

This report not to be cited without prior reference to the Council *)

INTERNATIONAL COUNCIL FOR THE
EXPLORATION OF THE SEA

C.M. 1977/H: 11
Pelagic Fish (Northern) Committee

REPORT OF THE WORKING GROUP ON NORTH SEA
YOUNG HERRING SURVEYS.

This Report has not yet been approved by the International Council for the Exploration of the Sea; it has therefore at present the status of an internal document and does not represent an advice given on behalf of the Council. The proviso that it shall not be cited without the consent of the Council should be strictly observed.

*) General Secretary, ICES, Charlottenlund Slot, 2920 Charlottenlund, Denmark.

REPORT OF THE WORKING GROUP ON NORTH SEA
YOUNG HERRING SURVEYS.

=====

Contents

1. Introduction and participation.
2. Standardization of fishing gear (joint sessions with I-Group Gadoid Working Group).
3. Other items of common interest for the herring and gadoid survey (joint session with I-Group Gadoid Working Group).
4. Allocation of sampling effort.
5. Calculation of mean abundance indices per year-class.
6. Relationship between YHS-abundance indices and VPA-estimates of year-class strength.
7. Sampling of big herring larvae by Isaacs-Kidd Midwater Trawl.
8. Conclusions and recommendations.
9. References.

This report has not yet been approved by the International Council for the Exploration of the Sea; it has therefore at present the status of an internal document and does not represent an advice given on behalf of the Council. The proviso that it shall not be cited without the consent of the Council should be strictly observed.

*) General Secretary, ICES, Charlottenlund Slot, 2920 Charlottenlund, Denmark.

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 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-Group 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 meeting 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	- the Netherlands.
P.J.G. Carrothers	- Canada.
A. Corten	- the Netherlands (chairman).
H. Dornheim	- Fed. Rep. of Germany.
C.J. Kuitert	- the Netherlands.
A. Maucorps	- France.
K. Popp Madsen	- Denmark.
A. Saville	- Scotland.
R.J. Wood	- England.

2. Standardization of fishing gear.

At previous meetings of the Young Herring WG, the need was expressed by the majority of the participants to achieve a standardization of trawls used during the Young Herring Surveys (ICES 1974, 1975). 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 meters.

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 YHS. 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 YHS. 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 YHS. The GOV-trawl (fig. 1) 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. A detailed construction drawing of the net will be circulated after the meeting, together with the address of some French manufacturers.

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 YHS. 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 will be sent to participating countries as soon as possible after the meeting.

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 ground rope 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 codend, 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 or 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 subsample for length and age determination is taken (stratified or proportional), and in the actual size of the subsample. 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 subsamples should be taken.

In an earlier report of the Young Herring Working Group (ICES 1974) the need was expressed to use an automatic data processing system for the analysis of the results from the YHS. 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.

In one of the previous reports of the Working Group (ICES 1974) the methods were described by which the "standard area" of 53 squares was selected. 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 - 1977 since the last report was written, it was also apparent that some reallocation of the squares within the sampling strata was required. This necessitated, as described in ICES 1974, calculating the ratio between the mean abundance in each square and the overall mean for the whole standard area. This was done for the yearclasses 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 reallocation 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 CM 1974/H:6, 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 year, namely 12 hauls per square in stratum 3, 6 hauls per square in *) 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 recommendation of the Herring Assessment Working Group for the Area South of 62°N 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.

*) stratum 2, and 2 hauls per square in stratum 1.

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 1968-1975. 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 abundances 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 1974 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 YHS-abundance indices and VPA-estimates of year-class strength.

For the prediction of year-class strength from YHS 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 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.

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 1974). Several countries used the new Swedish designed 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 will be 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.

A. Joint sessions with I-Group Gadoid WG.

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 utilize the new GOV-trawl.

The remaining countries should make the change to the new gear at the earliest possible occasion. Detailed specifications of the construction of the net and its rigging will be circulated well before the start of the next survey.

It was decided to change the recommended duration of the hauls from 1 hour to 1/2 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 subsamples, 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 WG 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 herringstock. Even this level does not permit an intensity of sampling which fully satisfies the somewhat conflicting requirements of both the herring and gadoid groups.

B. Young Herring Surveys

The stratification pattern used during the surveys in 1974 - 1977 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 4 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 as 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.

- Corten, A. 1977. - Report on the ICES Young Herring Survey in the North Sea in 1977.
ICES CM 1977/H: 12
- ICES, 1974. - Report of the Working Group on North Sea Young Herring Surveys.
ICES CM 1974/H:6.
- ICES, 1975. - Report of the Working Group on North Sea Young Herring Surveys.
ICES CM 1975/H:9.
- ICES, 1977a. - Report of the Gadoid I-Group Working Group.
ICES CM 1977/F:19.
- 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. Board 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	<u>YHS abundance index</u>		VPA-estimate as I-group
	uncorrected	corrected	
1958	2279	2421	7.07 x 10 ⁹
1959	503	648	1.63
1968	700	822	3.35
1969	2571	2647	7.35
1970	1603	1629	5.79
1971	781	827	8.82
1972	1155	1195	1.75
1973	1628	1529	4.39
1974	458	452	0.69
1975	342	342	

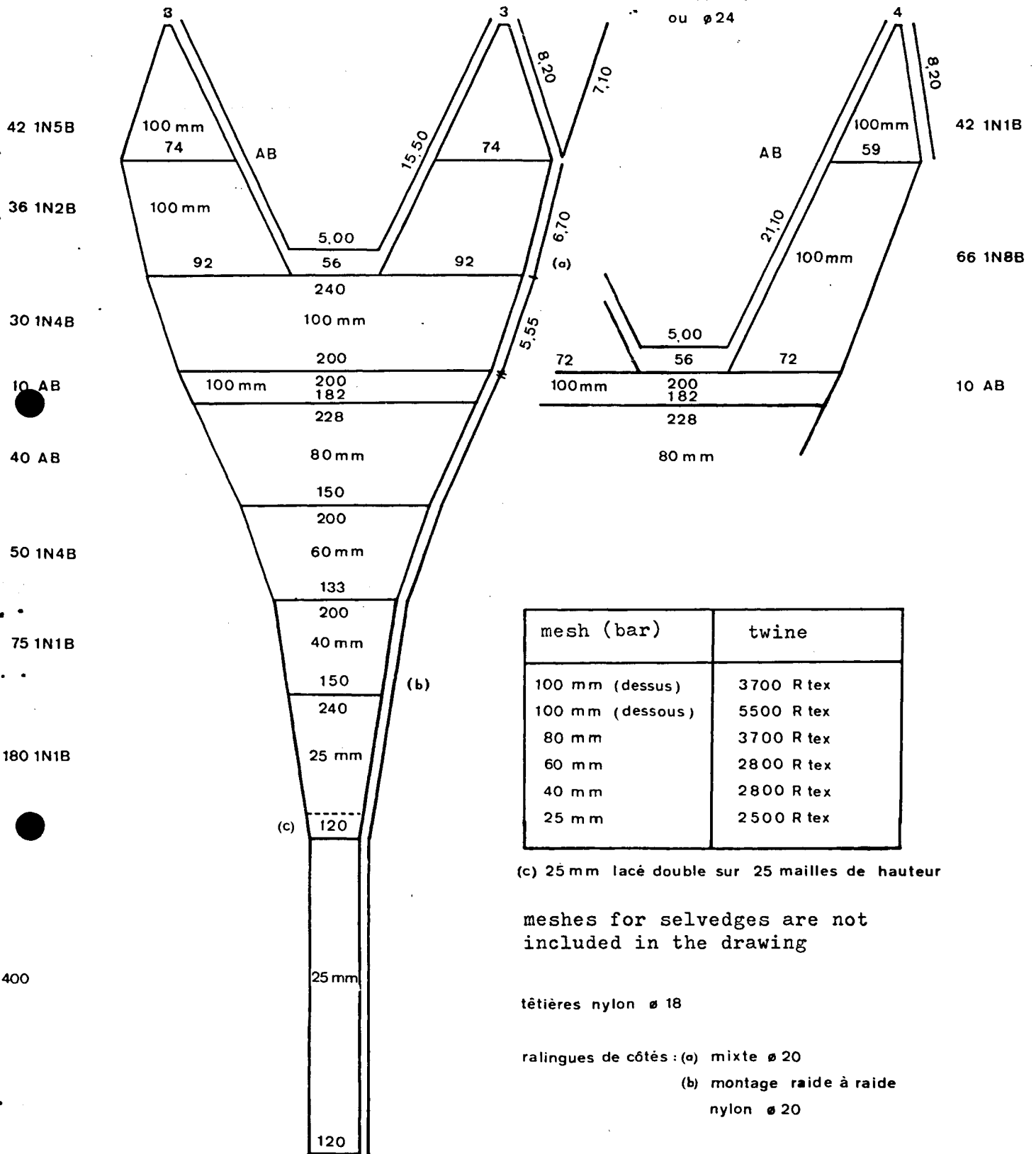
headline 36 m

groundrope 47 m

acier ø 14

mixte polypropylène ø 22

ou ø 24



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 selvages 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 1 CHALUT 36/47 GOV

fond à grande ouverture verticale

1 bateau de 800_1000 cv
panneaux de 4,5 m²

ech 1/300 e

Ref:

Institut des Pêches Maritimes

Boulogne /mer

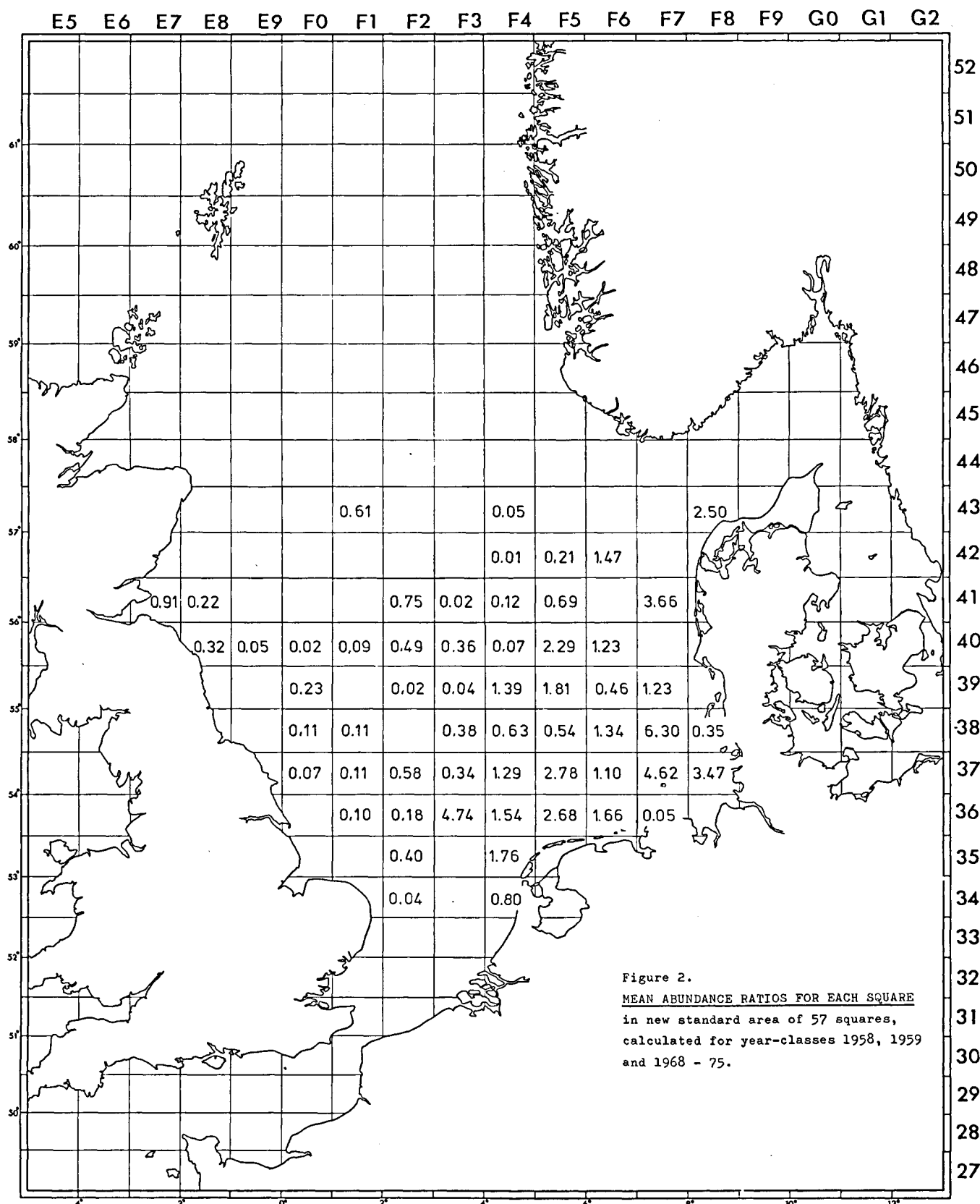


Figure 2.
MEAN ABUNDANCE RATIOS FOR EACH SQUARE
 in new standard area of 57 squares,
 calculated for year-classes 1958, 1959
 and 1968 - 75.

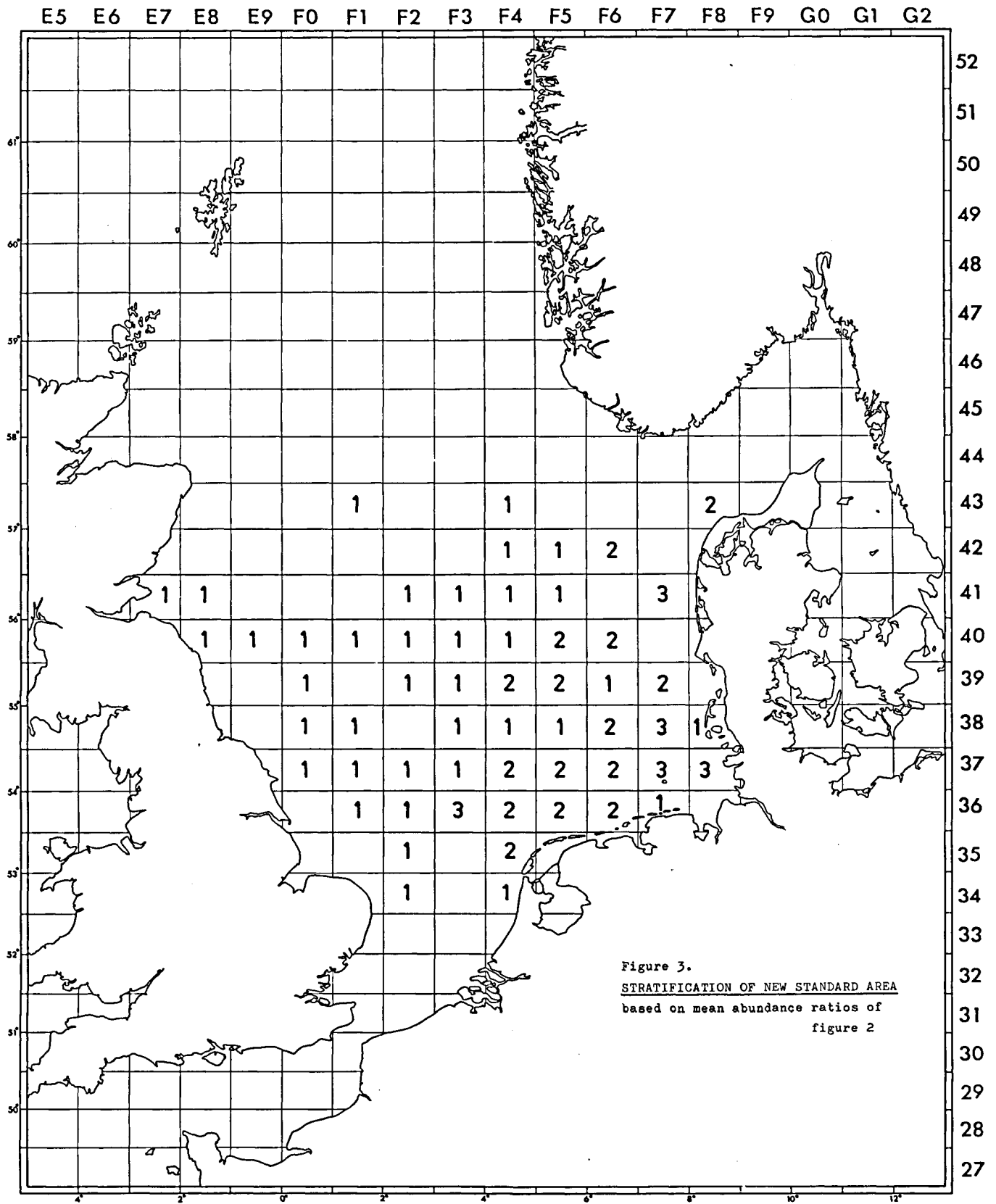


Figure 3.
STRATIFICATION OF NEW STANDARD AREA
 based on mean abundance ratios of
 figure 2

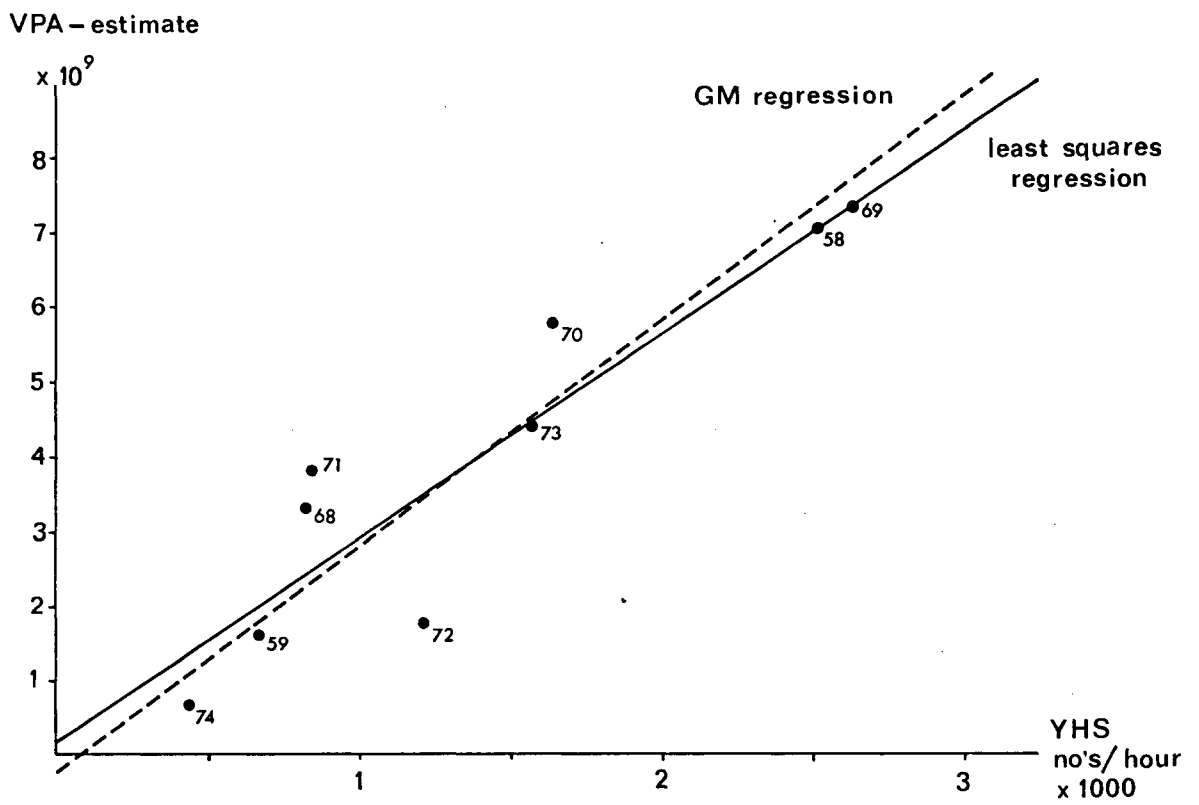


Figure 4. Relationship between YHS-abundance indices and VPA-estimates of year-class strength