

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

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# **The Sea Fish Industry Authority**

## **Seafish Technology**



**FAIR-CT96-1452 "MESH"**

### **Evaluation of Mesh Measurement Methodologies for Fisheries Inspection and Research (MESH)**

#### **Task 1 - Review of current mesh measurement procedures**

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##### **Task 1 - Review of current mesh measurement procedures**

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Author: G Dunlin

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### **Summary**

In the first task of the project each partner has to review the mesh measurement procedures used in his organisation.

Seafish staff identified four types of gauges and mesh measurement methods and these are; (i) the wedge gauge, (ii) the ICES gauges, (iii) the digimatic vernier gauge, and (iv) the tape measure.

The method of application of each method is described including the selection of meshes and force applied.

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### **3. DESCRIPTION OF PROCEDURES**

#### **Wedges and ICES.**

The procedures for selecting meshes, calculating mesh sizes and sequence of measurements are the same for both gauges when used in trials. The ICES gauge is used exclusively in selectivity trials although comparative measuring has at times been carried out.

There are 2 positions on the codends used for mesh selection:

- i) Top sheet - near to the cod-line, midway, and near to the extension
- ii) Lower sheet - near to the cod-line, midway, and near to the extension

The term “near to” means at least one full round in from the joining round. A total of twenty meshes are selected at random across the net (not longitudinally) and the measurement recorded. A mean mesh size is calculated from each set of twenty and also an overall mean from all measured meshes. The meshes are measured at the beginning, mid-way and at the end of the trials in a wet state.

In using the wedge gauge, the net is stretched in a longitudinal direction and the narrow end of the gauge inserted into the mesh opening perpendicular to the plan of the wedge. Force is applied by hand until the resistance of the net on the wedge stops any further movement. A reading is then taken where the top of the twine stops to the nearest millimetre above.

The parallel jaws of the ICES gauge are inserted into the mesh and the mesh is then stretched diagonally (lengthwise) under constant pressure. One of the 2 jaws slides along a graduated bar (in millimetres) until a tension of 4kg is exerted. This predetermined force is acquired by one of the jaws pivoting against a spring; when the tension between the jaws is sufficient to overcome the spring’s compression, the pivoted jaw rotates slightly and locks the gauge. The reading is taken directly off the graduated bar.

#### **Digimatic Vernier Calliper**

Random nets from the batch are selected and used for mesh measurement purposes, the number being dependant on the size of the batch. The aim is to take a minimum of one hundred measurements for each particular mesh size. One mesh is measured in the top, mid and lower zone of the net (selected randomly) in at least the beginning, middle and end of the selected net. An example would be that ten nets should be selected in a batch of one hundred.

The mesh selected for measurement is pulled until it closes and its side knots are touching. The jaws are wound out until they touch the inside of each opposite knot and the reading recorded manually or via the mini-processor. The mean mesh size and the standard deviation is calculated over the one hundred meshes.

## 1. Introduction

This report describes progress with the first task of the EC-funded study of mesh measurement methods and equipment. This requires each partner to describe their own reasons for measuring meshes, their methods, and their formats for presenting results.

Four types of measuring gauges are currently used by Authority staff to determine as accurately as possible the mesh sizes of various gears. These measurements are taken for four main reasons:

- i) To ensure that mesh sizes fulfill the legal requirement
- ii) To ensure mesh size accuracy in selectivity trials
- iii) To ensure the correct mesh sizes are used in constructing a new or modified trawl
- iv) To create accurate trawl plans from which to build model trawls.

## 2. Description of mesh gauges

### Wedge Gauge

This consists of a 2mm thick brass plate with two tapered edges (figure 1). The taper to these edges is one to eight. The width in millimetres is inscribed on each edge and marked with figures every two millimetres (ie 92, 94, 96 etc). It is further marked in major sections every ten millimetres by way of a line inscribed right across the plate with the measurement printed above the line. The gauge has a hole at its narrow end to facilitate the attachment of a weight. It is stamped with the words EEC GAUGE and DAFS 232, the latter being the serial number of this particular gauge. It has a hand hole cut out at the top and relies on the force being applied either by hand or with a weight attached.

### ICES Gauge.

This is a hand held device (figure 2) which measures the mesh by exerting a longitudinal force between opposite knots of the selected mesh. This force (4kg for mesh sizes greater than 35mm) is both precise and repeatable and is applied by a compression spring within the body of the gauge. The linear measurement provides a direct measurement of the deflection of the measuring jaws.

### Digimatic Vernier Calliper

This hand held device has both a LCD readout (figure 3) and is attached by cabling to a mini processor. It is used primarily to measure meshes in static nets where wedge gauges are completely unsuitable. The outward facing jaws are wound out to touch the inside of each knot in a mesh and a reading either recorded manually or via the micro processor.

### Tape Measure

Any standard metal or fabric tape measure can be used provided it is long enough to measure over 10 adjacent stretched meshes in the netting sample to be measured and is subdivided into millimetres for accuracy.

## **4. PRESENTATION OF RESULTS**

Results presented are typically the mean values and are set out as shown in the examples, i.e. Tables 1 and 2 (although on some occasions all values are shown - Table 3). They are usually rounded up to the nearest whole millimetre but can be presented to 1 or 2 decimal places if doing a comparative measure.

## **Tape Measure**

This method is used for engineering performance trials where the overall geometry of the trawl is required, especially for cases where model trawls are to be built based on full scale plans.

In the construction of model trawls the linear dimensions of the full scale trawl are scaled which requires knowledge of the length of meshes (knot centre to knot centre) when stretched longitudinally.

Samples of 10 adjacent meshes are selected along the panel and pulled with minimum force so the meshes close. The overall length of these 10 meshes is measured with a tape measure, and the average of the sample is calculated to give the length of mesh.

This procedure is carried out several times at different locations in each panel of the trawl and an overall average established.

In practice 3 areas are sampled for mesh size in each panel, but where large variability is found due to manufacture or stretch the number of sample areas may be increased.

This procedure is then repeated for each panel of the trawl.



**TABLE 1: Codend Mesh Measurements I**

<b>Codend/Gauge:</b>	<b>ICES mm</b>	<b>Wedge mm</b>	<b>Average (mm)</b>
Standard	94.7	97.4	96.1
Exp. bottom	91.5	95.7	93.6
Exp. top	68.8	70.1	69.4
Square mesh panel	88.6	90.6	89.6
Lifting bag on top	143.2		

**TABLE 2: Basic catch results - Hake Gill Net Metier**

	<b>Mesh size (stretched mm)</b>				
Nominal mesh size (mm)	92	102	114	127	140
Measured mesh size (mm)	92	106	116	129	143

TABLE 3: Codend Mesh Measurements II

100 mm mesh (top c/e; 1 knot) New							100 mm mesh (top c/e; 1 knot) Halfway stage							100 mm mesh (top c/e; 1 knot) End of Trial						
mm	Top		Mid		Btm		mm	Top		Mid		Btm		mm	Top		Mid		Btm	
	U	L	U	L	U	L		U	L	U	L	U	L		U	L	U	L	U	L
91							91							91						
92							92							92	1					
93							93			1				93						
94							94							94						1
95	1	3					95			1	1			95						
96	1	6				1	96	1	2		1		1	96	5	3	1	1		1
97	1	3	1	1	1	1	97	1	2	2	1	2	4	97	3	3	2		1	1
98	5	6	1	1	1	1	98	2	2	2	2	1		98	3	1		4	3	4
99	2	2	2	2	1	1	99	4	2	3	5	4	4	99	3	5	1	10	2	2
100	6		5	9	13	12	100	5	3	8	6	11	5	100	5	8	9	3	8	9
101	3		7	3		4	101	4	4	2		2	4	101		2	2	2	3	1
102	1		3	2		4	102	1	2		1		2	102			5		1	3
103			1	2			103	2			1			103						
104							104		2	1	2			104						
105							105							105						
106							106							106						
107							107		1					107		1				
TOT	20	20	20	20	20	20	TOT	20	20	20	20	20	20	TOT	20	20	20	20	20	20
mean	99	mean					mean	100						mean	99					

100 mm mesh (bottom c/e; 2knots) Dry, New							100 mm mesh (bottom c/e; 2 knots) Halfway stage							100 mm mesh (bottom c/e; 2 knots) End of Trial						
mm	Top		Mid		Btm		mm	Top		Mid		Btm		mm	Top		Mid		Btm	
	U	L	U	L	U	L		U	L	U	L	U	L		U	L	U	L	U	L
91							91							91						1
92							92							92			1			
93							93							93						
94		1					94							94			2			
95	1	2					95							95		1				
96	5	1		1	1	1	96				1	2	2	96	3	3				
97	1			4	1	1	97	1		2		2	3	97	3	5		2		1
98	3	7	3	1	3	2	98		3	2		5	4	98	4		1	2		1
99		4	2	4	1	2	99	7	3	2	6	2	5	99	3	6	2	3	2	4
100	9	4	7	5	7	14	100	5	7	8	5	4	4	100	8	1	10	6	8	8
101	1	1	6	3	4		101	3	2	1	2	4	2	101			1	4	3	3
102			2	2	2		102	3	3	2	4			102		1	3	3	5	2
103					1		103		1	1	1	1		103			3		1	1
104							104	1	1		1			104		1				
105							105			1				105						
106							106							106						
107							107							107						
TOT	20	20	20	20	20	20	TOT	20	20	19	20	20	20	TOT	22	20	20	20	20	20
mean	99						mean	100						mean	100					

Key: c/e = codend  
 U = Upper surface of codend  
 L = Lower surface of codend  
 Top = Region of mesh near to joining round with the extension  
 Mid = Region of mesh halfway along the codend from either end  
 Btm = Region of mesh near to the codline at the codend tip  
 TOT = Total number of observations  
 mean = mean mesh size from all observations

**FIGURE 1 - WEDGE GAUGE**

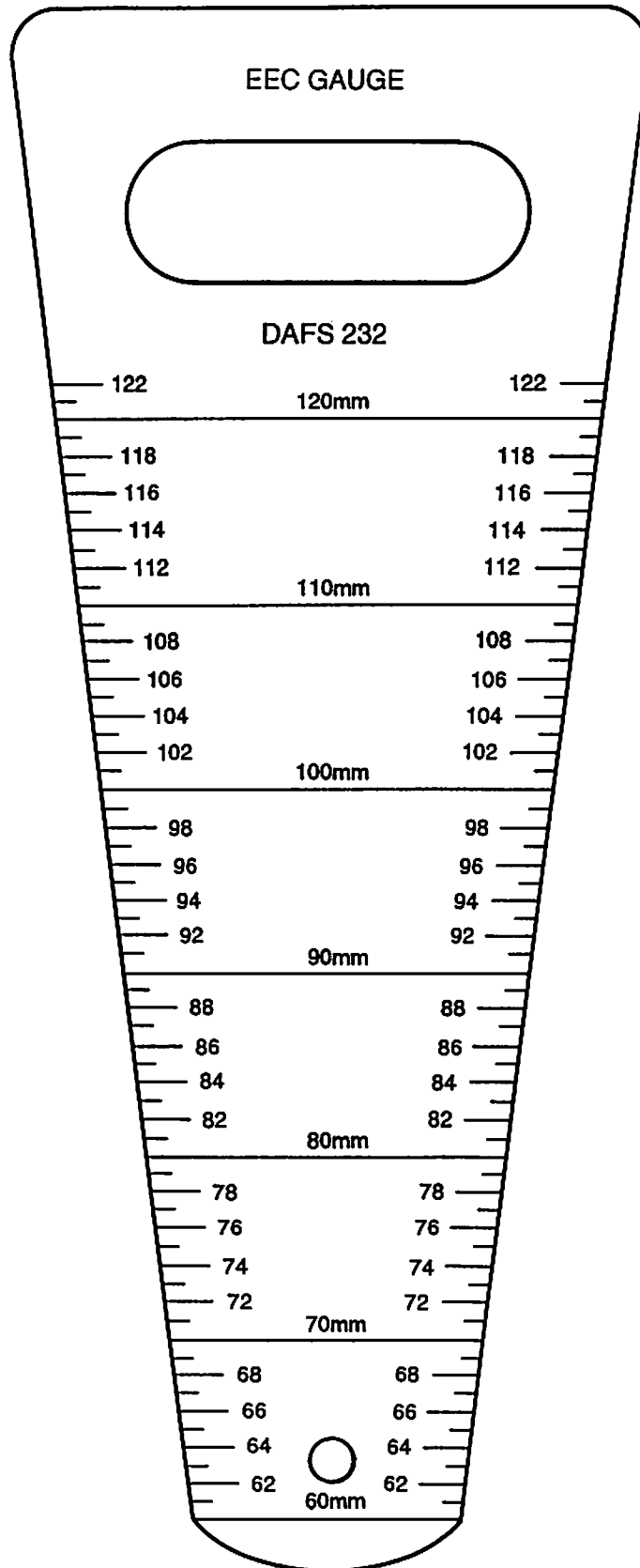
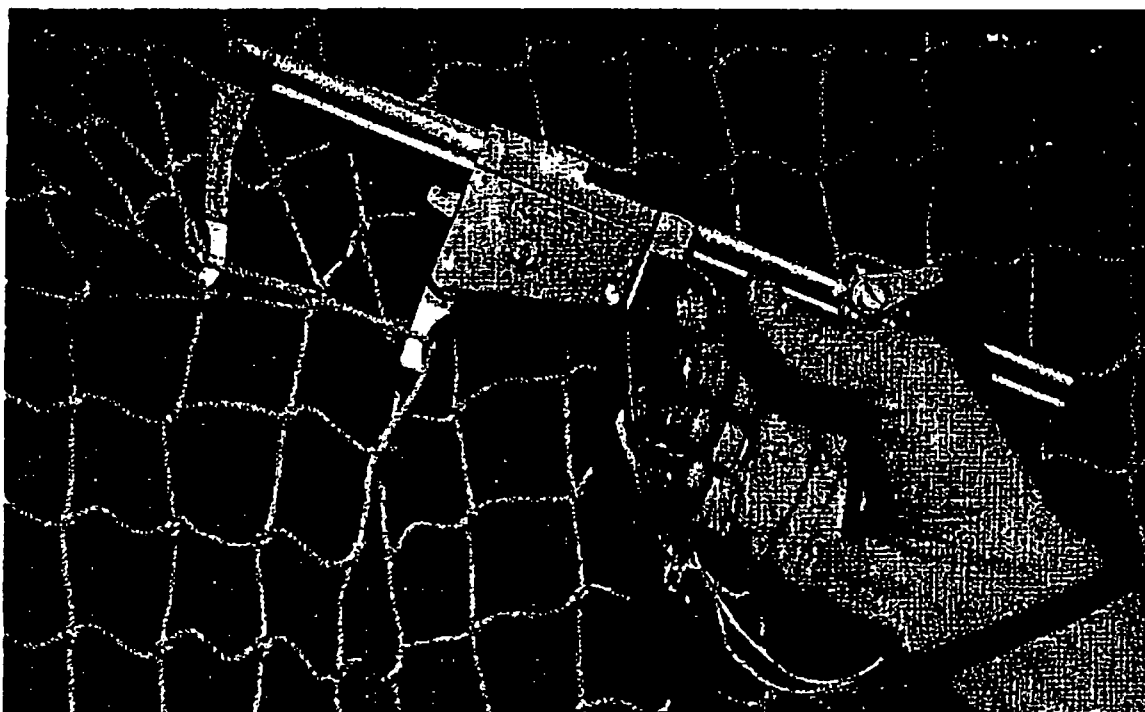
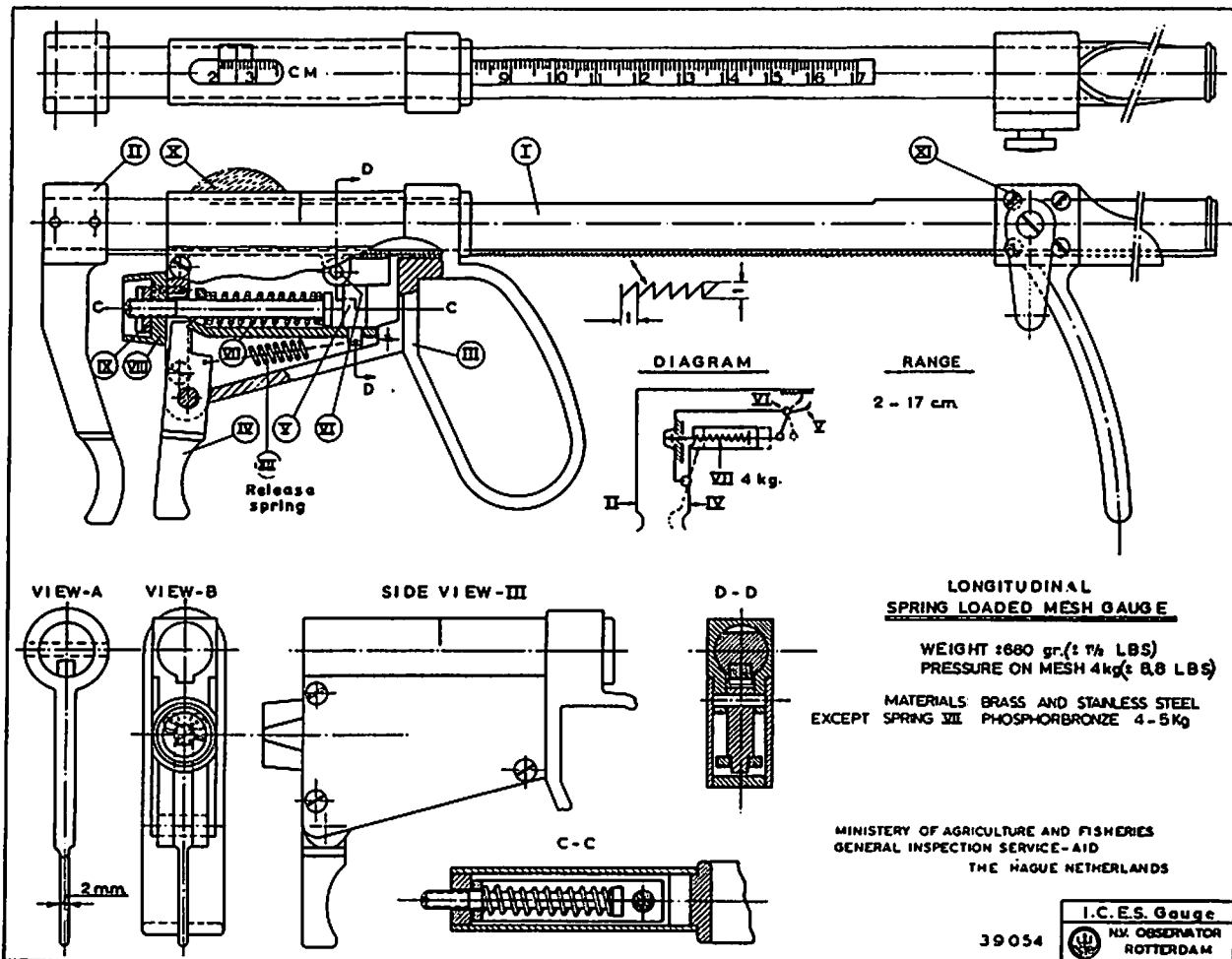


FIGURE 2 - ICES GAUGE



**FIGURE 3 - DIGIMATIC VERNIER GAUGE**

