Evaluation of Mesh Measurement Methodologies for Fisheries Inspection and Research (MESH) FAIR-CT96-1452

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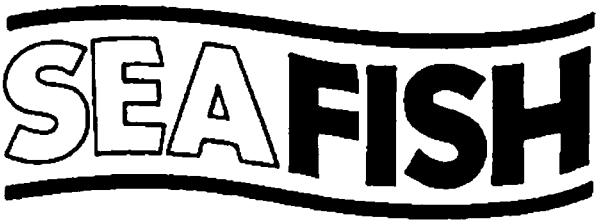
Sea Fish Industry Authority

Technology Division



Evaluation of mesh measurement methodologies for Fisheries inspection and research (MESH)

Task 2: Problems encountered with common mesh measurement practices

FAIR-CT96-1452 'MESH'
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Author: G Dunlin
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Table of Contents

The Sea Fish Industry Authority

Seafish Technology

Evaluation of mesh measurement methodologies for Fisheries inspection and research (MESH)

Confidential Report 122

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FAIR-CT96-1452 "MESH"

Task 2 Problems encountered with common mesh measurement practices.

Summary.

In task two of the project each partner had to identify and describe problems with respect to mesh measurement procedures for scientific applications.

A series of hearings was set up involving fishermen, net suppliers and the Inspectorate from all areas of England, Wales and Northern Ireland. Any problems with the measurement of mesh sizes in these sectors were discussed and noted.

The procedures for ensuring adequate coverage of all sectors and areas are described. The points raised at each meeting are given in detail in Appendices I and II and condensed into points of commonality in the results section.

A discussion of relevant points and conclusions is included

1 Introduction.

This report describes progress with the second task of the EU-funded study of mesh measurement methods and equipment.

In task two of this project, each participating partner was required to make an inventory of all problems encountered by fisheries scientists, inspectorates and the fishing industry (fishermen and gear suppliers) in relation to current mesh measuring procedures. Previous projects involving selectivity highlighted problems with respect to fisheries scientists. A series of meetings and individual interviews with net suppliers, fishermen and Fisheries Inspectorate personnel highlighted the problems faced by the Industry.

2 Problems encountered with mesh measurement practices in fisheries research.

2.1 Wedge gauge and ICES gauge

Perhaps the most obvious problem encountered is the choice of which gauge to use. The gauge recommended for fisheries research is the ICES gauge which, although it gives the most consistent and repeatable force application, does under-measure compared with the wedge gauge. The ICES gauge is used in selectivity experiments often to predetermine the selectivity of mesh sizes and twine thicknesses. The same gauge is not used by the Inspectorate for checking that mesh sizes conform to legal requirments; this would seem an obvious anomaly.

The wedge gauge has the obvious drawback in that although it is relatively quick to use, inconsistencies arise if the same person is not measuring the meshes throughout the measurement period. It is impractical to use the wedge gauge with a weight attached due to having to measure so many meshes during any trials. The ICES gauge, although preferable, does present many problems to the user when dealing with such a high level of measurements, not least of which is the physical strain on the user's wrist and grip. It is expensive and requires extensive maintenance and calibration.

When predetermining the area of netting to be used so that measurements can be repeated at set intervals, manufacturing faults present specific problems. Irregular meshes in different areas of netting can lead to non-representative results if meshes are selected in these areas. Using random patterns of mesh selection often leads to the need to measure many more meshes until the variation between mesh sizes comes down to an acceptable level. In choosing the area to select meshes, the after part of the codend where the fish escape would be the obvious part. This however is also the part where the most mesh stretching will occur. There is no obligation on the Inspectors to select this area of netting.

The frequency of measuring meshes during trials presents problems in itself. The type of ground fished on when carrying out the trials can lead to varying rates of net shrinkage. The netting, if at all possible, should be measured wet - a problem if the netting is measured before the trial begins.

2.2 Tape measure method.

When the tape method of mesh measurement is employed for engineering trials it is intended to give overall linear geometry rather than the potential for fish to escape as it includes the length of the knots (*length of mesh* rather than *opening of mesh*).

As the method is not widely used for scientific purposes, there is no written standard of carrying out measurements, so gear technologists use their own standards, possibly leading to inconsistencies.

The usual method is to pick a sample of ten meshes longitudinally (N-direction) and to apply sufficient tension to close the meshes (so knots touch in the T-direction). The amount of tension to close the meshes may vary if the operatives have not laid the net out neatly with no initial tension on it.

The centre of the knot is estimated by eye, but because ten meshes are measured, any inaccuracy in the estimation of knot centre has reduced significance.

In some areas of the net, especially wings, it is necessary to measure meshes along bars rather than longitudinally (N-direction). It is generally found that meshes measured along bars are approximately 3% larger than when measured longitudinally.

Final problems are that the tape method requires two people to work successfully and is more easily carried out ashore than afloat, where adequate steady tension can be applied to the netting.

3 Hearings involving fishermen, net makers and the Inspectorate.

3.1 Methodology.

The United Kingdom fishing industry covers a geographically diverse coastline which results in many remote fishing ports. It was decided to hold a series of regional meetings, individual port visits and a final meeting in Hull to bring together fishermen, the Ministry of Agriculture Food and Fisheries (MAFF) Inspectorate, net suppliers and the project coordinator. Scotland would be covered by the Scottish Office Agriculture, Environment and Fisheries Department (SOAEFD) as their contribution to this task.

Letters were sent to regional Producer Organisations, the National Federation of Fishermen's Organisations, net suppliers and the Fisheries Inspectorate. These letters outlined the project and asked for the cooperation of the Industry to ensure that all areas of the Industry were able to offer some input. A considerable amount of effort was put in to ensure representation of all fishing methods:

- Beam Trawling
- Demersal Trawling for *Nephrops*
- Demersal Trawling for white fish
- Static gear

Demersal trawling included twin rig and pair trawls.

Seafish officers attended meetings and discussed problems with fishermen in the regional offices of:

i) The Northeast Regional National Federation of Fishermen's Organisations.

ii) The Southeast Regional National Federation of Fishermen's Organisations.

iii) The Cornish Fish Producers' Organisation.

iv) The Southwest Fish Producers' Organisation.

v) The Lowestoft Fish Producers' Organisation.

vi) The Anglo-North Irish Fish Producers' Organisation.

vii) The Northern Ireland Fish Producers' Organisation.

viii) Grimsby Fish Producers' Organisation.

Meetings were also held with the Department of Agriculture for Northern Ireland (DANI) Fisheries Division and Northern Ireland Fisheries patrol boat operatives to get full coverage of the industry. Two net suppliers were interviewed on an individual basis in Northern Ireland and their views noted.

At each of the meetings discussions were kept informal, whilst every effort was made to include all the topics mentioned in the Hearings Guidance list drawn up at the first project meeting in Sweden. The wedge gauge and ICES gauge were taken along for demonstration purposes together with a photograph of the dynamometer to show to anyone unfamiliar with these pieces of equipment.

After each meeting all the points mentioned were summarised into a list unique to that particular meeting (see Appendix I).

A final meeting was held in Hull involving fishermen, net suppliers and the Fisheries Inspectorate. The main points are summarised in Appendix II.

3.2 Results.

Rather then report every point mentioned at each meeting (see Appendix I and II), this section will summarise the common comments by Industry group and add any individual remarks that are not common throughout.

3.2.1 Fishermen.

An inconsistency of pressure applied to the wedge gauge between Fishery Officers and Naval Officers was a common observation at each meeting involving fishermen. Various observations were made about codends passing inspection ashore and subsequently failing when measured by a Naval boarding party.

Most fishermen expressed a need to be able to acquire and use an official wedge gauge. Many had found that the plastic version often snapped after a lot of use.

There was no interest at all in certification of codends. Many problems were raised by fishermen who felt that the idea was both unworkable and easily evaded. Questions were raised as to how long codends would be certified for and would there be different certification for various grounds and gears? A common question was how shrinkage would be accounted for.

A common observation made was that any potential replacement for the present system should be simple, repeatable (consistent) by anyone and result in as little fishing time being lost as possible.

Many fishermen felt that the wedge gauge was accepted by everyone due to the length of time they had been exposed to it. Although it was not perfect, it was familiar and most fishermen had not had any particularly bad experiences with it.

There was a general consensus that they relied on net suppliers to give them a safety margin in mesh size by ensuring it was a little over the minimum required. Common practice in most sectors of the Industry was to order a mesh size 2-3mm over the legal requirements to allow for shrinkage and the range of pressures that might be applied to the wedge gauge.

The weight used with the wedge gauge was not acceptable to anyone. Most felt that the weights selected were too light and should be more in line with an average pressure applied by a man to the wedge gauge.

The wedge gauge was not thought to be capable of giving a fair measurement to all the different twine types and thicknesses. This was particularly relevant with the double heavy twine codends and monofilament netting in static gears.

There were two complaints about manufactured netting:

- Sheets of netting often have inconsistent mesh sizes and mis-shapen meshes.
- There was confusion over manufacturers measuring knot centre to knot centre (*length of mesh*) and the regulation measuring inside of knot to inside of knot (*opening of mesh*).

The general attitude of the majority of fishermen is that they would not knowingly use undersize meshes as they simply could not afford to be prosecuted. Mesh shrinkage was the biggest cause of borderline illegality and should in some way be taken into account. Many asked Fishery Officers to check their codends when they were unsure but this did not ensure that the codends would be passed by Naval Inspection. Measurements ashore are not legally binding and even a short time span of a few weeks could mean shrinkage making the nets illegal even if it were only by a few millimetres.

It was felt that both Naval and Ministry Inspectors did not have sufficient knowledge of fishing gears and methods. More training should be given to familiarise them with the construction and use of various gears and the problems inherent on different grounds.

The ICES gauge was not recognised generally and was thought to be too expensive, in need of regular calibration and result in too much lost fishing time.

The following were comments made by some individuals but not common to each meeting:

- Whatever was measured on the deck of a vessel or on the quayside would never equate to the opening of the mesh during fishing operations.
- The dynamometer would be acceptable if a greater weight/force was applied.
- There should be a registered list of all mesh sizes on board any particular vessel.
- Tolerance limits should be set to allow for unforseen problems such as mesh shrinkage or manufacturing variations.

3.2.2 Net suppliers.

The areas supplied with gear vary considerably geographically and span both national borders and differing gear types. An inconsistency of measuring techniques between area and national Fishery Officers results in considerable problems when trying to supply correct mesh sizes. There is an inconsistency in measurement by the wedge gauge between various Naval and Fishery Officers of ±4-5mm

Two methods of checking batches of netting are generally used:

- Random sampling of batches of netting using a 2kg load with the dynamometer.
- The counting of rows per metre determines the mesh size in a batch.

Differing types of codends produce different types of problems. Some beam trawlers want a tight minimum mesh size whilst others like them to have a safety margin. Vessels using grounds where mesh shrinkage rates are high like to have different margins of safety.

Meshes are measured with a pressure applied. Manufacturers do not produce netting under force therefore there can be considerable differences between a manufacturer's mesh size and an "inspected" mesh size. Manufacturing processes do not produce consistency in mesh size and quality. Manufacturers measure meshes by a different method to the Inspectorate (between knot centres instead of between knots) and this should be taken into account. Various twine sizes can produce significantly different knot diameters.

Inspectors are not trained by, or within, the Industry and so have little understanding of gears and how they are constructed. A good working knowledge of gears and their use may help them to be more sympathetic to borderline offenders.

The pressure exerted by a weight used with the wedge gauge will vary according to the mesh size it is used on.

Mesh sizes should be measured from source (manufacturer) to end use (by Inspectors) in a consistent, repeatable and standardised way. Tolerance limits should be set to account for manufactured inconsistencies and mesh shrinkage.

3.2.3 Fisheries Inspectorate (MAFF and DANI).

The use of the wedge gauge can vary significantly. It is possible to get a variety of results from different people using the wedge gauge on the same gear. The 5 kg weight gives a smaller reading than hand pressure and as such is not usually asked for by fishermen.

The present method of measuring mesh sizes does not accurately reflect the way in which the mesh opens during fishing operations. It gives a linear measurement no matter what the mesh construction or twine thickness. The construction and structure of the net should be taken into account when measuring meshes.

Older netting gives a greater range of mesh sizes due to knot slippage and mesh distortion. It is often difficult to find the number of meshes required by the regulation to measure in the correct position on the codend.

Small meshes such as those used in pelagic nets do not give as much variation in mesh sizes as the larger meshes.

The Inspectorate are constrained by existing regulations and have great difficulty in trying to exercise any leniency. Measurements done in port by Fishery Officers are for guidance and are not legally binding.

The method involving measuring along a number of bars or down a number of meshes appears to have some merit.

Tolerance limits and certification will inevitably encourage some people to work to the limit and still ask for more. The current system does not often result in the intentional offenders being targetted and caught which could be achieved quite easily. Instead attention seems to be focussed on marginal offenders whose problems are mostly caused by inconsistencies in measuring and the shrinkage of the materials they are using.

The existing design of wedge gauge is in need of some modification. The handle often cuts into the hand when the wedge gauge is being used over a long period of time. The serrations marking the millimetre increments should not go right to the edge as it often causes older netting to break.

The ICES gauge was thought to be unworkable over an extended period of mesh measuring. It was thought that the constant need to re-calibrate the instrument could prejudice subsequent legal proceedings.

4. Discussion.

Each sector of the Industry from technologists to net suppliers has highlighted many problems with the present mesh measurement systems. The problems may be specific to individual sectors or common to all. They can all be summarised under a series of general headings:

- Netting specification and responsibility
- Inconsistences and variations between users
- Degrees of 'sin'
- Fishing gear, netting/twine types
- Selectivity implications
- Static gear
- Fast and simple method

There is some disagreement as to who should be responsible if mesh sizes are undersize. Many of the fishermen rely on the supplier to ensure that there is either a safety margin or that the mesh size meets minimum requirements. If the end user is subsequently prosecuted, it is possible that he will blame the supplier resulting in future sales loss. The law is quite clear on this - the person using the net for the purpose of fishing has the responsibility to ensure that it complies with existing regulations. Suppliers are often in a no-win situation and have to contend with inconsistent mesh sizes from manufacturers, as well as variations in gear, grounds and officers measuring meshes.

Mesh measurement practices at the present time are totally inconsistent between each sector of the Industry. Fisheries' scientists, officers, manufacturers and suppliers all use different methods to obtain a mesh size. Where there is some common ground, for example in the use of the wedge gauge, then there is the problem of inconsistency of pressure exerted between users. Regulations look at the distance between the inside of two knots (*opening of mesh*) and manufacturers produce netting using centre of knot to centre of knot (*length of mesh*).

One point which was discussed frequently was that of tolerance limits. Many from both the catching sector and the suppliers believed that there should be limits set to allow the many marginal offenders some chance of correcting the problem. It is thought that many people would work up to this limit and then plead for more tolerance if they were caught. Under the present regulations this point appears to have some merit.

There was general agreement that present systems do not fully take into account the different uses of fishing gear or the different types of twine sizes and netting. The wedge gauge will pass through double thick twine codends as easily as it does through single twine lighter codends giving the same mesh size. Mesh shrinkage and stretch rates vary considerably from ground to ground and from fishing method to fishing method. The latter point again raises the question of responsibility.

The previous point leads to the question of mesh selectivity. The present regulation measures the mesh in a simple linear way. It does not reflect the true opening of the mesh either on the surface or during fishing operations (or the ease with which it opens). Selectivity experiments require a precise, consistent and easily repeatable method of assessing the size of the mesh. To this end, the ICES gauge is the recommended instrument with 4kg of pressure and the number of meshes to be measured can be over 100. Once the selectivity of a particular mesh size is calculated and this mesh size becomes a legal minimum, it is enforced by officers using hand pressure (or if necessary with a weight) on the wedge gauge measuring between 20 and 60 meshes. It is well documented that double heavy twine codends are less selective then single light twine codends; both however can pass the present measuring system as legal mesh sizes.

There has been little input from static gear men because the minimum mesh size regulation has not yet come into force. There has been no indication as to what the measuring instrument or method of mesh selection will be. The general opinion is that the wedge gauge and the number of meshes to be measured should not be the same as that used on mobile gear. Most static gear is usually over the minimum required anyway and few problems are foreseen with compliance.

5 Conclusions

The overriding conclusions are:

If any new method is not simple, quick to use and repeatable throughout the chain by anyone who has to measure a mesh size, then the present system should not be altered.

Everyone from manufacturer to Fisheries Inspector should employ the same method.

The weight used with the wedge gauge or the pressure exerted through the ICES gauge should be increased and related to the average pressure exerted by several different people on the wedge gauge.

Net suppliers are probably faced with the most problems with regard to mesh measurement practices and devices. It would therefore be logical to enable them to have a large input into the development of any new device or method that might be recommended.

Appendix I - Summary of meetings held

Meeting with the North East Regional NFFO

These are the itemised comments made by various attendees (some twenty fishermen using both static and trawled gear):

1 The wedge gauge finishing with a rather large rounded end instead of a narrower point caused problems with initial mesh entry.

2 A need to be able to purchase the same gauge as the Inspectorate was expressed.

3 An inconsistency of pressure applied to the wedge gauge was a common complaint.

4 The wedge gauge was by now familiar to everyone and although not perfect was found to be acceptable to most fishermen (better the devil you know!).

5 The ICES gauge was not widely recognised.

6 It was thought to be far too expensive.

7 Would the ICES gauge be able to measure heavy twine codends?

8 Gear life does vary significantly between areas so how would certification of gear cope with differing fishing grounds when setting the time limit on certification?

9 Although it was open to abuse there had been an attempt in the past by the NFFO to interest the Ministry in codend certification.

10 A larger than required mesh size should be asked for when purchasing new gear.

11 A three dimensional wedge gauge should be developed to measure mesh opening.

12 Whatever was measured on the surface or on the quay side would never be representative of what was occurring whilst the gear was in operation.

13 Mesh shrinkage was seen as a big problem especially when certification was discussed.

Meetings with the CFPO and the South East Regional NFFO

These are the itemised comments made by various attendees (some 10 fishermen using both static and trawled gear) at meetings with the above organisations:

Cornish Fish Producers' Organisation:

1 An inconsistency of pressure applied to the wedge gauge was a common complaint.

2 The need to be able to purchase the same gauge as the Inspectorate was expressed.

3 There have been no bad experiences with the Inspectorate and the wedge gauge.

4 Would there be a difference using the weight if the codends were measured slack or stretched out?

5 The ICES gauge was not recognised and was thought to be inadequate as it would result in too much lost fishing time.

6 Sheets of netting often come with inconsistent mesh sizes.

7 Most fishermen make their own trawls and do not measure the mesh sizes. The first hint of small mesh sizes would not occur until they were roping out the trawl.

8 Beamers order 85mm mesh size (80mm is legal) and find after 4 or 5 days it will measure at 87 - 90mm.

9 They all stated that they experienced little or no mesh shrinkage.

10 They did not know if manufacturers measured sizes centre of knot to centre of knot or inside as do the Inspectorate.

11 Whatever was measured on the surface or on the quay side would never be representative of what was occurring whilst the gear was in operation.

12 As the majority make their own trawls, spare codends are often made up and stored for long periods before use - could certification take this into account?

13 They were interested in the dynamometer as a measuring device as it seemed simple, consistent and easily read.

14 All were in agreement that they did not want knowingly to use undersize meshes as they simply could not afford to be caught.

15 Whatever method was chosen should be simple, consistent and result in as little lost fishing time as possible.

16 The static gear men expressed little interest as they had not as yet been affected. They did however say that the wedge gauge would be the preferred gauge.

17 Thinking imperial and measuring metric is still a problem

Southeast Region NFFO Meeting:

1 There is a need for consistency and accuracy.

2 Pressures applied and weights used should vary according to twine types and thickness.

3 Digital readouts would be preferable to vernier.

4 Should gauges be re-calibrated at regular intervals?

5 Hand pressure was preferred to a weight.

6 The need to be able to purchase the same gauge as the Inspectorate was expressed.

7 Nets are supplied with mesh measured centre to centre of knot as opposed to regulation measured inner to inner.

8 Netting is supplied with inconsistent mesh sizes.

9 Nets are often ordered at 83mm (oversize) and averages out at 86mm. This then shrinks to 82mm.

10 When they are doubtful over mesh sizes, they ask the Fishery Officer to check them.

11 There was no interest in certification.

12 There was uncertainty over the proposed regulation for static gear - ie what would be the sampling routine and what gauge would be used? - It should be simple and quick.

13 There was little knowledge of, or interest in, the ICES gauge.

14 The wedge gauge would be acceptable to netters.

Meetings with NIFPO, ANIFPO, and DANI Officers

Itemised comments made during a visit to Northern Ireland by fishermen, netmakers and Fishery Officers:

1 An inconsistency of pressure applied to the wedge gauge was a common complaint.

2 There have been no bad experiences with the Inspectorate and the wedge gauge.

3 The need to be able to purchase the same gauge as the Inspectorate was expressed.

4 The ICES gauge was not recognised and was thought to be inadequate as it would result in too much lost fishing time.

5 All were in agreement that they did not want knowingly to use undersize meshes as they simply could not afford to be caught.

6 Whatever method was chosen should be simple, consistent and result in as little lost fishing time as possible.

7 Hand pressure was preferred to a weight.

8 There was no interest in certification.

9 The design of the wedge gauge often resulted in meshes being broken due to the sharp edge and serrations from the millimetre markings. The handle caused soreness to the hand after prolonged use.

10 There was often a difference between the Navy measuring and the local Fishery Officer/ patrol boat.

11 If vessels ordered larger mesh sizes to account for shrinkage they were often using illegal covers as the covers needed to be two times the codend mesh size - 70mm cod end with 140mm cover. If the codend measured out at 75mm then their cover became illegal.

12 The 5 kg weight is too light. Why 5kg? Do a "man test" to get a representative thrust force - and use that weight.

13 Rely on net rigger to provide adequate margin of safety in mesh size of new gear.

14 The concept of the ICES gauge is much liked, but feel that it won't stand up in law (due to calibration problems).

15 Not enough training given to Naval officers and Government officers in the measurement and assessment of mesh size in netting.

16 Skippers order a nominal mesh size and rely on the net rigger to supply oversized mesh to allow for shrinkage.

Meeting with SWFPO Ltd

Eight representatives present, representing;

Beam Trawlers (x2)
Demersal Trawlers (x2)
Scallopers (x2)
Malcolm Cooke - Chairman SWFPO
Jim Portus - Chief Executive/Secretary SWFPO

Introduction followed by first question - why?

A number of those present questioned the reasoning behind the work/project.

The cost was also questioned and it was suggested that the money should be spent elsewhere, a possibility being that it would be better spent subsidising fishermen or addressing problems with Spanish fishermen.

The meeting was then put back on track, and the rational behind the project and the involvement of multi-national organisations was explained.

The next question raised was 'why change existing system - more regulations, more aggravations'. Mesh size - thrown example of 65mm:

- Question: Would hanging rates in static gear be taken into account with mesh measurements? This was considered to be irrelevant to this exercise.
- Experiences with dynamometer and/or weight - mostly wedge gauge - one with dynamometer by Dutch vessel in German Bight.
- Shrinkage - Beamers stressed that they must take account of shrinkage otherwise trouble? Usually 3-4mm allowance. Sand in braided twines cause shrinkage on top of general shrinkage in water. Every 6 weeks, change back netting on codends to take account of shrinkage 87mm - 80mm (mainly due to sand ingress).
- Experienced problems with gear passing inspection by one check and failing by another officer in second check within very short time period.
- See many problems lying with manufacturer inconsistency - Quality control?
- Cover wide areas, many ground types and therefore must consider shrinkage and therefore allowances made.
- Interested in certification in principle but emphasised certification should guarantee gear under working conditions.
- No time span - too difficult to determine - nobody would commit themselves to 'workable life span'.
- No other relevant suggestions.

- Other comments - registered list of all mesh sizes onboard vessels, including/in particular Spanish vessels.

General observations: - Not particularly interested in the project. It was considered unnecessary, complicating an already confused and difficult situation. It was felt that the money could be better spent. Regarded as a potential 'minefield' with little long term benefits perceived. There was no faith in other countries adopting any recommendations on outcomes of such work. Seen as yet another 'big stick to beat the British Fishermen with'.

Seafish's involvement in the project was questioned.

Spanish mesh: It was explained that the project was not about mesh size but the measuring methodologies and technologies used.

Following some general discussions and explanations re mesh size/twine diameter and stiffness, relationships managed to get back on track once again.

Being conscious of time the meeting went onto guidance notes:

- Major problems - no consistency in measurement - 'Limp-wristed' Fishery Officers.
- Navy officers do not understand fishing gear - work to letter of the law - very little give, eg would not be flexible with inconsistency in manufacture ie 'rogue' rows in netting panels dropping overall average mesh size.
- Shore-based MAFF inspectorate with more pragmatic approach. Malcolm Cooke pointed out that mesh infringement formed small part of prosecutions.
- Inconsistencies with netting from manufacturer.
- Static nets more flexible (finer twines) could envisage very few problems with wedge gauge measurement compared to heavier trawl twines - no actual experience of static gear measurement problems - no static gear regulations present but no problems reported - only recently been introduced into legislation.

Meeting with Lowestoft Fish Producers' Organisation.

Itemised comments made by fishermen and netmakers:

1 There have been no bad experiences with the Inspectorate and the wedge gauge.

2 The need to be able to purchase the same gauge as the Inspectorate was expressed.

3 As most of their fishing is in the Norwegian sector they use larger mesh sizes than the minimum legal size and check the mesh size every three trips. If the codends get to within 10mm of the minimum, they change them over.

4 All were in agreement that they did not want knowingly to use undersize meshes as they simply could not afford to be caught.

5 Whatever method was chosen should be simple, consistent and result in as little lost fishing time as possible.

6 Hand pressure was preferred to a weight.

7 There was no interest in certification.

Meeting with Grimsby Fish Producers' Organisation.

Itemised comments made by fishermen :

The meeting was attended by eight people but only two were fishermen and so most account was taken of their comments.

The PO represents otter trawlers, Danish seines and gillnets but the two fishermen worked otter trawlers.

1 The mesh opening was the only size used (i.e. according to regulation).

2 One skipper had had his net passed by a Sea Fisheries Committee but subsequently failed by an inspector using a manual gauge (very lightly). The test with the weight passed the net as the inspector shook the netting.

3 Both skippers ordered their codend netting oversize. For 100mm one said he bought 103mm but in fact it measured 110mm after towing and did not shrink as he had been informed it would.

4 However, these skippers are happy to use oversize mesh as there is no valuable catch gain in using smaller sizes.

5 The only part of the codend experiencing shrinkage are the bottom meshes.

6 Nylon netting used for codends stretched the same as polythene.

7 No experience of measurement by a different country's inspectors.

8 Although neither skipper experienced codend mesh shrinkage they were aware of it happening when towing in other areas.

9 Both skippers thought that certification of codends was an interesting option, but were concerned about the length of time for certification where one codend may last years and another is wrecked in a week.

10 Who would be liable if a certified codend was found undersize?

11 Both skippers were aware that some may try to deliberately shrink certified codend by towing in areas known to shrink them most. So certificated gear may not be as easy to apply as first thought.

12 The ICES gauge was seen to be a better principal of operation in that it appeared easier to get consistent results than the wedge gauge with different people using it.

13 The question of calibration of an ICES type gauge was raised. If fishermen bought this type of gauge how would they know it was correct and where could it be recalibrated?

14 Why is the wedge gauge not available to fishermen?

15 One fishermen said he used an aluminium gauge but was unaware of the 1:8 taper required.

16 One owner suggested a hydraulic ICES type gauge which would be more durable.

17 A second owner suggested that a stepped type gauge (i.e. like the Utzon which is parallel at each mesh size).

Appendix II.

Final meeting with Net suppliers, Fishermen, Fisheries Inspectorate and Project Coordinator.

Itemised comments made during this final meeting held in Hull on 9 May 1997.

Net Suppliers

1 There is an inconsistency in measurement by the wedge gauge between various Naval and Fishery Officers of ±4-5mm

2 They check the mesh sizes of batches of netting using a 2kg load with the dynamometer and random sampling.

3 After experimentation, the use of counting rows per metre determines if the mesh size in a batch is correct.

4 Differing types of codends produce different types of problems.

5 Some beam trawlers want a tight minimum mesh size whilst others like them to have a safety margin.

6 The areas supplied with gear vary considerably geographically and span borders and differing gear types. An inconsistency of measuring techniques between port and country Fishery Officers results in considerable problems of supplying a correct mesh size.

7 Meshes are measured with a pressure applied. Manufacturers do not produce netting under force.

8 Manufacturers measure meshes by a different method to the Inspectorate and this should be taken into account.

9 Inspectors are not trained by or within the Industry and so have little understanding of gears and how they are constructed.

10 If the weight is used with the wedge gauge, pressure it exerts will vary with mesh size.

11 Fishery Officers should not give out exact mesh size details but rather pass or fail.

12 Mesh sizes should be measured from source to end use in a consistent, repeatable and standard way.

Fishermen

1 The use of flexible materials and many kilometres of netting in static nets makes existing techniques and gauges unusable and unworkable.

2 There is no guarantee of consistent mesh size supply or quality.

3 The need to be able to purchase the same gauge as the Inspectorate was expressed.

4 Whatever method was chosen should be simple, consistent and result in as little lost fishing time as possible.

5 The present method was the most effective.

6 The Naval inspection officers sometimes stretch codends width-wise instead of length- wise.

7 Naval officers found meshes undersize but when they were checked ashore by the Inspectorate they were found to be legal.

District Inspector(MAFF Fisheries Inspectorate).

1 The present method of measuring mesh sizes does not accurately reflect the way in which the mesh opens during fishing operations.

2 You will get a variety of results from different people using the wedge gauge.

3 The 5kg weight gives a smaller reading than hand pressure.

4 Older netting gives a greater range of mesh sizes due to knot slippage and mesh distortion.

5 Measurements done in port by Fishery Officers are for guidance and are not legally binding.

6 The use of the wedge gauge can vary significantly.

7 Would prefer measuring to be done by rows.

8 The construction and structure of the net should be taken into account when measuring meshes.

9 The Inspectorate are constrained by regulations.

10 Small meshes such as those used in pelagic nets do not give as much variation in mesh sizes as the larger meshes.

General

1 The regulation should include tolerance limits to account for manufacturing variations.

2 If tolerance limits were set, many people would work to the limit and still ask for just a bit more leeway.

3 Marginal offenders are often the ones facing the most problems. Intentional offenders are easily caught with the present mesh measurement regime.

4 Certified codends were not thought to be of any use at all.