Gear types <b>4a.v</b>	<b>156</b> days in North Sea
(Equal to or larger than 120mm)	<b>145</b> days in the West of Scotland
<b>Demersal Trawls - mesh between 70 and 99mm:</b>	
Gear Types <b>4a.ii</b>	<b>204</b> days in North Sea
(Equal to or larger than 70mm and less than 90);	<b>227</b> days in the West of Scotland
Gear Types <b>4a.iii</b>	<b>209</b> days in the North Sea
(Equal to or larger than 90mm and less than 100)	<b>227</b> days in the West of Scotland
<b><u>Please note that vessels benefiting from EU derogations for additional days will continue to receive the same allocation as provided in Annex IIa. These allocations remain unchanged from last year.</u></b>	
<p><b>The Steering Group’s strong wish is that the whole Scottish fleet should form part of these efforts to secure sustainable fisheries. We will therefore assume that all vessels wish to operate within the Basic Scottish Conservation Credits Scheme. You do not need to contact us in order to be part of this scheme.</b> A vessel which does not comply with <b>all</b> of the conditions set out above would, initially, <b>return</b> to operating under <b>days</b> at sea rather than hours at sea for the remainder of the year. If, thereafter, a vessel does not comply with any of the conditions for a second time, it will have reduced from its total allocation the number of days of the relevant trip - up to a total of the difference between the allocations in Table 1 of Annex IIa in 2008 and 2007 - and will no longer be able to apply to sign up to measures under the enhanced scheme which will be introduced later in this spring.</p>	

The CCSG will evaluate the impact of the basic scheme in terms of stock sustainability, economic impact and effort deployed and adjust the basic scheme as necessary. In particular it will monitor closely the impact on fishing practices of the hours at sea approach. This approach is designed to allow vessels greater flexibility in their fishing patterns primarily for reasons of safety, fuel usage and cod avoidance. The value of a day at sea will initially be set at 24 hours: on the basis of evidence of the volume and patterns of fishing effort deployed by gear category in the first two months of the scheme, the CCSG will decide whether the value should be reduced to less than 24 hours.

If you are in any doubt about how these rules affect you, please seek advice initially from the Marine Directorate, Days at Sea Team on 0131 244 6238.

Yours faithfully,



### **Real Time Closures, Protection of Spawning Cod**

The Marine Directorate of the Scottish Government has introduced a system of Real Time Closures intended to protect Spawning Cod. For the purposes of this Scottish initiative, Spawning Cod will be considered to be **any cod** over 50cms in length. The specific features are:

- The threshold number for Spawning Cod will be 10 fish per effort hour.
- The number of positive samples required to instigate the introduction of a Closed Area will be 1.
- Closed Areas will be squares with 7.0 nautical miles sides centred on the agreed position of the sample and aligned North/South/East/West. There will be limits on the maximum number of Closed Areas in a given locality.
- Closed Areas will remain in force for 21 days.
- This RTC applies only to fishing vessels registered in Scotland, vessels from other parts of the UK and elsewhere will be encouraged to avoid the Cod Spawning Areas and any Closed Areas.
- The RTC will operate from 1<sup>st</sup> January to 30<sup>th</sup> April 2008.

**Skippers are encouraged to notify us where they have encountered high numbers of undersized cod. TEL: +44(0)131-271-9700, FAX: +44(0)131-244-6471 and Email: [UKFCC@scotland.gsi.gov.uk](mailto:UKFCC@scotland.gsi.gov.uk) or you may alternatively ask your own Association to forward the information to the Marine Directorate at [allan.gibb@scotland.gsi.gov.uk](mailto:allan.gibb@scotland.gsi.gov.uk) 0131 244 4981**

- Information on sample results and closed areas will be published on the Marine Directorate website. <http://www.scotland.gov.uk/realtimenclosures>
- Sampling will be undertaken by the SFPA.
- The area of application shall be ICES Zones IV & VI

To support this RTC, geographical areas known to be inhabited by spawning cod during January to April have been identified. The areas concerned have been agreed after consultation with FRS and CEFAS and the industry has also had a significant input to the process. These Cod Spawning Areas are purely indicative and advisory in nature, the intention is simply to discourage any fishing effort likely to catch cod within the spawning areas. The view is that, due to the shoaling habits of cod when spawning, avoiding fishing in these areas may significantly reduce mortality amongst cod preparing to spawn as well as allowing them to spawn unhindered.

Vessels electing to fish in one of the Cod Spawning Areas will be targeted for repeated inspections while they remain in the area and their catches sampled to identify the number of spawning cod in the catch. Importantly, Spawning Cod sampling will not be limited to the Cod Spawning Areas but will be undertaken wherever and whenever inspectors consider there to be sufficient quantities of cod in the catch to justify a sample. Similarly, Closed Areas may be introduced whenever a positive sample is found, regardless of the whether the sample position lies within or outwith a Cod Spawning Area.

## APPENDIX 2

### INDUSTRY MEETING IN SHETLAND

Industry Meeting for SISP Project 017/07

To review technical measures suitable for mixed fisheries

Lerwick Shetland – Friday 18 January 2008

Present

Robert Sandison	Arcturus LK59	Josie Simpson	SHOAL
John Scott	Guiding Light LK84	Leslie Tait	SFA
Gordon Irvine	Defiant LK371	Hansen Black	SFA
Mark Anderson	Copius LK985	Rob Kynoch	FRS Aberdeen
Victor Laurenson	Radiant Star LK71	Dick Ferro	FRS Aberdeen

A presentation on options for technical measures to reduce problems associated with mixed fisheries was given. This promoted discussion on a wide range of topics. Skippers were each asked to fill in a form identifying their fisheries and giving opinions on the different devices which might improve selectivity in their nets. The main issues arising from the discussion are summarized below.

#### 1. Main Shetland fisheries

There were 3 main fisheries represented at the meeting which covered the significant ones in Shetland. The whitefish fleet using 120+mm single, twin and scraper gear targeted a wide range of species including cod, haddock, whiting, saithe, megrim, flatfish, monk and ling. One vessel (seiner/trawler) also used 100+mm mesh codends to target whiting mainly (in the list of species down to turbot) with a minimum catch requirement of 70%. Finally one vessel twin rigged for *Nephrops* with 120+mm codends or pair seined occasionally for whitefish using 120+mm mesh. The fishermen felt that their fisheries generally had low discard rates and they did not consider that there was a great need for further technical measures to improve the selectivity of their gears. The SFA Chairman Leslie Tait made the point strongly that it was important for the Scottish industry to demonstrate a significant reduction in cod mortality by one means or another during the coming year.

#### 2. Flexibility

TCMs need to be appropriate to specific gears and to target specific aims in terms of the species composition. Hence a particular TCM may be relevant only for a limited period during the year, such as for a couple of months perhaps when there are more discards. Flexibility needs to be built into the system to allow TCM solutions to attract additional days pro rata for relatively short periods.

#### 3. Discard definition

A question was raised over the definition of discard targets in this year's management plan. For example, whiting discards in the North Sea are to be reduced by 30% by number and cod discards to 10% by weight in the longer term. The question is how to define these quantities. Should discards include both marketable and juvenile fish (i.e over and under minimum landing sizes)? Discards of juveniles

are caused by gear selectivity failing to match the minimum landing size. Discards of marketable fish are usually caused by lack of quota (or high grading) and do not necessarily indicate unselective gear. Hence, particularly in the case of cod, the discarding of marketable fish will not be altered by changing gear design and should therefore not be counted when defining discards or monitoring whether targets have been reached.

#### 4. Discard study

Discussion of discards lead on to the possibility of submitting a proposal through SISP to undertake a desk study of discards. The aim would be to give a more detailed breakdown on the contribution by species, area, gear type and season from the different sectors of the fleet. The industry would be very interested to see this information – hence a proposal to SISP is being considered by SFA and NAFC.

#### 5. Cod problem

The Shetland whitefish fleet using 120+mm codends consider that they do not discard much commercial whitefish or indeed many non-target species. The exception is of course over-quota cod and sometimes hake. However, when pressed they agreed that 120mm mesh would catch some juvenile cod <35cm if they were on the grounds. 2006 was the last time this happened significantly when discards of the 2005 year class occurred.

Any increase in selectivity for cod, such as the insertion of a 120mm SMP, will inevitably reduce the legitimate catch of haddock and whiting. More complex gears are needed to solve this problem – hence the proposal for a new SISP project below.

#### 6. Catch compositions

It was agreed that SFA would supply some typical catch composition figures (in terms of value) for typical fisheries around Shetland to show the wide range of species on which local vessels currently depend.

#### 7. Potential proposals under the 2<sup>nd</sup> call of SISP

- a) Horizontal separator gear to reduce mortality on cod – commercial trials on twin rigger and pair trawler.
- b) Desk study to analyse discard data by gear, season, area for main commercial species. The aim would be to identify more accurately where and when discarding occurs and by which gear types. Some indication of the cause of discarding might also be given from the length composition of the discards.
- c) Megrim stock project – Chevonne Laurenson to speak to Paul Fernandes.

RST Ferro

29 January 2008

## APPENDIX 3

### INDUSTRY MEETING IN INVERNESS

Industry Meeting for SISP Project 017/07

To review technical measures suitable for mixed fisheries

Inverness – Friday 1 February 2008

Present:

Ruari Finlayson	Accord III CN67	Michael Cameron	Gleaner CN444
James Manson OB198	Margaret Ann II	Ronnie Gordon	Serene INS1027
Peter Finnie	Contest LK70	Robert Summers	Ocean Trust OB38
Iain Murray	Comrade SY337	John Hermse	M & NWFA
Murdo Macdonald SY190	Sharon Rose	Duncan MacInnes	WIFA
		Rob Kynoch	FRS Aberdeen
		Dick Ferro	FRS Aberdeen

A presentation on options for technical measures to reduce problems associated with mixed fisheries was given. This promoted discussion on a wide range of topics. Skippers were each asked to fill in a form identifying their fisheries and giving opinions on the different devices which might improve selectivity. The main issues arising from the discussion are summarized below.

#### 1. Main North West of Scotland Nephrops fisheries

Present at the meeting were two different sub-fleets targeting west coast (WC) Nephrops grounds covering an area which extended from the North Minch down to Oban. The first sub-fleet targets 'clean' Nephrops using a mixture of single and twin rig Nephrops gears. The fact that this sub-fleet were prosecuting a 'clean' Nephrops fishery was emphasised by the fact that some of this group no longer have a fish entitlement due to a lack of landings during the reference years. Codend mesh sizes used by this group included 3 single trawlers in the 70mm-95mm range and 2 twin trawlers using 95mm-99mm and 100mm-109mm respectively. The second sub-fleet targeted a mix of Nephrops and whitefish with twin and single trawl. Codend mesh sizes used by the 2 single trawlers were in the 70mm-95mm range and for the 1 twin trawler in the 100mm-109mm range. It was noted that the skippers attending the meeting in this second sub-fleet tended to be migratory in their fishing practices and targeted Nephrops grounds in the North Sea during different times of the year using the same gear.

#### 2. Discarding

The group attending the meeting were quite surprised at the level of whiting, haddock and cod discards indicated by the FRS observer data for WC grounds north of the Clyde. The group commented that for the 'clean' Nephrops fishery marketable fish were never encountered in any number and only juveniles were retained but only on a seasonal basis. The higher level of cod discarding recorded during 2007 was attributed to the dumping of marketable fish in northern WC areas. It was agreed that further clarification of the discard figures (in terms of which vessel, gear, area and season) were required to identify where specific problems are occurring. This would

help to target specific gears for the enhanced credit scheme. There was a concern expressed with regard to dogfish by-catch rules introduced for 2008, limiting catches to 5%. Did this apply to the traditional targeted dogfish fishery in the area? The point was raised that this would lead to an increase in discarding of marketable fish which was a valuable source of income between December-March each year.

### 3. TCMs

The group expressed concern that many recent trials testing different TCMs had been conducted on vessels targeting North Sea grounds. FRS made the point that the trials conducted over the last few years have been specifically directed towards the North Sea Nephrops fishery due to a juvenile cod by-catch problem. The group highlighted that vessels targeting WC Nephrops were generally of a smaller size with less main engine power and towed at a slower speed. After further discussion the consensus was that weather plays a major role in restricting the fishing performance of smaller vessels. When towing into poor weather a smaller vessel will slow down allowing Nephrops to escape because the codend meshes slacken. This is not the case for larger more powerful vessels as they are able to maintain tension on the gear throughout and therefore keep the meshes closed. The conclusion was that any trials of new TCMs for west coast Nephrops fisheries would have to be conducted on both large and small vessels, to represent better the range of vessels targeting this fishery.

### 4. Square mesh panels

This was viewed as the most promising TCM option which would significantly reduce the by-catch of juvenile whitefish. From the group it was suggested that skippers targeting the 'clean' Nephrops fishery could be open to testing larger mesh SMPs (>140mm). The main concerns expressed were from skippers of the smaller vessels in this fleet due to a perception that marketable Nephrops could be lost through these panels. The rationale for this was because these vessels tow smaller shorter trawls than larger vessels, washout could occur due to water turbulence. Another issue raised by the group was the positioning of the SMP in the trawl's straight extension/codend which was regarded as impractical. This was due to inherent twisting of the gear because vessels had to make many turns during towing, leading to the panel lying upside down and causing the loss of Nephrops catches. FRS agreed with the group that the correct positioning of an SMP was critical and concluded that the ideal location with a view to reduce the risk of twisting was in the top sheet at the end of the tapered netting section. For skippers prosecuting a mixed Nephrops/whitefish fishery (Stanton Bank etc) a smaller SMP mesh size would be required to allow marketable haddock and whiting to be retained. Furthermore if positioned at the end of the tapered section, the length and cutting rate of the main trawl body might have to be adjusted to allow for a shorter extension/codend length (total length 15m). This was to ensure enough netting to enable the codend to be hauled to the bag hatch, usually positioned on a vessel's starboard side. However, it was noted that if the volume of netting was significantly increased there may not be sufficient capacity on the net drum for the trawl.

### 5. Selective devices

From the forms completed by skippers, some general points can be made.

- a. There was support from 'clean' Nephrops skippers for large mesh (>140mm) SMPs to reduce the retention of juvenile fish. All expressed support for the panel to be positioned at the end of the tapered section of

the trawl. The consensus was that a position in the extension/codend creates a weak point and could lead to the potential loss of Nephrops catches if twists or blockages occurred. It was also noted that an SMP at the end of the taper may not be effective in releasing dogfish but positioned in the extension causes meshing and therefore a blockage.

- b. Only one comment was made on separator panels and this was that they could be effective but were difficult to repair.
- c. Comments on Large mesh top sheets were that >160mm does work and is easy to rig and repair. However, the view was expressed that at the end of the taper the large meshes may in fact close up, giving a false impression of an opening.
- d. The coverless trawl appeared to work in the correct conditions but may be easily affected by tide, sharp turns, towing speed and instability in deeper depths (>100m). Overall it was not viewed as a workable solution.
- e. Other devices suggested were reductions in twine diameter in the extension/codend and the use of multiple SMPs along the top sheet of the trawl's main tapered section.

RJ Kynoch

12 February 2008

## APPENDIX 4

### INDUSTRY MEETING IN FRASERBURGH

To review technical measures suitable for mixed fisheries

Fraserburgh – Saturday 2 February 2008

Present:

Alistair Bruce	New Dawn FR470	John Watt	SWFPA
Donald Anderson	Strathelliot A446	Mike Park	SWFPA
David West	Amethyst BF19	Rob Kynoch	FRS Aberdeen
John Clark	Reliance BF80	Dick Ferro	FRS Aberdeen
Andrew Buchan	Favonius	Forms also received from	
James Buchan	Amity PD177	Chic Anderson	Alba BF46
George West	Bountiful BF79	Ian Balgowan	Harvester A865
Bill Wiseman	Lynden II FR151		

A presentation on options for technical measures to reduce problems associated with mixed fisheries was given. This promoted useful discussion on the pros and cons of different selective devices. Skippers were each asked to fill in a form to identify their fisheries and to give opinions on the practicality and effectiveness of different devices which might improve selectivity in their nets. The main issues arising from the discussion are summarized below.

#### 1. Main fisheries

Skippers who filled in the forms represented 4 different sectors of the main North Sea *Nephrops* fishery. There were those targeting clean *Nephrops* using either 95-99mm twin trawl outside the Fladen area or 80mm single trawls. The majority of the fleet however, targeted mixed *Nephrops* and whitefish with twin rig inside the Fladen area using either 80mm or 95-99mm.

#### 2. New management measures

The new management measures had been introduced only the previous day and many skippers were keen to have clarification on the new rules from their SWFPA representatives. On gear issues they expressed concern that the alternative gear allowed in the conservation credits scheme (95mm codend in 5mm double twine with a 90mm SMP at 15-18m) was not as selective for *Nephrops* as the 80mm codend made of 4mm single twine with a 110mm SMP. Furthermore a significant proportion of the fleet already use mesh sizes above 80mm and these skippers would be prepared to consider moving to 90mm codends made of perhaps 5mm single twine as the standard minimum for *Nephrops*.

It was also not certain that gears in the 100-119mm mesh range were sufficiently selective for whitefish. A 110mm SMP could be suitable in these gears as well as in 80-99mm prawn gears.

The question was also raised whether those fishermen with access to an adequate number of days at sea (e.g. because they already had a derogation through their low (<5%) cod catches) would change their gear to be more selective. They could still have sufficient days at sea to catch their quota even if they declined to join the basic credit scheme and continued to use 80mm without the 110mm SMP. Their discard

rate would not reduce, thereby jeopardizing the conservation targets of the new management scheme. An SWFPA representative made the point that SGMD had the option of introducing a Statutory Instrument to enforce a particular measure if they wished – such as requiring all vessels to use the 110mm SMP in 80mm codends. The Scottish *Nephrops* fleet has already implemented several unilateral measures to enhance gear selectivity, such as use of 4mm single twine, use of 90mm SMP since 2001 with positioning of the SMP strictly at 15-18m and adoption of 110mm SMP as of February 1<sup>st</sup>. It was felt that other European fisheries should bring their standards up to those of Scotland before a further enhanced conservation credit scheme was considered for the prawn fishery.

There was concern about the constant changes to technical measures which each required purchase of new gear. However, FRS made the point that taking small steps in improving selectivity ensured that not too many marketable fish were lost and fishing remained viable throughout the gradual evolution of gear design.

### 3. Discard data

There was a general interest in discard data, not only to have more information to check on the validity of this important data set (which vessels, what gears, what areas, when) but also to identify the gears, areas and seasons when discarding may be more of a problem so that any enhanced credits scheme can be targeted better at specific gears. The publication of summary information on the source of discard data would be welcomed.

There was some concern that the choice of vessel for discard trips did not take into account adequately the different net designs used by the fleet. For example, there was a wide range of codend mesh sizes used for *Nephrops* and with the choice of a range of more selective devices it was important to pick vessels which were representative of all the fleet. It was suggested that the SWFPA or other associations might be involved in identifying appropriate vessels for discard trips.

### 4. Selective devices

From the forms completed by skippers, some general points can be made.

- d) There was general support for the 110mm SMP as a means to improve selection of haddock and whiting although it was thought to weaken the net somewhat. While one skipper indicated that the SMP position would be better further aft, skippers of smaller vessels identified correct positioning to be vital to avoid excessive loss of marketable fish.
- e) Comments on large mesh panels in the top sheet were mostly negative, such as the loss of marketable fish, ineffectiveness and distortion of the net.
- f) The coverless trawl (headline level with footrope) was not considered viable as too much marketable by-catch were lost.
- g) Removal of the lifting bag on *Nephrops* gears was thought to be impractical because of the wear on the codend netting.
- h) Other devices such as grids and inclined panels were not suitable for Scottish *Nephrops* vessels.

## APPENDIX 5

### INDUSTRY MEETING IN GLASGOW

Industry Meeting for SISP Project 017/07

To review technical measures suitable for mixed fisheries

Glasgow – Saturday 23 February 2008

Present or forms received from:

I Wightman	Eilidh Anne GK2	D Fordy	Marny Gemma
J Parkhouse	Steadfast TT171	D Shiel	Good Fellowship
H McPhee	Freedom III BA280	S Todd	Endeavour LH169
J A Gillies	Silver Lining TT37	J Clark	Antares KY23
G Jack	Aeolus BA808	H White	Guide me on
K Brown	Caledonia TT34	N Suttie	Seaforth KY192
C McArthur	Mo Mhairi TT87	H Murray	St Adrian KY360
T Finn		A Sutherland	Just Reward
A McCreath		P Stewart	CFA
A Blackie	Rebecca LH11	K MacNab	CFA
E Johnstone	Incentive BH243	AB Ritchie	Anglo-Scottish FA
T Johnston	Crystal Stream	F Strang	SGMD
I Craig	Supreme LH109	D Ferro	FRS Aberdeen

A presentation on options for technical measures to reduce problems associated with mixed fisheries was given. This promoted useful discussion on the pros and cons of different selective devices. Skippers were each asked to fill in a form to identify their fisheries and to give opinions on the practicality and effectiveness of different devices which might improve selectivity in their nets. The main issues arising from the discussion are summarised below.

#### 1. Main fisheries

The skippers present at the meeting were involved in targeted *Nephrops* fisheries using single or twin trawls, mainly with 70 or 80mm codends although 1 used 95-99mm mesh.

#### 2. Discard data

There was a general view that few whitefish were discarded in fisheries in the area, with most being clean prawn fisheries although there remained a question of what would happen if whitefish stocks recovered. Overall discard figures for the West coast fisheries were discussed. The meeting looked forward to getting more information on a breakdown of the discard data if such an analysis were funded under SISP. New discard data, based on weight rather than fish length, are available from the Clyde Fisheries Partnership. Whether these data could be used in the proposed SISP project was uncertain and would be followed up.

It was agreed that it would be very useful if the project could identify the cause of discarding. New management measures were setting targets for the reduction of discards in some fisheries where technical measures were being introduced.

However, discarding of over-quota fish would not be solved by gear changes and it

was hoped that this would be taken into account when defining an historic baseline from which to evaluate any change due to developments in technical measures.

### 3. Legislation

Several points were raised regarding the interpretation of current legislation.

- a) Was it illegal to attach to a square mesh panel a longitudinal rope in the fore-aft direction to help maintain the panel shape?
- b) It was not clear in the new 2008 regulations what length the 110mm square mesh panels should be in the smaller range of vessel. Was there a derogation for these small vessels to use 2m long panels?
- c) Coverless trawls as tested by Seafish effectively removed altogether the first panel behind the headline of a conventional trawl design. However, legislation still required a 15 mesh long panel in 140mm mesh to be placed behind the headline. In many small trawls on low-powered vessels there was no room to fit this 140mm panel as well as the square mesh panel at 15-18m from the codline.

There was a need for better training of enforcement officers – especially the Navy – so that consistent and accurate interpretations could be made.

### 4. Selective devices

From the discussion and the forms completed by skippers, some general points can be made.

- a) **Grid:** This device was an option to create a clean prawn fishery although blockage by débris could be an issue. In collaboration with FRS, one skipper was actively investigating the use of a flexible grid of French design.
- b) **Coverless trawl:** Many skippers were already using a short cover although a minimum of cover of between 2 and 9 feet was still thought necessary by some, to maintain stability of the net, especially in strong tides.
- c) **Large mesh sections in top sheet:** Skippers of smaller vessels complained that there was not enough room for the large mesh section behind the headline as well as the SMP in the taper. There was also the risk of losing prawns at the selvedge. Reduced drag and hence fuel costs could be a benefit.
- d) **Horizontal separator panel:** While it may work, it was considered by one skipper to have major practical difficulties. It was costly to make and insert, liable to damage and difficult to mend.
- e) **Increase in codend mesh:** No support was voiced for an increase from 70 or 80mm.
- f) **Square mesh panel:** This was universally accepted as the cheapest and most convenient way to improve whitefish selectivity. The increase in panel mesh size from 90 to 110mm was questioned although some advocated that for clean prawn fisheries a larger mesh than 110mm was feasible. Others considered that 100mm was the limit - loss of prawns due to twisting of the codend was still considered an issue. Positioning the SMP in the taper was a possible solution. This was common practice in smaller nets because of the restricted length. The SMP was considered to weaken the net to some extent.
- g) **Low-powered vessels:** After some discussion of the problem, it was agreed that the main issue may be the inability of a small vessel to

maintain momentum in poor weather. FRS data suggested that towing speed was not a major factor affecting selectivity.

h) **The inclined panel** was not considered a viable option.

RST Ferro  
13 March 2008

## APPENDIX 6

### INDUSTRY MEETING IN BANFF

Industry Meeting for SISP Project 017/07

To review technical measures suitable for mixed fisheries

Banff – Friday 29 February 2008

Present or forms received from :

Alec Flett	John Buchan	
David Lovie	James McPherson	
Peter Lovie	Billy Gatt	
Mark Lovie	Sandy Patience	
Tom Marcus	Jess Sparks	
Willy Reid	Tom Rossiter	
Kevin West	George MacRae	SWFPA
Kenneth West	Mike Park	SWFPA
Peter Bruce	Joyce Petrie	FRS Aberdeen
James Buchan	Dave Reid	FRS Aberdeen
Alistair Milne	Dick Ferro	FRS Aberdeen
James Stephen		

A presentation on options for technical measures to reduce problems associated with mixed fisheries was given. This promoted useful discussion on the pros and cons of different selective devices. Skippers were each asked to fill in a form to identify their fisheries and to give opinions on the practicality and effectiveness of different devices which might improve selectivity in their nets. The main issues arising from the discussion are summarized below.

#### 1. Main fisheries

Skippers using a range of different gears and mesh sizes attended the meeting. The majority used 120+mm in Scottish seine, single trawl, twin trawl or pair seine /trawl. Fisheries using multi-rigs for *Nephrops* and 100-119mm mesh in a seine net were also represented.

#### 2. Size selectivity

The 120+mm mesh range achieved more than adequate selection of haddock, whiting and flatfish and several skippers indicated that they saw few discards being retained in most cases. Discarding was seen as a problem for *Nephrops* fisheries, not whitefish. The question was raised what was an acceptable discard rate? % discard rate was not the only issue as the total quantity of discards could be high even though the discard rate was low. There was of course always a need to match the minimum landing size to the mesh size. However, it was pointed out that there was a market for smaller haddock and that if all large fish were taken then there would be fewer in the spawning stock.

The rate of survival of escaping fish was questioned but FRS who have been involved in most of the experimental work on survival, indicated that for gadoids such

as cod, haddock and whiting there was high survival for medium sized fish in the range from about 25cm upwards. On the other hand, very small fish below 20cm exhibited the lowest survival rates because these fish suffered greater trauma in the capture process as they passed down the gear and it was their exhaustion rather than the act of passing through meshes which often killed them.

There was interest in T90 netting in which the netting is simply turned through 90°. Seafish explained that 30% less netting was required; it was used for whole trawls in Iceland; T90 may promote better flow through the net, catching bigger fish of better quality. Mending might be a problem and there was perhaps still a question over its long-term effectiveness. It was expected to have selective properties somewhere between normal diamond mesh and square mesh. Square mesh of a certain size had selective properties equivalent to diamond mesh about 10% larger. T120 or 120 square mesh codends were likely to lose too much marketable fish.

However, the major problem was currently cod for which there was inadequate quota – see next section.

### 3. Cod avoidance

There was a consensus view that it was as much a case of choosing the right place to fish as the right gear to fish with. There were well-known areas where juveniles were likely to be found and the real time closure system being introduced in Scotland was considered a good way forward in the right circumstances. The implication was that this system could be extended to species other than cod, e.g. haddock.

Management should be flexible enough in future that if juvenile areas were identified then there could be options of either leaving the area or using a more selective gear to avoid significant discards. Information on RTCs could perhaps be posted on the web. It was legal to have two net designs on board as long as they were in the same mesh size range. Fishermen were prepared to consider further changes to technical regulations for the whitefish fishery and to be pro-active in developing new designs but there was a need to allow the current changes in management rules to settle down and develop gradually.

### 4. Selective devices

From the forms completed by skippers and the discussion at the meeting, some general points can be made.

- a) It was generally agreed that at the moment the key issue for whitefish fisheries was species selectivity and not size selectivity. The US Eliminator design with very large meshes of 800mm and 2400mm in the upper and lower forward panels was not considered appropriate for the Scottish situation; the Orkney design which would be put forward for SISP funding was likely to have meshes in the range 200-500mm in the lower wings and belly with the aim of retaining monk. In the 1970s the NE fleet used redundant nylon pelagic nets with very large meshes in the fore sections and these were effective in reducing cod catch.
- b) There was general support for the 110mm SMP in prawn trawls as a means to improve selection of haddock and whiting although it was thought to weaken the net somewhat. While one skipper suggested that the square mesh panel should be acceptable at a position from 6 to 9m

from the codline of *Nephrops* trawls, skippers of smaller vessels identified correct positioning to be vital to avoid excessive loss of marketable fish.

- c) Comments on large mesh panels in the top sheet were mostly negative, such as the loss of marketable fish, ineffectiveness and distortion of the net.
- d) The coverless trawl (headline level with footrope) was not considered viable as too much marketable by-catch were lost.
- e) Removal of the lifting bag on *Nephrops* gears was thought to be impractical because of the wear on the codend netting.
- f) Other devices such as grids and inclined panels were not suitable for Scottish *Nephrops* vessels.

RST Ferro  
18 March 2008