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On the Shrinkage of the Manila Meshes in the Codend of  
Trawls for Pair Trawlers and Common Trawlers.

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Measurements of meshes in trawls were carried out on board the Spanish cod fishing trawlers and pair trawlers upon their arrival in port.

These trawls are made from various nets with different meshes. The wings, the ceiling and the bottom have a bigger mesh than the codend, in order to achieve a certain selection of fish as they enter the net. However, in the sack itself, and even in the codend, the fish continue escaping through the meshes. Numerous experiments have been carried out to show this. The clearest results are achieved by placing a codend of smaller meshes around the codend proper. In the space left between the two codends the escaping small fishes will be caught. This escapement has also been shown by means of underwater films.

Some trawler captains, however, maintain that the fish once in the sack cannot escape. If it should succeed in escaping from one of the sheets of the ceiling, in the cases where two such sheets are used, one would get firstly a better selection of cod and haddock, meaning less work in sorting, and, secondly, that the destruction of small fish would be less as they could escape under conditions which would secure their continued living; this being impossible when they have been taken on board.

The proposal adopted by ICNAF says referring to covers, chafing gear, etc.:

"The contracting governments permit (1) the use of whatever material attached to the underside only of the codend to reduce and prevent damage and (2) a rectangular piece of netting to be attached to the upper side of the trawl net to reduce and prevent damage, so long as such netting conforms to conditions:

- (a) This net shall not have meshes smaller than those of the regulation.
- (b) This net may be fastened to the codend only along the forward and lateral edges and at no other place. Its length shall not be more than 16 meshes counted parallel to the long axis of the codend;
- (c) The width of this net shall be at least one and a half times the width of the area of the codend covered.

In order to study the shrinkage which the meshes suffer during use, meshes of nets - new and used - of pair trawlers and otter trawlers were measured, noting as exactly as possible the time which they had

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been worked. The data were arranged as follows:

- A. Nets used and wet, single strand (pair trawlers),
- B. Nets used and wet, double strand (trawlers);
- C. Nets new and wet, double strand (trawlers).

A. Nets, Used and Wet, of Pair Trawlers.

In 1955 and 56 nets of 20 pair trawls were measured with a Scottish spring gauge from the Biological Station, St. John's, Nfld. The same gauge was used in all measurements. Of the 20 nets measured, only 4 were considered, namely those of which the dimension of the new mesh was known as well as the time they had been used. All the codend meshes are of single strand, except two which were included in the group of trawlers ( B ).

The period in which the trawls were used is stated in whole hours and includes the time to shoot the trawl and to haul it on board, as it is very difficult, even impossible, to fix the time used exclusively in hauling the net over the bottom. The number of hauls were also disregarded as in each haul the pressure suffered by the net varies according to the amount of fish caught. When the total time is used as unit there is a certain compensation between short hauls and long hauls and rich and poor catches.

Table 1. Measurements of pair trawls

	new net mm	used net mm	hours	hauls	% of Shrinkage
1.	144.63	138.90	204	68	3.96
2.	127.54	117.53	120	40	7.85
3.	125.75	122.31	84	21	2.74
4.	119.00	115.60	96	16	2.86
				Mean	4.35

The curve of shrinkage of meshes for the pair trawlers shows a marked parallel and a progressive decrease (Fig. 1).

B. Nets, used and wet, Double Strand (Pair Trawlers and Trawlers).

In this group 17 nets were measured; ten, for which all needed data were recorded, were used. From graph (Fig. 2) it appears, after some observation, that three different groups occur; the groups become more clear by considering the percentage of shrinkage.

Table 2. Measurements of nets of double strand, Pair trawlers

	new net mm	used net mm	hours	hauls	% of Shrinkage
1.	125.64	113.16	240	40	10.00
2.	130.00	114.40	84	20	12.00
				Mean	11.00

Table 3. Measurements of nets of double strand, trawlers:

	<u>new net</u> <u>mm</u>	<u>used net</u> <u>mm</u>	<u>hours</u>	<u>hauls</u>	<u>% of</u> <u>Shrinkage</u>
1.	127.00	113	720	-	11.00
2.	139.39	99.71	720	-	28.47
3.	120.6	107.40	720	-	11.00
4.	120.6	106.90	720	-	11.36
5.	125.7	90.26	240	-	28.20
6.	120.6	105.40	192	-	12.60
7.	130	93.34	480	-	28.20
8.	130	100.44	192	-	22.73

The nets of this last group (Table 3) might be subdivided in two:

1. 125 mm. and more with a reduction of 26.90% (mean);
2. 120-124 mm. with a reduction of 11.49% (mean).

As to the first of these groups, the following is to be noted. The starting figure is the dimension of the new mesh of the codend. This has two covers of the same mesh, and that which was measured to find the shrinkage is the exterior one as it is that which in the last instance selects the fish, and also because it was very difficult to measure the interior of the sheets.

The meshes of the codend proper (the interior) suffer a strain in each haul which tightens the knots. This pressure is much smaller in the third cover. However, the shrinkage owing to immersion in water is intense. This gives, as a result, a shrinkage larger than the real, owing to the fact that the knots remain more loose. This shrinkage does not seem to correspond to that of the mesh, but one has to consider it because it is this shrinkage which determines the fishery.

C. New Net, Double Strand.

The experiment was carried out using a codend of new double strand net. The knots were tightened as much as possible and 8 meshes measured together, i.e. from the centre of the knot of the first mesh to the centre of the knot of the eighth mesh. These meshes were marked for identification, and then placed in salt water. Measurements made at regular intervals showed the gradual decrease in size of the meshes owing exclusively to the immersion in water, as the net was not used (Fig. 3).

Table 4. New net of double strand

	<u>measurements</u>	<u>new wet</u> <u>mm</u>	<u>hours</u>	<u>% of</u> <u>Shrinkage</u>
1.	new dry	120.62	-	
2.	wet	112.50	25 1/2	6.72
3.	"	110.62	48	1.67
4.	"	108.75	73 1/2	1.69
5.	"	107.50	96	<u>1.15</u>

Total reduction 11.23

Note to Table 4: There is a small difference in the sum of decreases for the separate periods and the total decrease for the whole period.

R E S U L T S

One feature which also could influence the shrinkage, namely the thickness of the strand has not been dealt with. This lacking factor will be dealt with later. It was also difficult to make all the experiments under identical conditions, therefore conclusions, as stated below, are not to be considered as definitive:

1. The manila meshes of single strand shrink less than those of double strand. The shrinkage % was 4.35 for nets used by the pair trawlers, some of these are for nets used for 120 and 20+ hours. Therefore in order to achieve the regulated mesh size in Subareas 3 and 4, it shall be necessary to make the meshes with a 4.50% addition to their size (giving some margin because of the scarcity of data).

	<u>Subarea 3</u>	<u>Subarea 4</u>
Mesh, new (mm.)	106.20	119.44
Mesh, according to regulation (used, wet)	101.60 (4 inches)	114.30 (4 1/2 inches)

2. The manila meshes of double strand shrink much more, 11.00% for the nets of the pair trawlers and 11.49% for the common trawlers. A mean of 11.50 is used.

	<u>Subarea 3</u>	<u>Subarea 4</u>
Mesh, new (mm.)	113.28	127.44
Mesh, according to regulation (used, wet)	101.60 (4 inches)	114.30 (4 1/2 inches)

The sizes proposed for the new mesh must be regarded as a minimum size because at times the shrinkage may be larger.

It is to be noted that as these trawls carry over the codend one or two additional covers which suffer less pressure and are those which in the end select the fish, the meshes of these sheets ought to be made using the mean of the shrinkage found, which is 26.90% (to be used 27%).

	<u>Subarea 3</u>	<u>Subarea 4</u>
Mesh, new (mm.)	129.03	145.16
Mesh, according to regulation (used, wet)	101.60 (4 inches)	114.30 (4 1/2 inches)

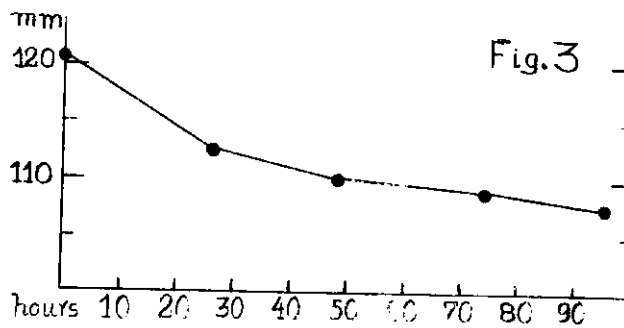
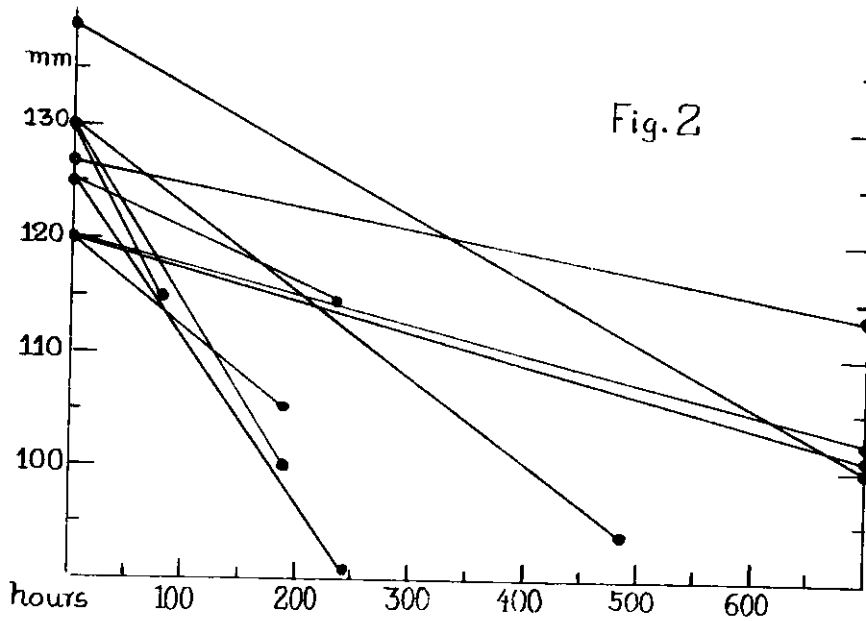
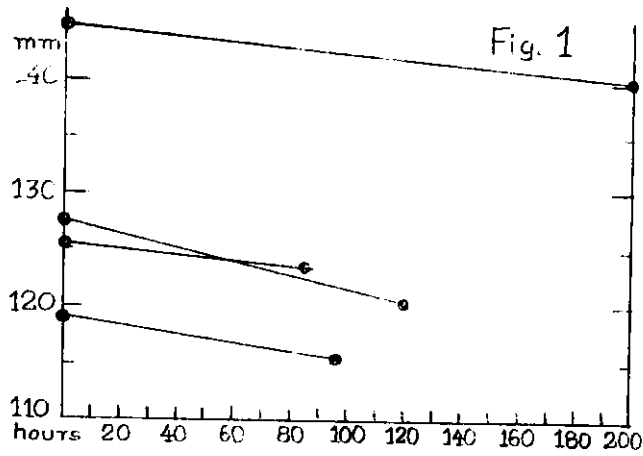
This, in fact, ought to be the mesh sizes for the new meshes when multiple codends are used. However, we do not propose to make this resolution as covers will not be used in future.

It is finally to be noted that the Spanish pair trawlers use a mesh much larger than that of the regulation. This because it is not found economical to make the long voyage to catch cod of small dimensions.

APPENDIX. Measurements of meshes in trawls used by pair-trawlers, 1955 and 1956.

<u>Name of vessel</u>	<u>new net</u>	<u>used net</u>	<u>length of time</u>
BAHIA DE PASAJES	-	108.04 mm	2 hours
BAHIA DE PASAJES	-	112.03	6 hours
RIO NARCEA	-	116.58	2 hours
RIO NARCEA	-	117.17	7 days
PARROTE	127.54	117.53	10 days
"	-	110.42	3 days
ESTRELLA AZUL	144.63	138.90	17 days
SANTA CRUZ DE LLANERA	-	97.90	2 days
" " " "	-	97.64	1 month
MERCADER	125.75	122.31	7 days
COSTARENCALA	119.00	115.60	8 days
APOSTOL SAN PEDRO	125.64	-	-
APOSTOL SAN PEDRO	-	113.16	20 days
BAHIA DE PASAJES	-	129.25	10 days
VIRGEN DE LA PASTORA	-	120.66	
APOSTOL SAN PEDRO	-	110.13	
VISPON	-	130.68	
MARINEMI	130	114.40	1 week
MONTE JAIZQUIBEL	-	125.60	
TXINDOQUI	-	110.49	1 month

- - T H E E N D - -



Curves showing shrinkage of manila meshes of the Cod end.  
Fig.1 - Pair trawlers, single strand, used and wet;  
Fig.2 - Trawlers, double strand, used and wet;  
Fig.3 - New and wet net, double strand.