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# A RECENT UK JOINT INITIATIVE TO REVISE TECHNICAL CONSERVATION MEASURES REGULATING THE DESIGN OF MOBILE GEARS

R.S.T. Ferro and G.N. Graham

FRS Marine Laboratory, PO Box 101, Victoria Road,
Aberdeen, AB11 9DB, Scotland, UK

## INTRODUCTION

The demersal fisheries in ICES Sub-areas IV (North Sea) and VIa (West of Scotland) (Fig. 1) are of particular importance to the UK industry. Of the countries fishing these areas, the highest proportion of the three main roundfish species - cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*) and whiting (*Merlangius merlangus*) are landed in the UK (Table 1). Landings from sub-areas IV and VIa accounted for 81% of the total UK landings of these three species in 1997.

In the last decade, priority has been given to developing and promoting technical conservation measures (tcm's) which control gear design and aim to reduce the catching and discarding of juveniles. The fisheries for cod, haddock and whiting within these two sub-areas are currently regulated by a minimum mesh size of 100 mm. There is a by-catch in the flatfish and *Nephrops* fisheries which are subject to minimum mesh sizes of 70 and 80 mm and generate significant discarding of undersized roundfish. There are additional controls on codend design, limiting the number of meshes round the codend, twine thickness and codend attachments.

EU enforcement of total allowable catches and regulation of exploitation rate are based on monitoring landings in port. This is in contrast to the Norwegian system of regulating and monitoring catches, which effectively prohibits discarding of small fish. The EU system allows discarding. There are differing opinions on the effectiveness of the Norwegian system in reducing the catch of juveniles. With the EU system skippers themselves have to change their strategy if discarding is to be minimised. When high discarding occurs even though viable quantities of marketable fish are being caught, a change of grounds may avoid the capture of small fish, or a change of gear may ensure small fish escape. Any gear design regulation intended to improve selectivity must be economically acceptable to the fishing industry and to individual skippers.

There has been some scepticism over the introduction of effective technical conservation measures in the past. This paper describes the key elements of a process which is resulting in a closer partnership between industry, Government, fisheries managers and scientists to address the problem of introducing effective technical measures regulating fishing gear design in the mixed demersal UK fishery. The paper concentrates on the measures applying to the whitefish fishery.

## SITUATION UP TO DECEMBER 1999

Quotas in the whitefish fisheries were relatively stable, or even increasing, in the late 1970s and early 1980s (Fig. 2), and at that time discarding was substantial. By the mid-1980s however, the EU was calling for an increase in mesh size from 80 to 100 mm and in 1990 even to 120 mm in an attempt to improve selectivity. The increase to 100 mm was eventually achieved in three stages – in 1987 to 85 mm, in 1989 to 90 mm and not until June 1992 to 100 mm. During this period however, the industry gradually introduced codend design features which reduced selectivity. Heavier twine codends and designs in which the numbers of meshes around the circumference increased towards the aft end (ballooning) were becoming increasingly common. These designs largely negated the increases in mesh size. Increasing mesh size from 80 to 100 mm in codends made of 3 mm double twine would increase the 50% retention length (L50) of haddock from 23.6 to 30.3 cm but increasing twine thickness to 6 mm double twine would reduce L50 of a 100 mm mesh codend back to 25.6 cm.

An option which had been studied in the 1980s to improve conservation was the use of square mesh. This netting does not close when under tension and therefore maintains a larger area of open meshes in the codend. While research showed that more small fish escaped, there was little evidence at that time that square mesh was more effective than other measures, such as increasing the size of diamond mesh. Nevertheless, the introduction of limited areas of square mesh panel was supported wholeheartedly by fishermen's leaders. To achieve moderate improvements in selectivity and to ensure that not too many marketable fish escaped it was found necessary to use a square mesh size which was smaller than the minimum legal mesh size of 90 mm at that time. Despite 80 mm square mesh panels being advocated strongly by the main fishermen's organisations (Anon, 1993) appropriate technical measures could not be agreed. Some measures were nevertheless introduced in the UK to improve conservation: ballooning was outlawed in 1991 and 80 mm square mesh panels were made mandatory in prawn (*Nephrops norvegicus*) trawls in 1991-2. The effect of the panel on discarding was not detectable however (Gosden *et al.*, 1995), possibly due to the inherent variability of the data.

The health of most whitefish stocks did not improve markedly throughout the decade. Successive poor year classes entered the fishery but at the same time discarding of juveniles continued at the same levels or even increased (Fig. 2). It was clear that fishermen were aware of the need for improved conservation but they found it difficult to adopt voluntary measures as the economics of their operations worsened. This was demonstrated in 1996 when the North Sea cod fishery experienced a larger than average year class. During the following two years, this year class was subject to high discard rates – sampling suggested about 80% at one year old in 1997 (Anon, 1999) and about 30% at two years old in 1998 (Anon, 2000). Scientists were acutely aware that technical measures regulating gear design would not solve the problem alone (Shepherd, 1993). A reduction in effort on the adult population was also required. A new Multiannual Guidance Programme to limit fleet size had been introduced by the European Commission in 1987 but it has proved difficult to establish a clear relation between actual fishing mortality and nominal measures of

effort such as engine power and days fishing. Technological advances which enhance catching capacity need to be taken into account. The problem of overcapacity was lessened, in Scotland particularly, by the availability of opportunities to diversify into the developing or expanding fisheries for monk fish, megrim and prawns around the coasts of Scotland.

## CHANGE IN CIRCUMSTANCES BY DECEMBER 1999

During the course of 1999, circumstances changed in three ways which led to a desire in all partners to improve selectivity. First it became clear from research vessel young fish surveys that the 1999 haddock year class was very much larger than average. There was therefore an even greater incentive to adopt more selective gears which would allow these fish to escape while they were undersize, to recruit to the fishable stock and eventually to increase the spawning stock biomass. It was possible to predict that very large discarding would occur during 2000 if no change was made to current codend designs. 75% of the 1999 year class of haddock would be discarded in 2000 and the weight of discards would be as great as the weight of landings (Fig. 3). In terms of individual fish, discards would far outnumber landed fish.

Secondly, the UK industry wanted to be able to use any new UK/EU technical measures in Norwegian waters to avoid having to change gears when crossing into the Norwegian sector. Non-Norwegian vessels however, must adhere to the regulations in force in the Norwegian EEZ which tend to be strictly enforced. Furthermore and crucially, bilateral negotiations between the EU and Norway in December 1999 achieved an agreement on the haddock quota which was based on the understanding that the EU would address the discard issue. It was therefore necessary to obtain clear agreement with the Norwegian authorities that any new gear regulations could be used in the Norwegian EEZ.

Thirdly there was a further difficulty for fishermen in the reduced availability of monkfish and the lower prices for prawns during the winter of 1999/2000. This meant that there were fewer alternative fisheries in which to diversify. While this was a powerful incentive to maintain effort in the haddock fishery in the short term, it also emphasised to fishermen the longer term need to create a stronger haddock stock by protecting the juvenile haddock.

## REACHING A CONSENSUS

In 1998 a UK industry and government joint consultative body, the Fisheries Conservation Group (FCG), had been initiated by the UK Fisheries Minister to provide a forum to discuss technical conservation measures such as fishing gear design, closed areas and closed seasons. The industry is represented by the major fishermen's federations and producer organisations as well as the Netmakers' Association which gives technical advice. Government representation is provided by the three fisheries departments, representing Scotland, England and Wales and Northern Ireland and includes members from the scientific, enforcement and administrative departments.

At a meeting in September 1999, the Government first brought to the attention of the industry the need to rationalise UK technical measures in the light of new EU regulations. This gave the opportunity to make changes in order to benefit conservation. A presentation by the FRS gear technologists described various options for gear design changes which would improve selectivity. First news of the good year class of haddock was given to industry. In January 2000 a detailed report was presented to FCG by FRS Marine Laboratory describing the current state of the haddock and whiting stocks and the background on options available for technical conservation measures relating to gear design. Great stress was laid on the likely need for urgent action to mitigate the predicted discard levels and to allow the strong haddock year class to be recruited to the fishable stock.

Using a model of codend selectivity with parameters of mesh size, twine diameter and square mesh panel mesh size and position, it was possible to demonstrate the potential changes in discards and landings in the short term and the increases in stock size in the longer term. As a baseline it was assumed that a typical codend used by the industry was 100 mm mesh made of 5.5 mm double twine. A range of possible gear design changes and their effects were presented to the fishing industry (Table 2). It was argued that discards needed to be reduced very significantly considering the predicted huge discard rates which were liable to occur with current gears (Fig. 3).

One of the major fishermen's groups, the Scottish Whitefish Producers Association (SWFPA) voiced concerns that the loss of marketable fish when using 90 mm square mesh panels would be economically unacceptable to their members. At the request of SWFPA, sea trials were conducted onboard two members' vessels. The industry volunteered the use of the vessels provided that scientific staff from the FRS Marine Laboratory Aberdeen monitored the catches. The results of these trials showed that, with the forward edge of the panel 12 m from the codline, the loss of marketable fish was negligible and that the levels of discards were significantly reduced by approximately 40%. The results were publicised in the national media and this helped to allay the industry's fears. Apart from this publicity, during the trials scientists were in radio contact with several other skippers, spreading the news of the results. However, the skippers of the trials vessels themselves formed positive opinions and their communication with fellow fishermen undoubtedly resulted in positive feedback to the national federations.

Following further negotiations, the government put out a consultation document proposing a 90 mm square mesh panel within 12 m of the codline and a maximum codend twine thickness of 5 mm double twine. With minor alternations agreement was reached. The final hurdle was cleared when a team of Scottish administrators and FRS scientists travelled to Norway and succeeded in gaining their acceptance that the package of measures could be used by UK vessels in the Norwegian sector of the North Sea.

## CONCLUSIONS

As a result of these negotiations, new regulations have been adopted in the Scottish whitefish fisheries which limit twine thickness to 5 mm double twine or 8 mm single twine. A 90 mm square mesh panel must be inserted not more than 12 m from the codline. In prawn fisheries, the twine thickness is limited to 4 mm single twine and the square mesh panel (still 90 mm) must be inserted not more than 18 m from the codline. There is a clear legal definition to distinguish made between twin and single rig trawls and there are consequent changes to minimum mesh sizes in some areas. The prediction was that, if introduced on 1 January 2000, these measures would increase spawning stock biomass by 14% by 2002,

reduce discards by 41% in 2000 and result in an increase in landings of 14% in the fourth year.

A major problem in this process is the need for immediate legislative action. However, at key stages consultation with the industry is essential and highly technical legislation cannot be drafted and agreed by both national and EU authorities quickly. The industry may also request a lead-in period to allow old gear to be used up. In this case, square mesh panels were required from 3 August 2000 but the twine thickness and mesh size changes will not be enforced until March 2001. Discarding may therefore remain higher than expected for much of 2000.

The UK Fisheries Conservation Group was set up in recognition of the need to improve the dialogue between industry, fishery managers and scientists. The reaction of all parties has been positive. The industry feels more involved in the decision making process as a stake holder; the stock assessment biologists have been more actively involved in demonstrating the predicted effects of changes in gear design on discards, landings and stock size over the short to medium term; the gear technologists have had direct dialogue with net makers and fishermen on the practicalities of different gear options; fishermen and gear technologists have worked together to validate the predictions on discards and landings in the short term.

One of the key requirements to maintain this momentum is for scientists to demonstrate what effect the new measures have had during the years following their introduction. Identifying a significant effect from such an analysis will require good quality data on landings and discards and knowledge of the actual designs of fishing gear being used by the industry.

Those in the best position to assess the effectiveness of the changes in tcm's are the fishermen themselves. If they find that the discard rate does not reduce they have the means to make their gear more selective at very short notice. They are well aware that increasing mesh size or changing panel position or reducing codend twine thickness will all be effective. In the past fishermen have been reluctant to change gear designs unless legislation is brought in. Skippers need to have confidence, from their own experience and the work of gear technologists and biologists, that specific gear changes have predictable effects on the numbers and size of fish retained and escaping from the codend and also in the longer term effects on stocks. The position may then be reached where fishermen themselves will take the initiative on technical measures rather than waiting for legislation to be introduced.

## REFERENCES


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TABLE 1

The proportion of the catch from sub-areas IV and VIa landed in UK in 1997. Total landings are estimated by ACFM (Anon, 2000).

| Sub-area | Species | Total landings (k tonnes) | % taken by UK |
|---|---|---|---|
| IV | Cod | 102.2 | 45 |
| | Haddock | 85.7 | 76 |
| | Whiting | 37.0 | 67 |
| Via | Cod | 7.0 | 75 |
| | Haddock | 12.9 | 84 |
| | Whiting | 6.3 | 81 |

TABLE 2

Gains and short-term losses of a range of changes in technical measures involving codend mesh size, square mesh panels (with forward edge at 12 m from the codline) and codend twine size. The changes are relative to the state of the fishery in 1999.

| | Codend mesh size mm | Panel mesh size mm | Codend twine size mm | % spawning biomass increase by 2002 | % discard reduction in 2000 | % change in landings | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 1st year | 2nd year | 3rd year | 4th year |
| 1 | 100 | 0 | 5.5 | *Current codend design – No change* | | | | | |
| 2 | 100 | 80 | 6 | 2% | 9% | -1% | -1% | +1% | +2% |
| 3 | 100 | 90 | 6 | 9% | 29% | -3% | -5% | +4% | +8% |
| 4 | 105 | 0 | 6 | 5% | 17% | -2% | -2% | +2% | +4% |
| 5 | 100 | 0 | 4 | 12% | 35% | -5% | -7% | +5% | +11% |
| 6 | 100 | 90 | 4.5 | 17% | 46% | -7% | -11% | +5% | +16% |
| 7 | 110 | 0 | 6 | 13% | 38% | -5% | -8% | +5% | +12% |
| 8 | 110 | 90 | 6 | 22% | 55% | -10% | -15% | +5% | +21% |
| 9 | 100 | 80 | 4 | 12% | 35% | -5% | -7% | +5% | +11% |
| 10 | 100 | 90 | 4 | 20% | 51% | -9% | -13% | +5% | +19% |
| 11 | 100 | 85 | 6 | 6% | 19% | -2% | -3% | +3% | +5% |
| 12 | 100 | 85 | 4 | 16% | 45% | -7% | -10% | +5% | +15% |

Figure 1. Main UK fisheries for whitefish are in ICES subareas IV and VIa.

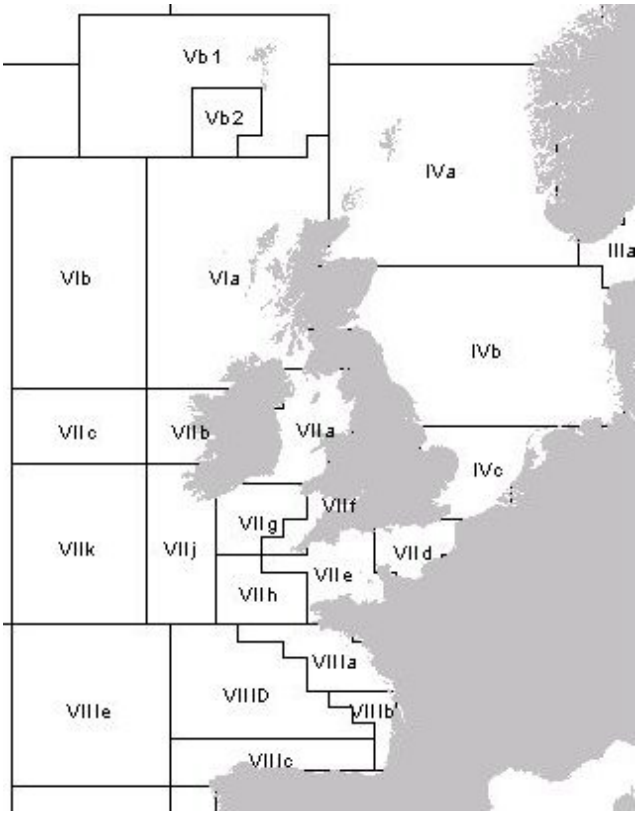
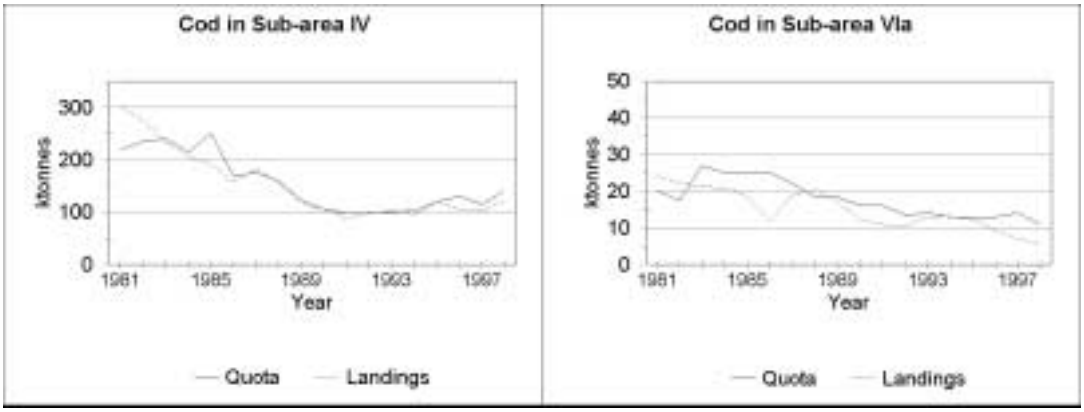
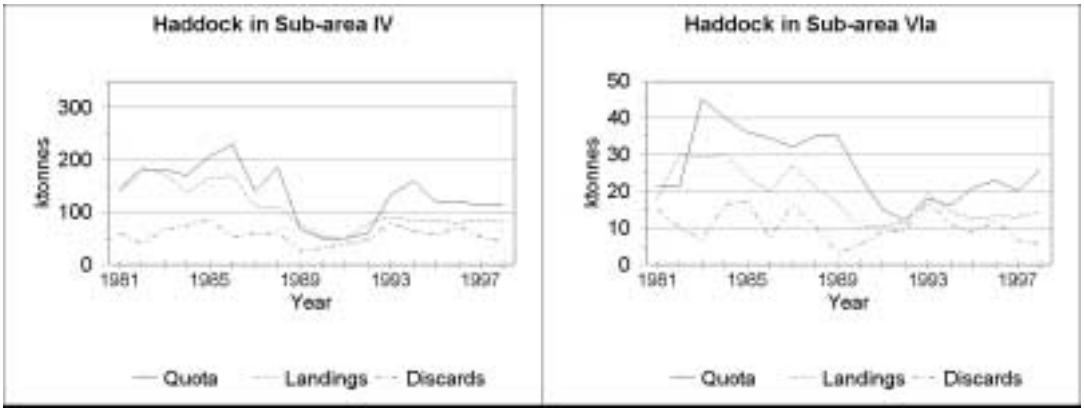


Figure 2. Quota and landings for cod, haddock and whiting and discards for haddock and whiting for ICES sub-areas IV and VIa from 1981 to 1998.



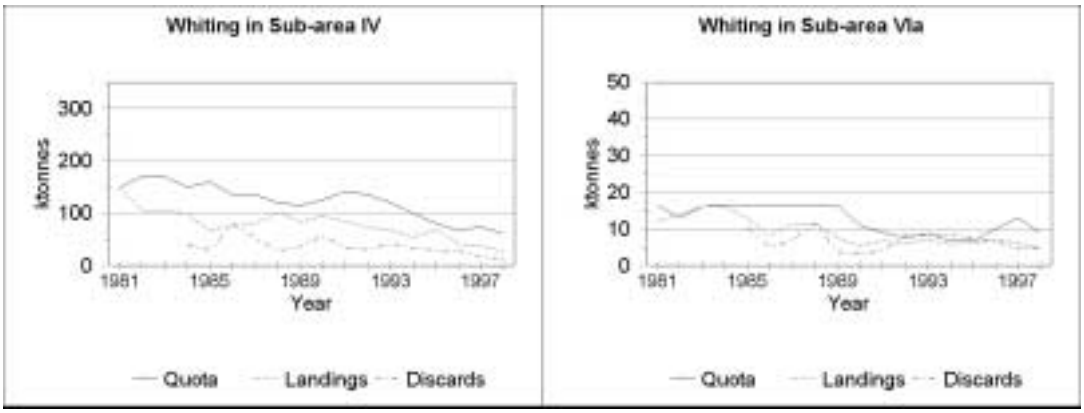



Figure 3. The predicted weight of discarded haddock by age during the year 2000. Information presented to industry to indicate the outcome if gear selectivity was not improved.