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REPORT OF THE WORKING GROUP ON NORTH SEA YOUNG HERRING SURVEYS, 1977

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1. INTRODUCTION AND PARTICIPATION

The ICES Statutory Meeting in 1976 decided that "The Working Group on North Sea Young Herring Surveys should meet for 3 days in May 1977 in IJmuiden to discuss the planning of these surveys and discuss further the standardization of gear and methods. The meeting of the Working Group should coincide in time and place with a similar meeting of the Gadoid-I Working Group, so that aspects of mutual interest can be resolved". (C.Res.1976/2:10.) Consequently, both Working Groups met in IJmuiden on 24-26 May 1977. This report presents both the results of joint sessions of the two Working Groups and the results of separate sessions of the herring group. Results from separate meetings of the gadoid group are presented in ICES 1977a.

The meeting of the Working Group on North Sea Young Herring Surveys was attended by the following participants:

H B Becker	Netherlands
P J G Carrothers	Canada
A Corten (Chairman)	Netherlands
H Dornheim	Federal Republic of Germany
C J Kuiter	Netherlands
A Maucorps	France
K Popp Madsen	Denmark
A Saville	United Kingdom
R J Wood	United Kingdom

The following additional persons took part in the joint sessions of the two Working Groups (see Sections 2 and 3):

N Daan	Netherlands
O Hagstrøm	Sweden
J R G Hislop	United Kingdom
J Lahn-Johannessen	Norway
G Lefranc	France
P F Lett	Canada
C T Macer	United Kingdom
G Wagner	Federal Republic of Germany.

2. STANDARDIZATION OF FISHING GEAR

At previous meetings of the Young Herring Working Group, the need was expressed by the majority of the participants to achieve a standardization of trawls used during the Young Herring Surveys (ICES, 1975a, 1975b). The Working Group at that time, however, could not reach agreement on the detailed specifications for a standard gear because insufficient data were available on the trawls used by the various participants. It was decided that technical advice should be sought outside the Working Group, and that a proposal for a standard trawl should be circulated at a later date.

At the time of the present meeting, several proposals for a standard gear had been put forward. The Netherlands had proposed a 4-panel high opening bottom trawl (HOBT) which had been introduced into their commercial fleet in recent years. Several comparative fishing experiments had been conducted in 1976 and 1977 in order to compare the fishing power of the HOBT with that of the traditional 73 ft Herring Trawl. The catches of herring in the HOBT were higher than in the Herring Trawl, but the catches of roundfish were

significantly lower. In order to increase the catches of roundfish, considerable amounts of weight had to be added to the groundrope, and the kites at the wing-ends had to be removed. This in fact reduced the headline height to about 3 metres.

Two other proposals were put forward by France. The first was a 2-panel Semi-Pelagic Trawl, especially designed for herring fishery on rough grounds in the English Channel. This net was compared with the Dutch HOBT during the 1977 Young Herring Surveys. Catches of whiting by this gear were considerably higher than by the HOBT, but catches of herring were much lower. The low herring catches were explained by the short wings of the net, which were designed to minimise net damage on rough grounds.

The second French proposal was the GOV-trawl (Grande Ouverture Verticale = high vertical opening), which RV "Thalassa" employed successfully during the 1976 Young Herring Surveys. This gear is presently used by French commercial trawlers mainly for roundfish. It is a 2-panel bottom trawl, rather similar to the French Semi-Pelagic Trawl, except for its longer wings. The net obtains its vertical opening by the use of 3 legs and an aluminium kite on the headline. The kite has fixed bars which are attached to the headline; this system always guarantees a uniform angle of the kite during fishing operations.

After considerable deliberation, the majority of both Working Groups expressed their preference for the French GOV-trawl, and consequently this net was chosen as the standard gear for the Young Herring Surveys. The GOV-trawl (Figure 1a) corresponds most closely to the trawls that have been used by most countries during recent surveys. Therefore, the change to this new trawl is not expected to cause a considerable change in average fishing power, and thus in the long term comparability of year class strength indices. Also, because most research vessels have used similar nets before, the introduction of this new trawl should not create too many problems for the crews. Participating countries should either purchase the net from French manufacturers or construct the net themselves.

The rigging of the GOV-trawl has to be standardized too. It should be fitted with a false footrope with medium-sized rubber discs (10 and 20 cm). This rigging will enable the net to be employed on medium rough grounds. Only in exceptional circumstances should this standard footrope be replaced by a heavier roller gear. Generally the worst fishing grounds can be avoided by using information from fishing charts or from the list of suitable trawling positions compiled for the Young Herring Surveys. The use of information on bottom topography was not considered to be in conflict with the principle of random sampling on which the survey is based.

The Working Groups did not discuss the standard rigging of the GOV-trawl in further detail, but asked the French participants to prepare a detailed description of the most suitable rigging for the net (including the trawl doors). This description is presented in Figures 1b-d.

A practical difficulty was that several countries had only recently purchased new fishing gear for these surveys, and could not afford to replace these nets immediately by the GOV-trawl. However, it was agreed that it would not be essential that all countries introduced the standard gear as soon as 1978. In fact it might be even better if the change-over was gradual, so that at least some comparison could be obtained between the GOV-trawl and some of the nets that have been used in the past. During the 1978 survey, only England,

France and the Netherlands will employ the GOV-trawl. The other countries should make the change as soon as possible in one of the following years.

Only the Norwegian participant could foresee some problems in using the GOV-trawl on board his ship. The Norwegian RV "Johan Hjort" is a sidetrawler which generally only handles trawls with a groundrope shorter than the distance between the gallows. As the groundrope of the GOV-trawl is considerably larger than the distance between the gallows, this net could not be handled in the usual way.

The construction of the cod-end will have to be adapted to the type of ship. Stern trawlers with a slipway will need a reinforced cod-end, whereas trawlers that take the catch on board in batches can use a much lighter cod-end.

Standardization of Fishing Method

It was agreed that fishing speed should be standardized at 4 knots, preferably measured in relation to the bottom. Towing the net at this speed will require an engine power of approximately 800 bhp.

There was a considerable amount of discussion on the question whether hauls should be of one hour duration of half an hour. One hour hauls have the advantage that more time is spent in actual fishing. On the other hand, making half hour tows will increase the number of hauls that can be made by about 30%. In addition, the risk of net damage is decreased, sampling the (smaller) catch is easier, and the number of possible fishing positions is increased. In view of these advantages, it was agreed to recommend half an hour as the standard duration of a tow.

3. OTHER ITEMS OF COMMON INTEREST FOR THE HERRING AND GADOID SURVEY

The need was expressed for more uniform methods in sampling the trawl catches. Large differences seem to exist both in the way a sub-sample for length and age determination is taken (stratified or proportional), and in the actual size of the sub-sample. It was agreed that in next year's programme more detailed instructions should be given as to the minimum sampling requirements per haul, and the way in which the sub-samples should be taken.

In an earlier report of the Working Group on North Sea Young Herring Surveys (ICES, 1975a) the need was expressed to use an automatic data processing system for the analysis of the results from the Young Herring Surveys. Two laboratories (Aberdeen and IJmuiden) have now started to write computer programmes that can handle this task. It is proposed that in future participants will send their basic data in the form of length-age distributions per haul for all species to one of these laboratories. The data will there be checked for completeness and put on magnetic tape. As a routine analysis charts will then be produced for each species with mean densities and mean length per square. The computer output can be used by the various authors to write their sections for the annual report of the survey. This system will avoid duplication of effort (checking position, fishing time, net damage, etc.) and eliminate possible calculation errors in the processing of data. Its major advantage, however, is that it will give easy access to data from previous surveys, and thereby increase the possibilities for re-analysing past data. The IJmuiden laboratory offered to take on the task of processing data on all species at least for the 1978 survey.

4. ALLOCATION OF SAMPLING EFFORT

The mean abundance of herring has up till now been calculated for a standard area of 53 squares. This standard area had been defined as all squares that had been sampled during the surveys in 1967-73, plus all other squares that had yielded a catch of more than 1 000 herring (I-group) per hour in any year (ICES, 1975a).

During the present meeting it was apparent that four additional squares, which in recent years had been fished for gadoid purposes, consistently gave rather high catches of I-group herring. It was decided that these should be incorporated into the "standard area" in future surveys, and into the abundance estimates of I-group fish calculated from the data collected during past surveys. The resulting standard area therefore now consists of the 57 squares shown in Figure 2.

From the catches taken in the years 1974-77 since the last report was written, it was also apparent that some re-allocation of the squares within the sampling strata was required. This necessitated, as described in ICES, 1975a, calculating the ratio between the mean abundance in each square and the overall mean for the whole standard area. This was done for the year classes 1958, 1959 and 1968-75, and the mean ratio for each square over the entire period was calculated. The resulting values are shown in Figure 2. These values were used as the basis for the re-allocation of squares to sampling strata, and also for correcting overall abundance indices for incomplete coverage of the standard area in any year.

In allocating squares within the standard area to the various strata, the same stratum boundaries were used as in ICES, 1975a, namely:

stratum 1: abundance ratio < 1.0

stratum 2: abundance ratio 1.0 - 3.0

stratum 3: abundance ratio > 3.0

The resulting allocation was (see Figure 3):

stratum 1 - 37 squares

stratum 2 - 15 squares

stratum 3 - 5 squares

It is hoped that the sampling intensity within strata can be maintained at the same level as in recent years, namely 12 hauls per square in stratum 3, 6 hauls per square in stratum 2, and 2 hauls per square in stratum 1. The ability to do this, however, will depend on the maintenance of research vessel effort at least at the same level as in recent years. In the light of the critical role played by these surveys in assessing total allowable catches, and the even more critical role they will play in monitoring the recovery of the stock if the Council's recommendation for a prohibition of herring fishing in the North Sea is implemented, the authorities concerned must make every effort to supply the requisite research vessel effort.

5. CALCULATION OF MEAN ABUNDANCE INDICES PER YEAR CLASS

From an examination of the intensity and distribution of sampling in past surveys it was evident that sufficiently reliable estimates of I-group abundance could be made only for the year classes 1958, 1959 and 1968-75. For each of these year classes, new mean abundance

indices were calculated for the standard area of 57 squares. For those years in which one or more of the standard squares had not been sampled, the corrected mean abundance index for the total standard area was calculated by the following formula:

$$x = \frac{a}{57-b}$$

in which x = corrected mean abundance index

a = sum of mean abundance in all squares fished

b = sum of mean ratios (Figure 2) in missed squares.

The new abundance indices per year class are given in Table 1. In most cases the values are not very different from those given in ICES, 1975a, and in the annual reports on subsequent surveys. The small differences found can be accounted for by the introduction in the standard area of the four additional squares. However, for the 1959 and 1968 year classes the new values are too different from those given previously to be accounted for in this way. It would appear that in these cases the values previously quoted contained some major non-systematic error, and they should on no account be used in any future work with these data.

6. RELATIONSHIP BETWEEN YOUNG HERRING SURVEY ABUNDANCE INDICES AND VPA ESTIMATES OF YEAR CLASS STRENGTH

For the prediction of year class strength from Young Herring Survey abundance indices, the least square regression used in previous reports may not be the most appropriate method. In a recent publication (Ricker, 1973) it was shown that the geometric mean estimate of the functional regression of Y on X (the GM regression) is more suitable in situations where the distribution of both variables is non-normal and open-ended. The GM regression formula is:

$$y - \bar{y} = v(x - \bar{x})$$

in which $v = \pm \frac{b}{r}$

b = regression coefficient of least square regression

r = correlation coefficient

Using the values in Table 1 for the YHS-indices and VPA estimates, both the least square regression and the GM regression have been calculated:

least square regression: $y = 0.0028x + 0.19$

GM regression: $y = 0.0031x - 0.21$

Although the difference between both regression lines is rather small (Figure 4), the Working Group decided to use in future only the GM regression for the prediction of year class strength.

7. SAMPLING OF BIG HERRING LARVAE BY ISAACS-KIDD MIDWATER TRAWL (IKMT)

Preliminary results were available from the IKMT sampling conducted during the 1977 Young Herring Survey. This programme was initiated to investigate the possibility of estimating year class strength in the late larval stage (ICES, 1975a). Several countries used the new Swedish design IKMT, which was recommended for this work by the Working Group on North Sea Herring Larval Surveys (ICES, 1977b), and in most cases the net had worked quite well. Only one country complained that too many crew members were needed to handle the net. Also the instruction that sampling had to be done at night posed a problem in cases where working hours on board were restricted because of overtime regulations.

The results of the sampling during the 1977 survey are published in the annual report of the survey (Corten, 1977). Larvae were found mainly in the northwestern part of the North Sea, where they had not been expected at this time of the year (February). On the other hand, very few larvae were found in the German Bight where most of the IKMT sampling effort had been directed. It is obvious that the instructions for IKMT sampling have to be modified in the light of these results, and that next year all squares south of 60°N will have to be sampled.

8. CONCLUSIONS AND RECOMMENDATIONS

8.A Joint Sessions with I-Group Gadoid Working Group

The Working Groups decided to choose the French GOV (Grande Ouverture Verticale) trawl as standard gear for future surveys. This net is similar to the majority of nets that have been used during previous surveys. During the survey in 1978, at least 4 countries will utilise the new GOV-trawl. The remaining countries should make the change to the new gear at the earliest possible occasion.

It was decided to change the recommended duration of the hauls from 1 hour to ½ hour. This will cause some reduction in actual fishing time, but it will enable a larger number of hauls to be made. It will also facilitate the sampling of the catch and reduce the risk of severe net damage. Fishing speed should be standardized at 4 knots. It was thought advisable that more detailed instructions should be given for the procedure of taking sub-samples, and the minimum amount of fish to be sampled for length and age. These instructions will be included in the 1978 survey programme.

A proposal was accepted that the primary data sheets from the survey will all be sent to one laboratory for automatic processing. The processed data will then be sent to the various authors who will write up the relevant reports. The IJmuiden laboratory offered to take on this task for the 1978 survey.

In view of the fact that the Danish research vessel "Dana" will be out of commission in 1978, the Danish authorities are urged to provide a replacement for the "Dana" during the 1978 survey. The Working Group considers it essential that sampling effort in this programme is maintained at least at the present level, especially in view of the present situation in the herring stock. Even this level does not permit an intensity of sampling which fully satisfies the somewhat conflicting requirements of both the herring and gadoid groups.

8.B Young Herring Surveys

The stratification pattern used during the surveys in 1974-77 was reviewed in the light of the results from these years. This necessitated some modification of the stratification pattern. In addition, it was decided to add to the standard area four new squares in the German Bight, where substantial quantities of young herring had been encountered during recent years.

Mean abundance indices for the surveys in previous years were corrected both for the expansion of the survey area, and for other non-systematic errors. A new regression line was calculated for the relationship between YHS-indices and VPA estimates of year class strength. It was agreed that for this purpose, the geometric mean regression was more appropriate than the least squares regression used in former years. This new regression is appreciably more significant than those previously used, and its intercept on the Y-axis is not significant.

Results of the IKMT-sampling programme show a better coverage in 1977 than in previous years. The newly introduced type of IKMT has worked satisfactorily in most cases. Herring larvae were found mainly in the northwestern North Sea to as far north as 60°N. Therefore, the sampling area as specified in the programme of the 1977 survey will have to be expanded considerably.

At this stage it is too early to evaluate the usefulness of this programme in relation to the prediction of year class strength which it is hoped that it will in due course provide. However, the limited data now available have already given some useful new insight into the relationship between spawning grounds and nursery areas.

9. REFERENCES

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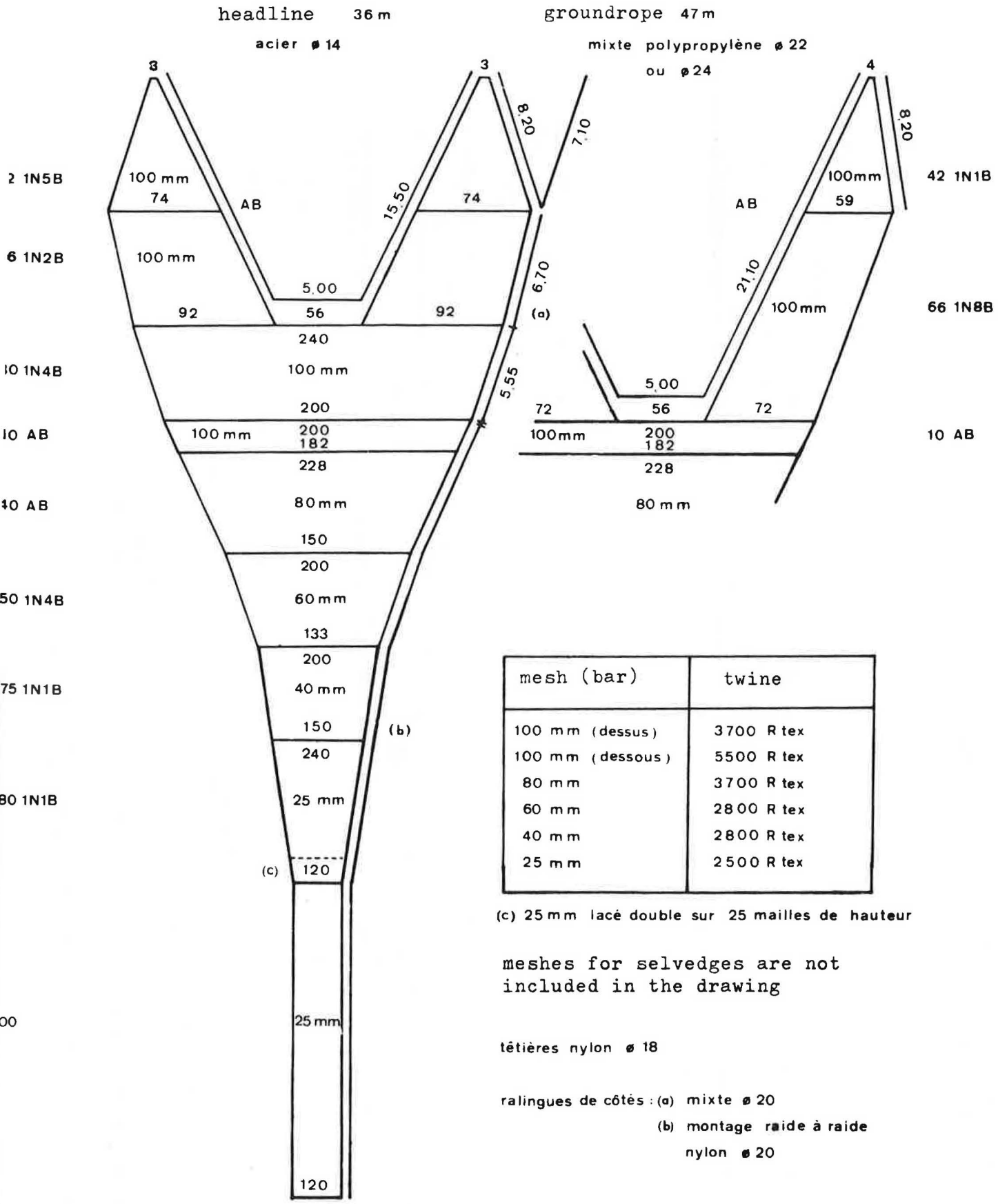
ICES, 1977b. Report of the Working Group on North Sea Herring Larval Surveys. ICES Coop.Res.Rep., No.68.

Ricker, W E. 1973. Linear regressions in fishery research. J.Fish.Res. Bd Can., 30:409-434.

Table 1. YHS abundance indices for the new standard area of 57 squares, and VPA estimates of year class strength.

Year class	YHS abundance index		VPA estimate as I-group
	uncorrected	corrected	
1958	2 279	2 421	7.07×10^9
1959	503	648	1.63
1968	700	822	3.35
1969	2 571	2 647	7.35
1970	1 603	1 629	5.79
1971	781	827	8.82
1972	1 155	1 195	1.75
1973	1 628	1 529	4.39
1974	458	452	0.69
1975	342	342	



mesh (bar)	twine
100 mm (dessus)	3700 R tex
100 mm (dessous)	5500 R tex
80 mm	3700 R tex
60 mm	2800 R tex
40 mm	2800 R tex
25 mm	2500 R tex

(c) 25 mm lacé double sur 25 mailles de hauteur

meshes for selvedges are not included in the drawing

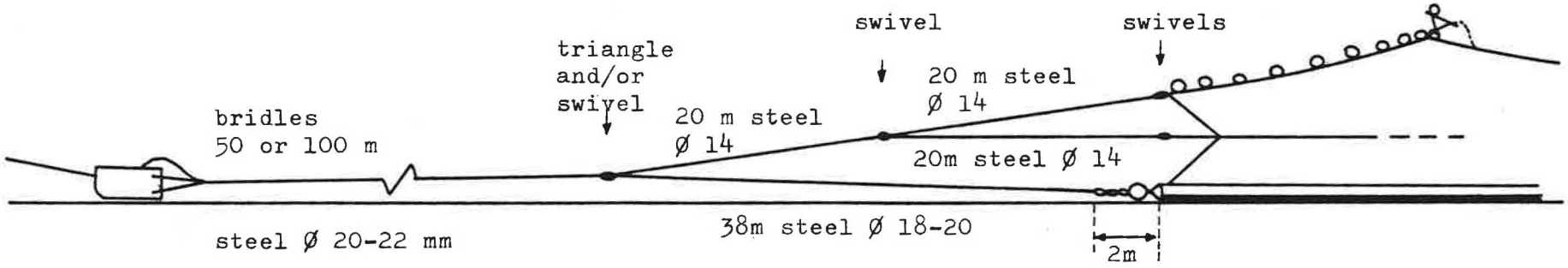
têtières nylon ø 18

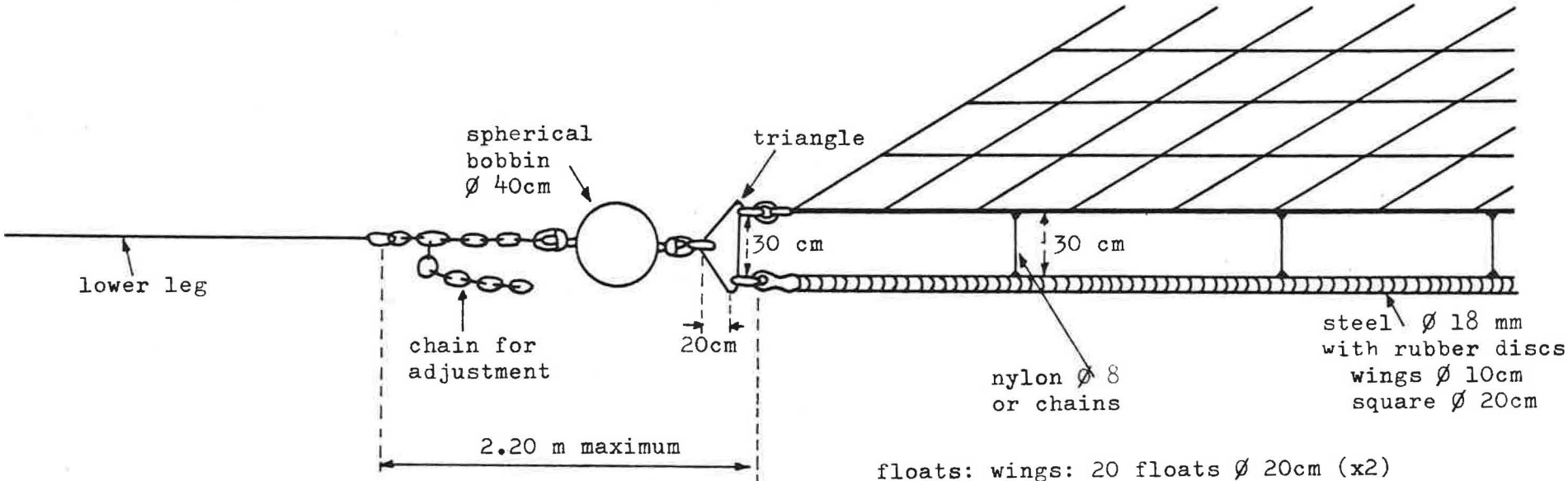
ralingues de côtés : (a) mixte ø 20
(b) montage raide à raide nylon ø 20

Figure 1a. CHALUT 36/47 GOV fond à grande ouverture verticale	1 bateau de 800_1000 cv panneaux de 4,5 m^2 ech 1/300 e Ref :
Institut des Pêches Maritimes	Boulogne /mer

Figure 1b. Rigging of the 36/47 m GOV-trawl

Following specifications provided by the
Institut des Pêches Maritimes, Boulogne-sur-Mer





trawl doors: oval shaped 3.10x1.80 1000/1100 kg
or rectangular 3.00x1.50 "

difference between upper and lower leg:
normally: 0 (upper 40, lower 38+2)
rough grounds: -0.30 (upper 40, lower 38+1.7)
if net fishes too light: +0.20 (upper 40, lower 38+2.2)

floats: wings: 20 floats Ø 20cm (x2)
square: 10 floats Ø20cm

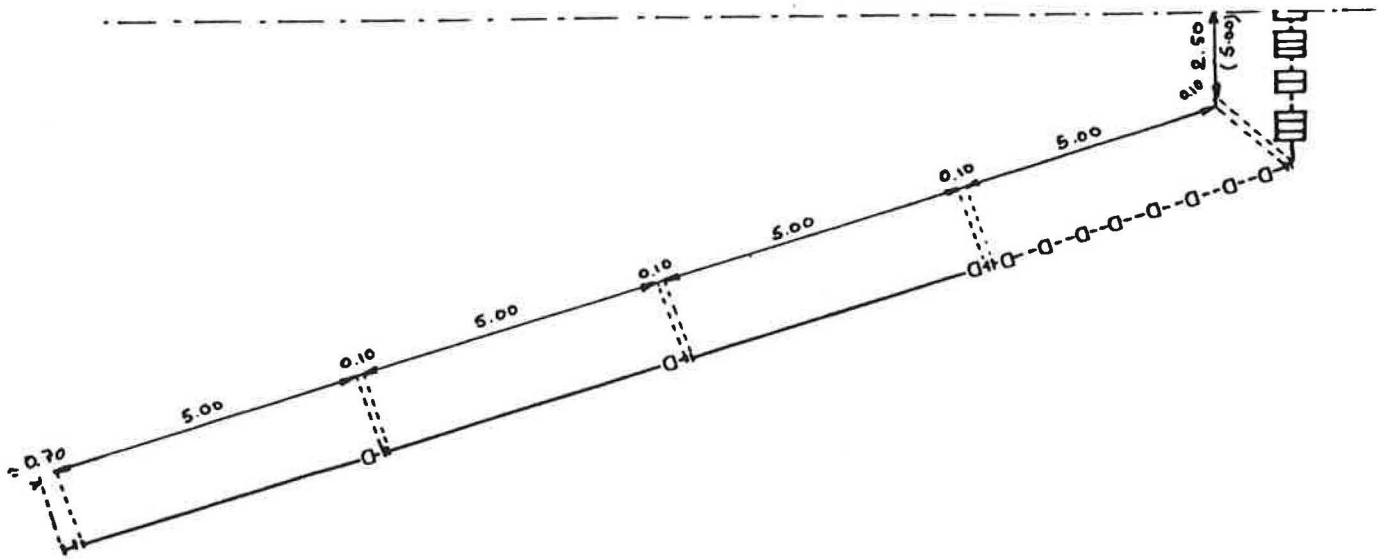
kite : type "Exocet" with 5 floats

weights: square: 70 kg approx.
each wing 35 kg "
wing ends 35 kg "

Figure 1c.

Roller gear for 36/47m GOV-trawl for use on rough grounds

Specifications provided by the Institut des Pêches Maritimes, Boulogne sur Mer



Ø bobbins 30.5cm Ø intersections 18cm	length cm	weight kg	No.of elements	length	weight under water
	49	4.8	square 1 wing 0	49	4.8
	62	6.6	square 2 wing 0	124	13.2
	75	8.4	square 4 wing 0	300	33.6
	56	5.7	square 0 wing 8	448	45.6
	38	4.2	square 0 wing 1x3	500x3	12.6

Total weight ground rope (under water) > 170 kg
(excluding chains, steel wire, manilla)

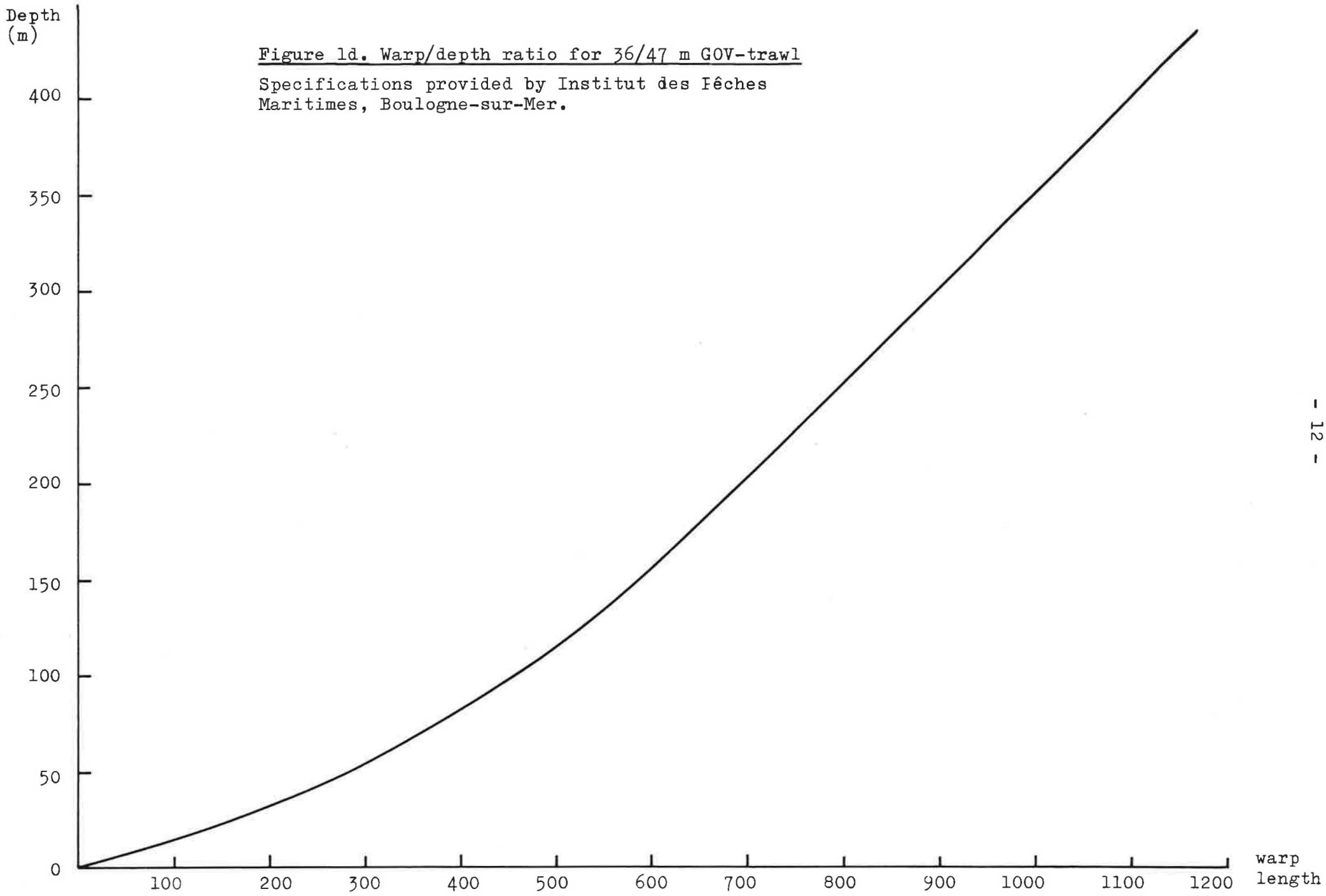


Figure 1d. Warp/depth ratio for 36/47 m GOV-trawl

Specifications provided by Institut des Pêches Maritimes, Boulogne-sur-Mer.

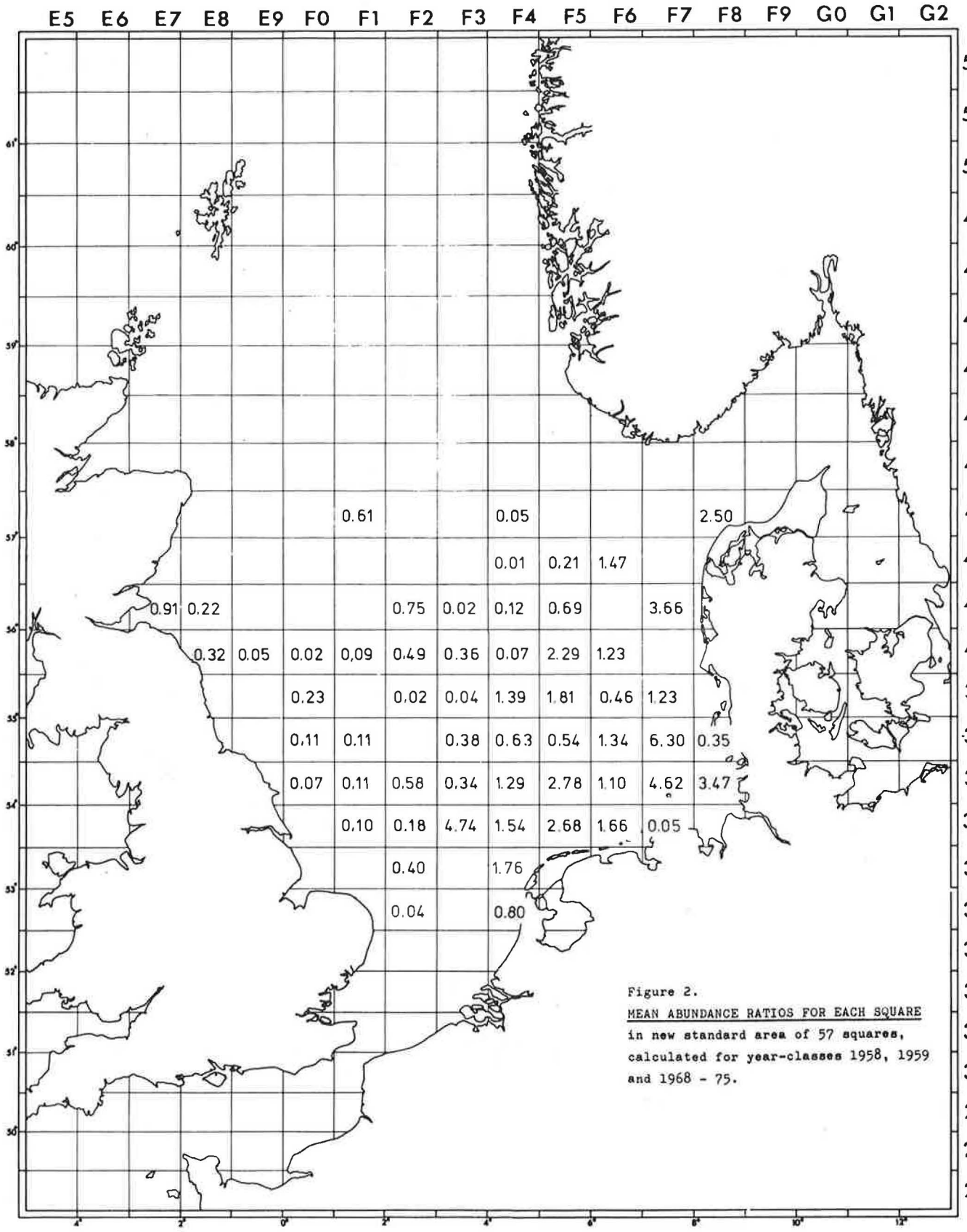


Figure 2.
MEAN ABUNDANCE RATIOS FOR EACH SQUARE
in new standard area of 57 squares, calculated for year-classes 1958, 1959 and 1968 - 75.

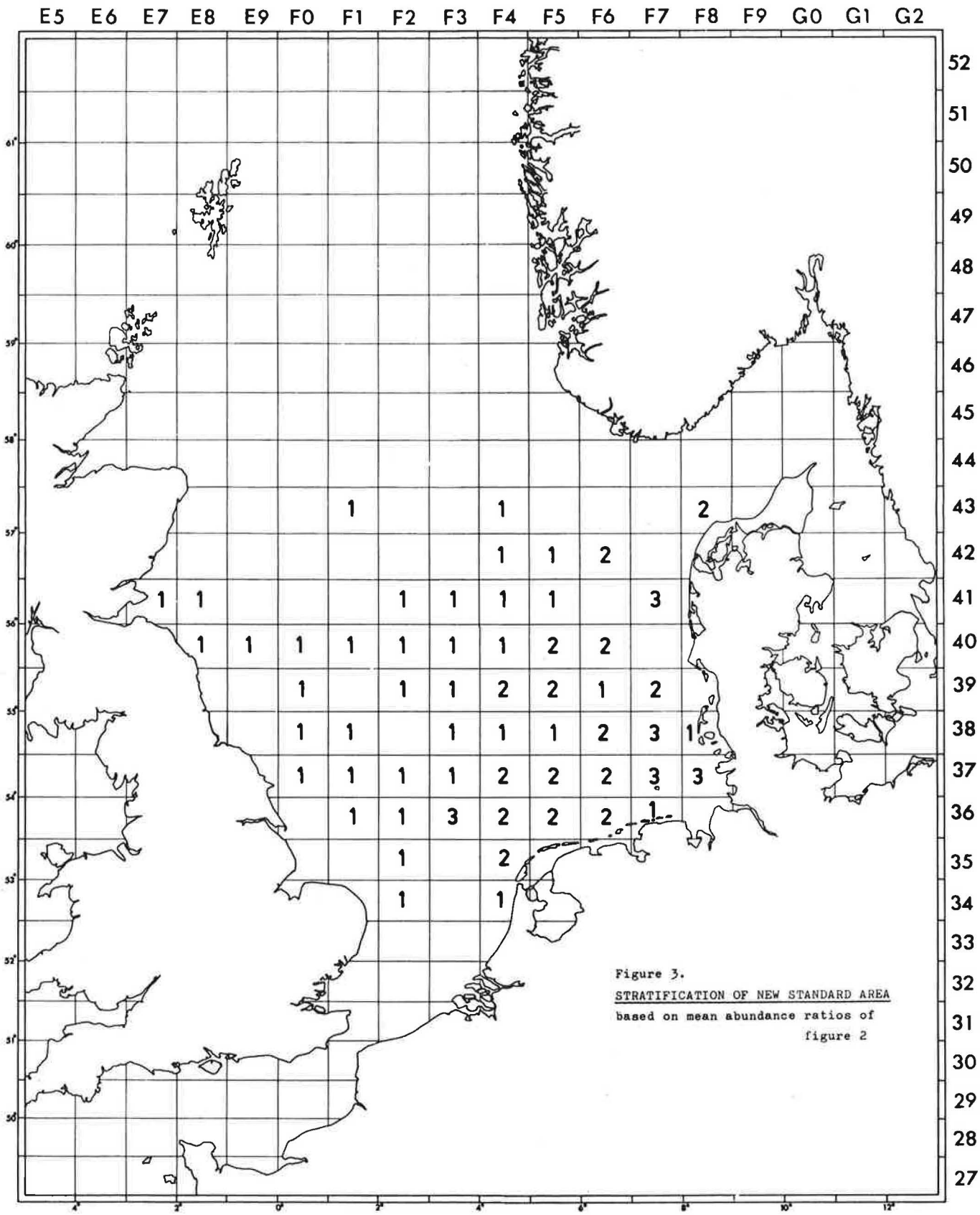


Figure 3.
STRATIFICATION OF NEW STANDARD AREA
based on mean abundance ratios of
figure 2

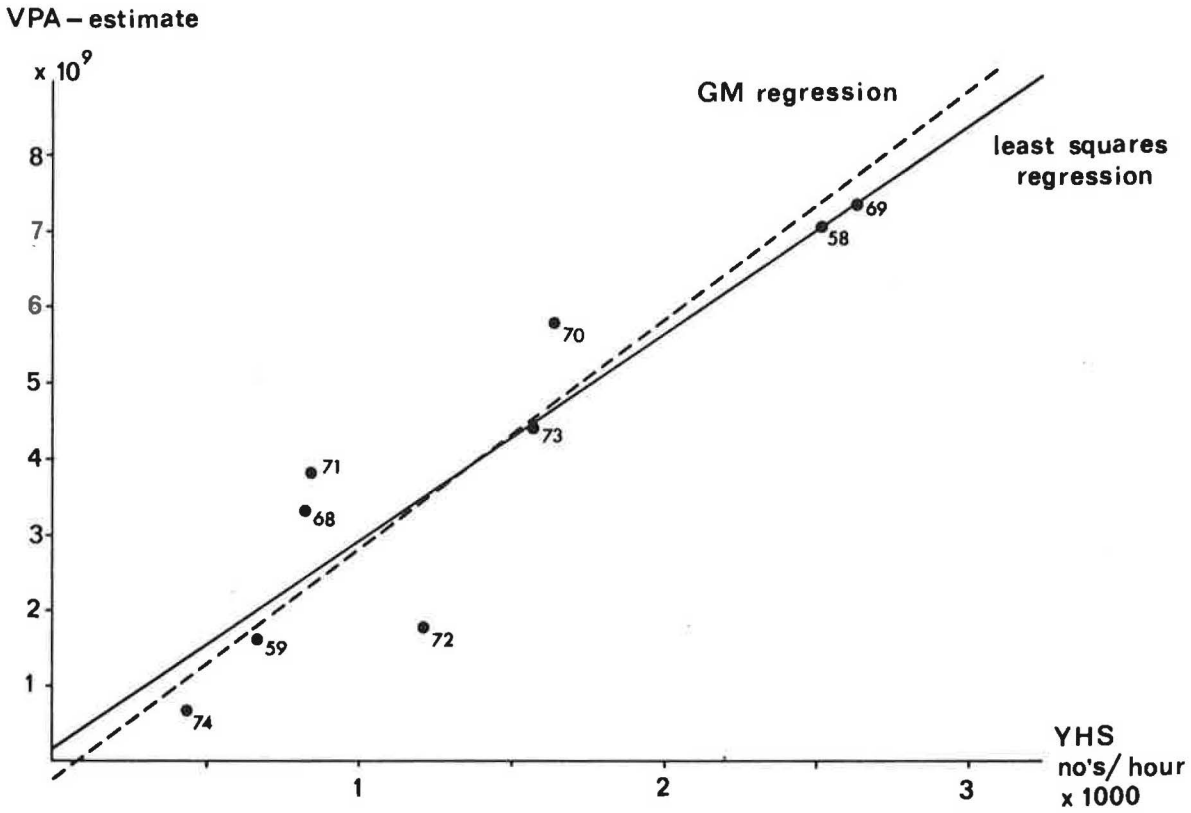


Figure 4. Relationship between YHS-abundance indices and VPA-estimates of year-class strength

Indication of spine colours

Liaison Committee Reports	Red
Reports of Advisory Committee on Marine Pollution	Yellow
Fish Assessment Reports	Grey
Pollution Studies	Green
Others	Black

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