International Council for the
Exploration of the Sea

ANNEX IV

REPORT OF THE THIRD MEETING
of
ICES/ICNAF JOINT WORKING GROUP ON SELECTIVITY ANALYSIS

Charlottenlund, 5 - 9 January 1970

Note:

1. The Tables 1-42, 47, 53 and 54 which contain the raw data have not been included in the present version of the document. They are included in Doc. C.M.1970/B:2.

2. As an Appendix to the present document are found Tables 36, 37 and 38 of the Working Group's First Report.

3. The Working Group's First Report has been issued by the Council as Doc.C.M.1969/B:13.

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Report of the 3rd Meeting of the ICES/ICNAF Joint Working Group on Selectivity Analysis

Introduction

At the 1969 Statutory Meeting of ICES it was recommended that the ICES/ICNAF Joint Working Group on Selectivity Analysis be wound up and a new Working Group be set up with the following terms of reference (C.Res.1969/3:6):-

"1. to extend the work of the 1969 ICES/ICNAF Joint Selectivity Analysis Working Group to include data relating to NEAFC Region 2 and ICNAF Areas 4 and 5;

2. to investigate further all factors (including physical properties of net twines, biological factors, etc.) which cause, or may cause, differences in mesh selection;

3. to examine the adequacy of the present system of mesh differentials used by NEAFC and ICNAF in relation to the principle of equivalent selectivity."

The Working Group met at Charlottenlund from 5th to 9th January 1970, and the following participants attended the meeting:-

Dr. A. I. Treschev, Convenor	USSR
Mr. M. J. Holden, Secretary	UK
Prof., Dr. A. von Brandt	Germany
Dr. H. Bohl	Germany
Mr. M. Portier	France
Dr. J. Reuter	Netherlands
Dr. W. Strzyzewski	Poland
Mr. S. Prüffer	Poland
Mr. J. A. Pope	UK
Mr. M. D. Grosslein	USA
Mr. V. Belof	USSR
Mr. A. R. Margetts, ICES	(Chairman, Gear and Behaviour Committee)
Mr. J. Møller Christensen, ICES	(Secretary to Liaison Committee)

Part I

Analysis of Data

Before the meeting all member countries of both ICES and ICNAF were sent copies of their published selectivity data and were asked for corrections and additions of unpublished data. Not all member countries were able to reply before the meeting started.

All selectivity data for all species in NEAFC Region 2, ICNAF Sub-Areas 4 and 5 and also for ICES Division Vb, which had not been considered at the previous meetings, were tabulated. However, there were only sufficient data from the following stocks to warrant an analysis:

1) Cod — ICNAF Sub-Areas 4, 5
2) Haddock — ICNAF Sub-Areas 4, 5
3) Haddock — NEAFC Region 2
4) Haddock — ICES Division Vb
5) Whiting — NEAFC Region 2.

The Working Group followed the same procedure as at their previous meetings:-

1) All experiments made at the same time with the same cod-end mesh and twine were grouped;
2) If no duration of haul was shown it was assumed to be 60 minutes, unless there were evidence to indicate that it should be shorter or longer; such estimated values are shown in paranthesis in Tables 1 to 42;
3) All doubtful experiments (for example, selection factor shown in paranthesis in original data) and all those with insufficient data for analysis were excluded.

For each stock the different types of material, braiding and gear were considered separately, that is, the Working Group considered seine cod-ends made of each material separately and for trawls single- and double-braided materials were considered separately. The data considered are shown in Tables 1 to 42.

Mean selection factors were calculated by four methods, unweighted mean, weighted by number of hauls, weighted by number of hauls and number of fish in selection range (or by number of fish/or species studied in the cod-end if this was not available) and weighted by the inverse of the variance. An average of the four means was taken to give a mean selection factor and from these averages equivalents were calculated using double manila, trawl, as a standard (Tables 43 to 46).

The selection factors and equivalents listed in Tables 43 to 46 are joint estimates derived from varying numbers of experiments of different accuracy. It is not possible, however, because of inadequate available information, to evaluate precisely the statistical variances of the estimates derived by the different methods of analysis. Adequate estimates of variances, based on assumptions as to the variance of a single determination such as given by Pope (1969) may, however, be derived for each method of analysis. Unfortunately there was not sufficient time during the meeting to make such calculations for every value, but from a relatively small number of calculations it seems reasonable to assume a standard error of at least $\pm$ 0.07 for each average selection factor and one of at least $\pm$ 0.08 for each equivalent. Ninety-five percent confidence limits for an estimate are obtained by adding and subtracting twice these figures to the estimate. Thus the 95% limits for an average selection factor of say 3.30 would be 3.30 $\pm$ 0.14, i.e. 3.16 and 3.44, while the limits for an equivalent of say 1.16 would be 1.16 $\pm$ 0.16, i.e. 1.00 and 1.32. Such confidence limits for equivalents are given in Tables 43 to 46 for those materials and gears for which there were four or more sets of experimental data. The degree of overlap of the confidence limits together with the present equivalents are shown in Figure 1 for the data analysed at this meeting, and in Figure 2 for the data analysed previously.

The number of sets of data considered for each stock is given in Table 47, and the range of selection factors for each stock in Tables 48 to 52.

Part II

The Working Group was asked to investigate further all factors (including physical properties of net twines, biological factors etc.) which cause or may cause, differences in mesh selection.

Physical Properties of Net Twines

To date very little data on the physical properties of the net twines used in selectivity experiments have been published. The Working Group, therefore, did not have data from which it could make an analysis of the relationship between physical properties of net twines and selectivity, and for future development there is an urgent need to establish a better understanding of the results of selectivity experiments with the properties of the netting twine used for trawls.

The analyses of selection experiments presented in the first report of this Working Group and of those contained in the present report indicate that the large variations in the selection factor for polyamide may be due to variations in the elongation introduced in manufaction. Elongation of netting twine depends on two factors, the type of fibre and the way of constructing the netting twine. An example may illustrate this point: starting with the same type of fibre a double-twisted twine has less elongation than one which is cable-laid (three times twisted). This is due only to the last (third) twist of the twine. This also means that it is impossible to judge twine properties without considering the construction of the twine, particularly with polyamide fibres.

The Working Group considers that an international experiment (details of which are given later) should be undertaken to determine whether high elongation and high selectivity are positively correlated or whether there is no correlation between them.

In textile research the following properties of netting twine and netting are considered highly important:

Netting Twines:

- Kind of material (PA, PE, PES, PP)
- Type of fibre (multi-filament, monofilament, staple fibre, split fibre)
- Construction of the twine (twisted or plaited)
- Coefficient of twist (soft, medium and hard lay)
- Designation (Tex and R.tex)
- Treatment (untreated, thermo-fixed, chemical treatment etc.)
- Breaking strength (wet weaver's-knot breaking strength)
- Load-elongation-curve (up to half of the value of the wet weaver's-knot breaking strength).

Netting:

- Method of manufacturing (hand or machine-made, knotted or knotless, single- or double-braided)
- Treatment (untreated, thermo-fixed, chemical treatment etc.)
- Mesh-size (wet mesh-size measured with ICES mesh-gauge).

The items mentioned above must be determined as far as possible according to the ISO standards for testing of netting twine and netting.

It is quite probable that other of the above-mentioned properties, either alone or in conjunction with each other, influence the selectivity of trawls. Further, there is the possibility that other physical properties not mentioned above also influence the selectivity of trawls; for example, some investigators have pointed to flexibility and elongation of the netting twine.

Biological Factors

Some of the biological factors which may influence selectivity of the same species are:-

1) Daily, seasonal, annual and long-term variations in the length/girth relationship;
2) Diurnal and seasonal variations in behaviour;
3) Behaviour changes in the net associated with the size of the catch and/or the presence of other species;
4) Differences between stocks.

This list does probably not include all biological factors affecting selectivity.

The Working Group was unable to examine the effect of behaviour on selectivity because there are too few data. Also there are no data from which diurnal variations can be studied (time is not included on the standard selectivity reporting forms).

For the majority of areas there were insufficient data to examine seasonal variations in selectivity and even in those instances for which there were many observations inspection showed that the majority of the experiments were carried out in a limited number of months; for example, in NEAFC Region 1 and in ICNAF Sub-Areas 1, 2, and 3 for experiments with double manila there were 71 sets of data for cod, 61 of which were for the months of July and August; for haddock there were 42 sets of experiments of which 32 were for June, July and August. Only three sets of experiments for both species were carried out in the period September to February.

Similarly there is a lack of data for comparison of selectivity between stocks of the same species. The only species for which there are any comparable data are for haddock, for ICES Division Vb, NEAFC Region 2 and NEAFC Region 1 combined with ICNAF Sub-Areas 1, 2 and 3, and then only for the twine material polypropylene.

In NEAFC Region 2 experiments with synthetic twines were done mainly after manila was no longer used, and possible long-term changes in selectivity may invalidate comparison between manila, as a standard, and other materials when determining equivalents.

To summarize, the Working Group considered that it was impossible to assess at this time the effect of physical properties of the twine material and biological factors on selectivity.

The present selectivity data incorporate all factors, biological, constructional, technological and environmental, and so one set of data is not strictly comparable with another; for example all the selectivity experiments for double manila twine for haddock in ICES Division Vb were carried out in December. However, they are the only data in existence from which to evaluate differentials.

Proposed Experiments

1. To obtain a new standard selection factor for each species

If the new standard polyamide is to be used in the same manner as manila has been used, it will be necessary to obtain as much data with the new standard polyamide as quickly as possible.

It is suggested that whenever possible research vessels should use cod-ends made of the new standard polyamide and collect selectivity data so that a large number of selection factors covering all species, seasons, areas etc., be obtained as quickly as possible, from which a standard selection factor for all species can be evaluated.

(It is realised that this standard will be no more than a reference point because there may be long-term changes in selection factors for a given species).

2. Investigations of factors affecting selectivity

Although many selectivity experiments have been conducted in which only one factor was varied, there are insufficient data from which to draw conclusions on the factors which affect selectivity. In all future selectivity experiments the experimental material should always be compared with the standard polyamide and only those factors varied, which it can be definitely shown have no effect on selectivity.

3. Evaluation of the relationship between elongation and selectivity

This experiment is a special case of 2 (above).

To minimise all sources of error the research vessels of all countries engaged to make this experiment must work with the same trawl. This means that the vessels must have the same net of the same material and of the same construction. In other words:-

(i) all vessels have the same forenet (this means the trawl without the cod-end), made of the same material, of the same mesh-size (machine-made netting), of the same construction and made by the same netmaker.

(ii) all vessels must have at least 3 different cod-ends:

a) made of the proposed standard twine (with an average elongation of about 24%);

b) made of polyamide netting twine with an average elongation less than 20%;

c) made of polyamide netting twine with an average elongation of more than 40%.

The twine of the three cod-ends has to be made by one factory from the same type of polyamide fibre and must differ in the construction only to get the wanted differences in elongation of the netting twine. The cod-ends have to be made just like the forenet by machine-made netting of one manufacturer and supplied by the same netmaker.

It can be expected that the price for trawls, and especially of the cod-ends, will be above average, because only small quantities of special-made netting will be needed for these important experiments.

For the realisation of these tests a new special programme must be worked out. Moreover, it is proposed to use headliner recorder to prove comparable behaviour of the bottom trawl.

It is desirable that each country should take part in the experiments to be conducted in the area where it is fishing.

Part III

Adequacy of the Present System of Differences of Mesh Differentials used by NEAFC and ICNAF in relation to the Principles of Equivalent Selectivity

Tables 53 and 54 show the mesh-sizes which are effective now in NEAFC and ICNAF, correspondingly. The last columns of the Tables show what acceptance of the average equivalents might imply in terms of mesh-sizes. (The averages are based on unweighted values/of simple aritmethic means).

(The distinction made between polyamides A and B is that distinction made in the first report of the Working Group and this difference is not accepted by the Delegates of both the Federal Republic of Germany and of the Netherlands).

The data in Table 1 to 42 are from many experiments which have been conducted over a long period of time in many fisheries but which have not been conducted systematically. They serve as a useful guide but no two mean figures are really strictly comparable. In making comparisons it is best to compare the bands of values for each material category as given by the confidence limits derived from the variation within and between experiments (Figures 1 and 2). In only some of the experiments were more than one type of cod-end tested at the same time under the same conditions. Thus even the bands of values for mean selectivities and the calculated selectivity equivalents are subject to variation from biological causes, fishery conditions, net construction and the way the net is used, and to features of the twines other than their basic chemical nature.

The full information about the twines used in the experiment, which is needed if a proper investigation is to be made of the causes of the observed selection differences, is not available. But, using the summary figures and making allowance for their reliability, it appears that the polyamide fibres as used in several fisheries have had higher selectivities on average than other twines, especially manila. The bands of selectivity values of many twines overlap considerably, indicating that any observed selection differences may not be due to the fibre type only.

The Working Group had no clear information as to why the average selectivity of polyamides was higher than that of manila or polyethylene, for example. There are indications that twine extensibility was perhaps the most important controlling factor, and the Working Group recommends that an experiment as detailed in Part II shall be conducted as soon as possible.

The accumulation of evidence from selectivity with more and more twine types (both basic chemical material and construction) indicates that the distinction between groups of twines with different selectivities is by no means as simple as it appeared to be when differentials were first considered and introduced into fisheries legislation. In particular, it is still not known with any certainty which feature or features of a twine are of primary importance in determining its selectivity. Thus, although the selectivity of some of the twines tested appears to be higher on average than that of other twine types, the Working Group cannot attribute a very reliable value to the measure of difference and has insufficient evidence to decide to what extent this apparently higher selectivity is due to the chemical nature of the material itself or to attributes of extensibility and flexibility which can be very substantially varied by such factors as the method of twine construction and choice of filament type.

The present system of mesh differentials is based mainly on the chemical nature of the fibres from which the cod-end was made. In view of the absence of other data on physical properties, discussed when considering the second term of reference, the Working Group considered that in the present state of knowledge it could not recommend any departure from the present system except that there would appear to be no basis for the distinction made between trawls and seines in all areas and between single- and double-braided cod-ends in NEAFC Region 2. Differentials should be based solely on the chemical nature of the twine from which the cod-end is made and not take into account the type of gear (seine or trawl) or the braiding of the twine (single- or double-braided). (For seines the present differential is based on experiments with cotton cod-ends and the differential was then given to the type of gear and not to the cod-end material because cotton was the only material used. The differential has been extended into other areas on the basis of the experiments in NEAFC Region 2 because there are no seine-net data for other regions).

These changes would mainly affect NEAFC Region 2. The Working Group considers that the data indicate that the present system of mesh differentials in other areas needs improvement also.

Table 43. Cod and Haddock, ICNAF Sub-Areas 4 and 5. Trawl only. Mean selection factors and equivalents.[1)]

1. Unweighted mean
2. Weighted by number of hauls
3. Weighted by 3-component method
4. Weighted by inverse of variance

		Haddock				Cod		
Single twines	Method	Manila	Cotton	PA	PES	Manila	Cotton	PA
	1	-	3.32	3.54	3.10	-	3.60	3.78
	2	-	3.38	3.70	3.10	-	3.60	3.84
	3	-	3.24	3.72	3.10	-	3.60	3.77
	4	-	3.24	3.50	3.10	-	3.60	3.76
	Mean	-	3.30	3.62	3.10	-	3.60	3.79
(No. of data sets)			(5)	(9)	(1)		(2)	(5)
Double twines	1	3.20	-	3.43	-	3.36	-	3.80
	2	3.24	-	3.40	-	3.38	-	3.80
	3	3.15	-	3.37	-	3.39	-	3.80
	4	3.22	-	3.42	-	3.35	-	3.80
	Mean	3.20	-	3.41	-	3.37	-	3.80
(No. of data sets)		(33)		(3)		(10)		(2)
		Point estimates of equivalents (double manila as standard)						
Single twines		-	1.03	1.13	0.97	-	1.13	1.18
Double twines		1	-	1.07	-	1	-	1.19
		Approximate 95% confidence limits of equivalents						
Single		-	0.87 to 1.19	0.97 to 1.29	-	-	-	1.02 to 1.34
Double		-	-	-	-	-	-	-

1) Number of data sets in each mean selection factor shown in parentheses. Confidence limits on equivalents estimated only for categories with at least 4 data sets.

Table 44. Haddock, NEAFC Region 2. Mean selection factors and equivalents [1)]

1. Unweighted mean
2. Weighted by number of hauls
3. Weighted by 3-component method
4. Weighted by inverse of variance

Selection factors

Single twines	Method	Manila	Sisal	Cotton	Hemp	PA	PE	PES	PP
Trawl	1	-	-	3.50	-	3.80	3.20	3.05	-
	2	-	-	3.50	-	3.84	3.17	3.05	-
	3	-	-	3.50	-	4.00	3.14	2.88	-
	4	-	-	3.50	-	3.73	3.19	3.01	-
	Mean	-	-	3.50	-	3.84	3.18	3.00	-
(No. of data sets)				(1)		(5)	(2)	(2)	
Seine	1	-	-	3.92	-	-	-	-	-
	2	-	-	3.92	-	-	-	-	-
	3	-	-	3.90	-	-	-	-	-
	4	-	-	3.88	-	-	-	-	-
	Mean	-	-	3.91	-	-	-	-	-
(No. of data sets)				(5)					
Double twines									
Trawl	1	3.10	3.45	-	-	3.40	3.10	3.55	3.38
	2	3.05	3.46	-	-	3.35	3.22	3.52	3.36
	3	3.05	3.49	-	-	3.36	3.29	3.53	2.99
	4	3.01	3.45	-	-	3.34	3.10	3.53	3.34
	Mean	3.05	3.46	-	-	3.36	3.18	3.53	3.27
(No. of data sets)		(11)	(2)			(4)	(2)	(2)	(12)
		Point estimates of equivalents (double manila as standard)							
Single, trawl		-	-	1.15	-	1.26	1.04	0.98	-
Single, seine		-	-	1.28	-	-	-	-	-
Double, trawl		1	1.13	-	-	1.10	1.04	1.16	1.07
		Approximate 95% confidence limits of equivalents							
Single, trawl		-	-	-	-	1.10 to 1.47	-	-	-
Single, seine		-	-	1.12 to 1.44	-	-	-	-	-
Double, trawl		-	-	-	-	0.94 to 1.26	-	-	0.91 to 1.23

1) Number of data sets in each mean selection factor shown in parentheses. Confidence limits on equivalents estimated only for categories with at least 4 data sets.

Table 45. Haddock, ICES Division Vb. Trawl only.
Mean selection factors and equivalents[1)]

1. Unweighted mean
2. Weighted by number of hauls
3. Weighted by 3-component method
4. Weighted by inverse of variance

Selection factors

Braiding	Method	Manila	PA	PP
Single	1	-	3.30	-
	2	-	3.30	-
	3	-	3.30	-
	4	-	3.30	-
	Mean	-	3.30	-
(No. of data sets)			(1)	
Double	1	2.86	-	3.43
	2	2.80	-	3.43
	3	2.79	-	3.48
	4	2.82	-	3.43
	Mean	2.82	-	3.44
(No. of data sets)		(8)		(13)
	Point estimates of equivalents (double manila as standard)			
Single		-	1.17	-
Double		1	-	1.22
	Approximate 95% confidence limits of equivalents			
Single		-	-	-
Double		-	-	1.06 to 1.38

1) Number of data sets in each mean selection factor shown in parentheses. Confidence limits on equivalents estimated only for categories with at least 4 data sets.

Table 46. Whiting, NEAFC Region 2. Mean selection factors and equivalent.[1)]

1. Unweighted mean
2. Weighted by number of hauls
3. Weighted by 3-component method
4. Weighted by inverse of variance

Selection factors

Single twines	Method	Manila	Sisal	Cotton	Hemp	PA	PE	PES	PP
Trawl	1	2.95	-	3.97	4.28	4.15	3.47	3.84	3.50
	2	3.03	-	3.96	4.34	3.92	3.48	3.86	3.50
	3	3.17	-	3.87	4.16	4.07	3.46	3.81	3.50
	4	2.93	-	3.95	4.28	4.00	3.43	3.79	3.50
	Mean	3.02	-	3.94	4.27	4.04	3.46	3.83	3.50
(No. of data sets)		(2)		(3)	(4)	(6)	(7)	(5)	(1)
Seine	1	-	-	4.06	-	3.80	4.00	-	3.66
	2	-	-	4.19	-	3.88	4.11	-	3.74
	3	-	-	4.06	-	3.77	3.90	-	3.70
	4	-	-	4.05	-	3.80	3.99	-	3.62
	Mean	-	-	4.09	-	3.81	4.00	-	3.68
(No. of data sets)				(7)		(3)	(3)		(7)
Double twines									
Trawl	1	3.82	3.63	3.93	4.16	4.06	3.84	4.26	3.81
	2	3.80	3.51	3.95	4.29	4.05	3.96	4.26	3.70
	3	3.85	3.58	4.04	4.27	4.01	4.13	4.40	3.69
	4	3.69	3.56	3.92	4.14	3.99	3.81	4.22	3.69
	Mean	3.79	3.57	3.96	4.22	4.03	3.94	4.29	3.72
(No. of data sets)		(22)	(12)	(3)	(8)	(7)	(7)	(5)	(14)
			Point estimates of equivalents						
Single, trawl		0.80	-	1.04	1.13	1.07	0.91	1.01	0.92
Single, seine		-	-	1.08	-	1.01	1.06	-	0.97
Double, trawl		1	0.94	1.04	1.11	1.06	1.04	1.13	0.98
			Approximate 95% confidence limits of equivalents						
Single, trawl		-	-	-	0.97 to 1.29	0.91 to 1.23	0.75 to 1.07	0.85 to 1.17	-
Single, seine		-	-	0.92 to 1.24	-	-	-	-	0.81 to 1.13
Double, trawl		-	0.78 to 1.10	-	0.95 to 1.27	0.90 to 1.22	0.88 to 1.20	0.97 to 1.29	0.82 to 1.14

1) Number of data sets in each mean selection factor shown in parentheses. Confidence limits on equivalents estimated only for categories with at least 4 data sets.

Table 48. Frequency distribution of selection factors

Cod. ICNAF Sub-Areas 4, 5. Trawl

Selection Factor	Double		Single	
	Manila	PA	Cotton	PA
2.5				
2.6				
2.7				
2.8				
2.9				
3.0				
3.1	1			
3.2	1			
3.3	2			
3.4	3			1
3.5	3		2	
3.6			2	
3.7				
3.8		2		1
3.9				3
4.0				
4.1				
4.2				
4.3				
4.4				
4.5				
Totals	10	2	2	5

Table 49. Frequency distribution of selection factors

Haddock. ICNAF Sub-Areas 4, 5. Trawl

Selection Factor	Double		Single		
	Manila	PA	Cotton	PA	PES
2.8			1		
2.9					
3.0	4		1		
3.1	6			1	1
3.2	7			2	
3.3	9	1		1	
3.4	5	1		1	
3.5	2		1		
3.6		1	1		
3.7			1		
3.8				2	
3.9					
4.0				1	
4.1				1	
Totals	33	3	5	9	1

Table 50. Frequency distribution of selection factors

Haddock. NEAFC Region 2

Selection Factor	Trawl Double						Trawl Single				Danish Seine Single
	Manila	Sisal	PP	PE	PES	PA	Cotton	PE	PES	PA	Cotton
2.5											
2.6	2										
2.7	1										
2.8									1		
2.9			1	1							
3.0	2		1			1					
3.1			1					1			
3.2	4										
3.3			1	1		1		1	1		
3.4		1	4		1	1				2	
3.5		1					1				1
3.6			2								
3.7	2		2		1						
3.8											2
3.9						1				2	
4.0											
4.1											1
4.2											
4.3											
4.4										1	1
4.5											
Totals	11	2	12	2	2	4	1	2	2	5	5

Table 51. Frequency distribution of selection factors

Haddock. ICES Vb. Trawl

Selection Factor	Manila double	PA single	PP double
2.5	1		
2.6	1		
2.7			
2.8	1		
2.9	1		
3.0	3		
3.1	1		
3.2			2
3.3		1	1
3.4			3
3.5			6
3.6			
3.7			1
Totals	8	1	13

Table 52. Frequency distributions of selection factors. Whiting. NEAFC Region 2.

	Trawl								Trawl							Danish Seine			
	Double Twines								Single Twines										
S.F.	Manila	Sisal	Cotton	Hemp	PP	PE	PES	PA	Manila	Cotton	Hemp	PP	PE	PES	PA	Cotton	PP	PE	PA
2.7	1								1										
2.8																			
2.9		1																	
3.0					1														
3.1	1												1				1		
3.2									1				2						
3.3	1	1			1									1					
3.4	1	1			1	1											1		
3.5	2				2	1						1	1				1	1	
3.6	1			1	1			1							1				1
3.7	2	5				1		1					2						1
3.8	1	2	2	2	2	2				1				1	1	1	1		
3.9	0	1						2		1			1		1	1	2		
4.0	2	1					2							2		2	1	1	
4.1	2				1						2			1		2			1
4.2	4		1	1	4	1	1	1		1	1				1				
4.3	2			1				1											
4.4	2			2															
4.5					1	1	1									1		1	
4.6							1				1				1				
4.7															0				
4.8				1				1							1				
Total	22	12	3	8	14	7	5	7	2	3	4	1	7	5	6	7	7	3	3

Table 36. Mean Selection Factors.

	Cod					Haddock					Redfish				
	(1)	(2)	(3)	(4)	Mean	(1)	(2)	(3)	(4)	Mean	(1)	(2)	(3)	(4)	Mean
Double Manila	3.52	3.48	3.45	3.42	3.47	3.26	3.16	3.09	3.22	3.18	2.71	2.62	2.64	2.62	2.65
Double Polyethylene	3.43	3.42	3.37	3.41	3.41	3.20	3.20	3.20	3.20	3.20					
Double Polypropylene	3.74	3.70	3.60	3.63	3.67	3.48	3.45	3.42	3.45	3.45	-	-	-	-	-
Double Polyester	3.95	3.95	3.95	3.95	3.95	3.40	3.40	3.42	3.39	3.40	-	-	-	-	-
Double Polyamide(A+B)	3.92	4.00	4.02	3.89	3.96	3.59	3.66	3.62	3.63	3.63					
Double Polyamide A	4.09	4.09	4.03	4.07	4.07	3.67	3.86	3.73	3.67	3.73	-	-	-	-	-
Double Polyamide B	3.66	3.66	3.57	3.63	3.63	3.40	3.33	3.51	3.40	3.41	2.92	2.95	2.84	2.87	2.90

(1) = unweighted mean;

(2) = weighted by number of hauls only;

(3) = weighted by method described in Part III; (1st Report of Working Group)

(4) = weighted by method described in Part II. (" " " " ")

Table 37. Characteristics of different Net Materials and Equivalents.

Material	Characteristics of Material: Percentage Elongation at the Load of the Half Knot Breaking Load	Equivalents	Cod	Haddock	Mean
Double Manila	6.5-7.8		1.00	1.00	-
Double Polyethylene	8.4-22.2	(1)	0.97	0.98	-
		(2)	0.98	1.01	-
		(3)	0.98	1.04	-
		(4)	1.00	0.99	-
		Mean	0.98	1.00	0.99
Double Polypropylene	10.4-21.3	(1)	1.06	1.07	-
		(2)	1.06	1.09	-
		(3)	1.04	1.11	-
		(4)	1.06	1.07	-
		Mean	1.06	1.08	1.07
Double Polyester	8.3-12.3	(1)	1.12	1.04	-
		(2)	1.14	1.08	-
		(3)	1.14	1.11	-
		(4)	1.15	1.05	-
		Mean	1.14	1.07	1.10
Double Polyamide	15.5-47.0	(1)	1.11	1.10	-
		(2)	1.15	1.16	-
		(3)	1.17	1.17	-
		(4)	1.14	1.13	-
		Mean	1.14	1.14	1.14
Double Polyamide A	< 25.0	(1)	1.16	1.13	-
		(2)	1.18	1.22	-
		(3)	1.17	1.21	-
		(4)	1.19	1.14	-
		Mean	1.18	1.18	1.18
Double Polyamide B	≥ 25.0	(1)	1.04	1.04	-
		(2)	1.05	1.05	-
		(3)	1.03	1.14	-
		(4)	1.06	1.06	-
		Mean	1.04	1.07	1.06

Table 38. Frequency Distributions of Unweighted Selection Factors for Cod, Haddock and Redfish.

	Cod					Haddock					Redfish	
S.F.	Manila	PP	PE	PES	PA	Manila	PP	PE	PES	PA	Manila	PA
2.1											1	
2.2											2	
2.3											0	
2.4											1	
2.5											3	
2.6											3	1
2.7						1					3	4
2.8	3					0					2	1
2.9	3					4					5	2
3.0	2					5					2	0
3.1	2					3				1	2	2
3.2	2	3	1			7	1	1		0	1	0
3.3	4	5	1			11	2		1	0		1
3.4	15	0	2		1	6	6		0	2		0
3.5	7	4	1		5	6	1		1	3		1
3.6	7	1	0		2	2	3			5		
3.7	6	1	0		3	1	2			1		
3.8	8	1	1		4	1	1			3		
3.9	0	0		1	2					0		
4.0	5	3		1	5					1		
4.1	3	3			2							
4.2	0	4			4							
4.3	2	1			2							
4.4		1			3							
Total	69	27	6	2	33	47	16	1	2	16	25	12

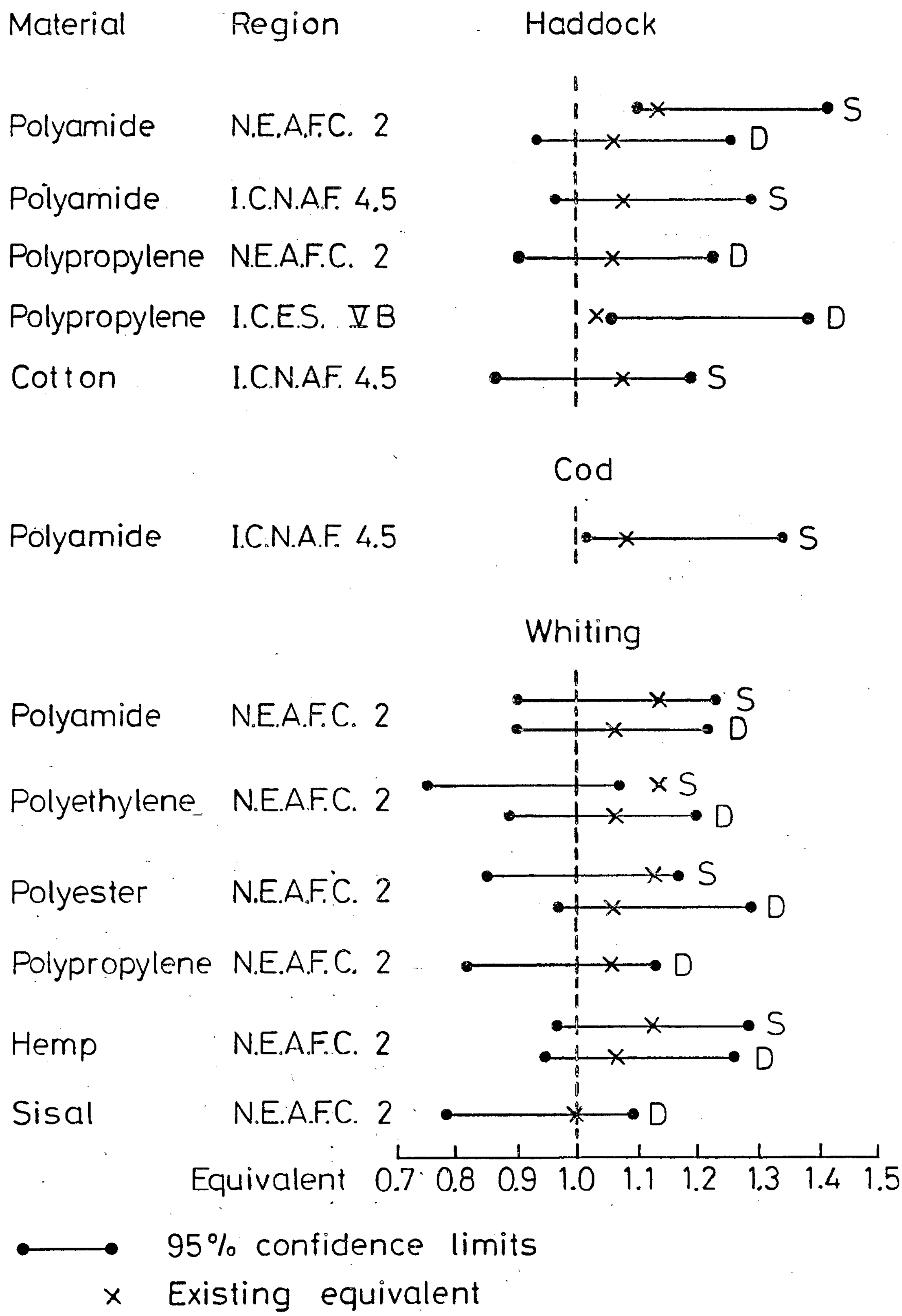

Figure 1. 95% confidence limits of calculated equivalents and position of equivalents currently in force for trawls in NEAFC Region 2, ICES Division Vb and ICNAF Sub-areas 4 and 5 (results for four or more sets of data only). S = single braided, D = double braided.

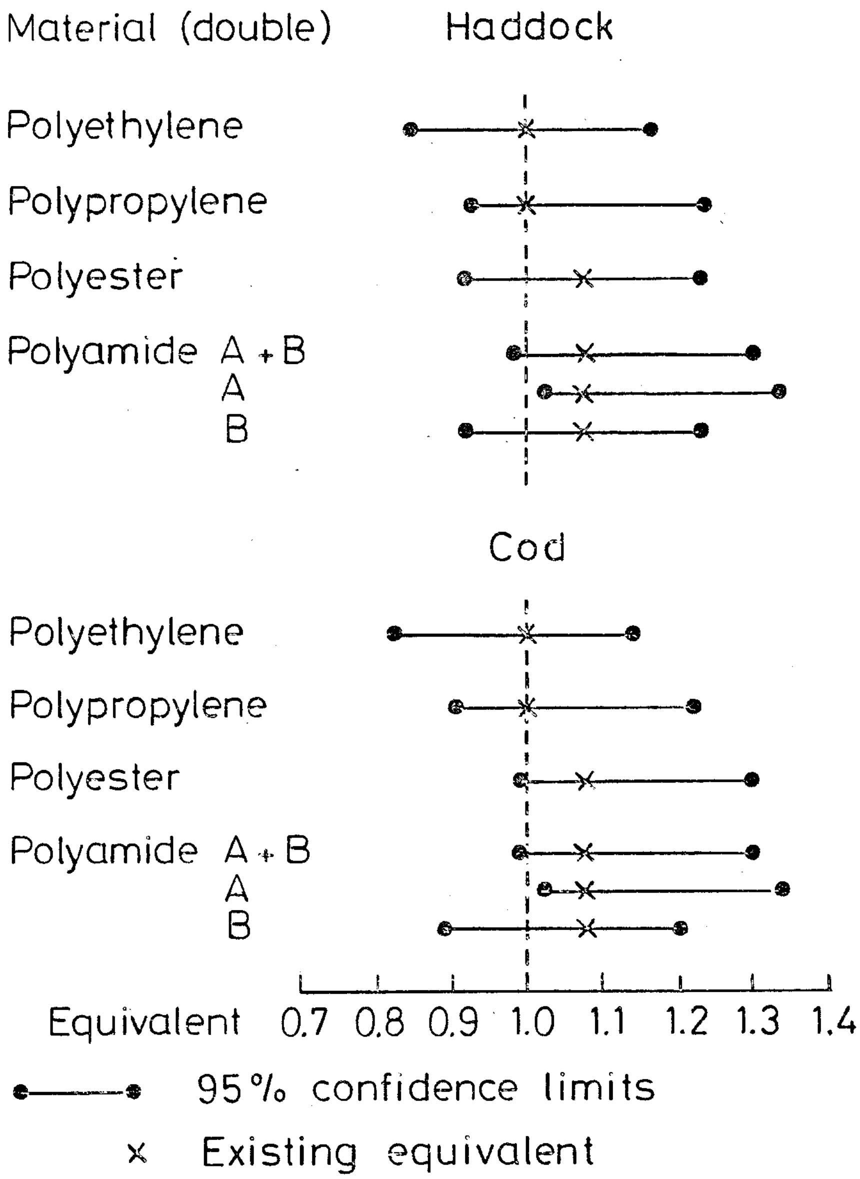

Figure 2. 95% confidence limits of calculated equivalents and position of equivalents currently in force for trawls in NEAFC Region 1, excluding ICES Division Vb, and ICNAF Sub-areas 1, 2 and 3 (results for four or more sets of data only).
N.B. The distinction made between polyamide A and polyamide B is that made by the Working Group and it is NOT recognized in the current mesh regulations.