INTERNATIONAL COUNCIL FOR THE
EXPLORATION OF THE SEA.

C.M. 1979 / H: 25
Pelagic Fish Committee

REPORT ON THE ICES YOUNG FISH SURVEY 1979: HERRING DATA.

by

A. Corten,
Netherlands Institute for Fishery Investigations,
P.O. Box 68, 1970 AB IJMUIDEN,
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Introduction

This paper is one in a series of yearly reports on the results of the ICES Young Fish Surveys (formerly called Young Herring Surveys). These surveys, which are conducted each year during the month of February are designed to obtain recruitment estimates for a number of fish species. The area covered by the survey includes the North Sea, Skagerak and Kattegat.

The surveys were first made in 1960 and 1961. After a break of 3 years they were resumed in 1965, and from the onward they have been continued without interruption. At present, 8 countries participate in this programme. Results from the surveys have been reported annually to the ICES Statutory Meeting. In addition to these annual reports, the ICES Working Group on North Sea Young Herring Surveys has produced several meeting documents in which the survey methods and results have been described and evaluated (most recent report: ICES 1978).

The abundance of I-group herring and gadoids is estimated by means of a bottom trawl which is fished at random positions within a statistical rectangle. Most countries participating in the survey have now adopted the standard GOV-bottom trawl (ICES 1978). Much of the sampling effort is concentrated in the southeastern part of the North Sea, in an area designated as the "herring standard area" (fig. 1).

The squares within this standard area are grouped into 3 different strata; sampling intensity in each stratum is proportional to the mean density of juvenile herring in that stratum during previous years.

In recent years, the surveys have also been used to estimate the abundance of 0-group herring (large herring larvae) which are sampled by means of an Isaacs-Kidd Midwater Trawl (IKMT). This gear is only fished at night, according to a standard procedure described in ICES 1977.

This paper presents the data on 0, 1 and 2 year-old herring obtained from the survey. Data on gadoids and hydrography, collected during the survey, are presented to the Statutory Meeting in seperate documents.

Participation in the 1979 survey.

Country	Ship	Period	Project supervisor
Denmark	J.C. Svabo	06/02 - 02/03	K. Popp Madsen
France	Thalassa	07/02 - 02/03	A. Maucorps
Fed.Rep.of German	Solea	01/03 - 22/03	G. Wagner
Norway	Johan Hjort	29/01 - 01/03	O. Østvedt
The Netherlands	Tridens	05/02 - 09/03	A. Corten
Sweden	Argos	05/03 - 22/03	O. Hagström
United Kingdom	Cirolana	01/02 - 28/02	W.G. Parnell
" "	Explorer	13/02 - 07/03.	A. Saville
" "	Clupea	22/01 - 09/02	A. Saville
U.S.S.R.	Korifena	01/02 - 01/03	S. Fiodorov

Results from the 1979 survey

General

Many ships were handicapped by adverse weather conditions during the month of February. Extremely low water temperatures, particularly in the southeastern North Sea, together with strong gales caused ice-formation on board some of the research vessels; which then had to go into port. The inshore area in the south-eastern North Sea could not be sampled because of drift ice. The same applied to the Skagerak and Kattegat which were covered largely with ice. Sweden had to postpone the survey by RV "Argos" until the month of March when fishing in these areas became possible again. It is possible that the abnormally low water temperatures will have affected fish distribution during the month of February. Herring catches were extremely low in the areas of low watertemperature (< 2°C).

During the weekend of 17-18 February, five of the participating research vessels met in Esbjerg to compare fishing gear and discuss survey methods.

Distribution and abundance of 0-group herring (year-class 1978)

Results of the sampling with Isaacs-Kidd Midwater Trawls are summarized in figure 2. Also in 1979, there were still some major gaps in the coverage of the North Sea. This was mainly caused by one country loosing its entire gear after the 3rd haul. As only about half the number of participating vessels are using IKMT's now, it is not possible to obtain a double coverage of the entire sampling area (such as we have for the bottom trawl), and gaps in the coverage are bound to arise as soon as any of the IKMT-carrying vessels has problems to complete its programme. It is therefore very important that the use of IKMT's is introduced on board all participating vessels.

The distribution of 0-group herring was rather similar to the one in 1978. The highest numbers of larvae were found north of 57°N, except for some local patches close to the English coast south of 57°N. Relatively high catches were reported from the Moray Firth and from the Orkney-area. For the first time since 1973 fairly high numbers were also caught in Skagerak and Kattegat. The southeastern part of the North Sea contained hardly any larvae at all.

Because of the gaps in coverage of the North Sea in 1978 and 1979, it is not possible to make an exact comparison between the abundance of 0-group herring in both years. The results from the survey indicate, however, that the abundance of 0-group herring was probably considerably higher in 1979 than in 1978. The text table below summarizes the results of the last 3 years.

year	number of squares fished with IKMT in North Sea	mean number of 0-group herring per square for North Sea	mean number of 0-group herring per square for Skagerak and Kattegat
1977	68	5.8	0.2
1978	106	3.9	0.9
1979	90	10.5	7.9

Distribution and abundance of 1-ringed herring (year-class 1977).

Figure 3 shows mean numbers/hour/square of 1-ringed herring, and figure 4 the corresponding mean lengths.
Contrary to the method of presentation in former years, no distinction has been made between spring and autumn spawners; all 1-ringed herring have been lumped together. The reason for this new procedure was that considerable confusion in differences in classification existed for juvenile herring in certain areas.

For the Skagerak and Kattegat area, Sweden has not been able to differentiate between 1-ringed spring and autumn spawners in recent years. While this area had been causing problems in this respect for some years already, the situtation in the North Sea had so far always been fairly straightforward, with the great majority of the juvenile herring being classified as autumn spawners, and only an occasional herring (never more than a few percent) as coastal spring spawners. In 1979 however, one country (Scotland) reported up to 20% spring spawners in catches from the southeastern North Sea, a percentage which had never occurred in that area in the past. Other countries classified fish with similar otolith types as autumn spawners (or rather Eastern Channel winter spawners). Unless these problems in identifying spring and autumn spawning juveniles can be solved, it is not possible to combine data from different sources into one overall chart giving mean numbers of autumn spawners per hour.

It can be seen from figure 3 that catches of juvenile herring were extremely low in the eastern part of the North Sea, the area which normally contains the largest concentrations of juveniles, and which therefore is sampled most thoroughly. Very low catches of juvenile herring were also reported from the Skagerak and Kattegat, an area where very large numbers of juveniles were taken during the previous survey in 1978.

In the western part of the North Sea, catches were slightly higher than normal. Especially RV "Solea" took considerable numbers of juveniles off the Moray Firth, and also between 55°30'N and 57°00' N. The "Solea" didnot work in this area until March, a time when most of the other vessels had already terminated their programme. The findings of the "Solea" were confirmed by RV "Korifena", which worked the whole of the western North Sea during March, and which found concentrations of juvenile herring in the same areas as the "Solea" did.

The mean density of 1-ringed herring for the herring standard area was 139 fish/hour. This is the mean value of all rectangle means, and it includes a correction for rectangle 38F8, which was missed in this year's survey. This is by far the lowest abundance index found during any of the recent surveys (see table I).

It should be noted that even this extremely low abundance figure in 1979 contains a positive bias because of the inclusion of a certain percentage spring spawners. As mentioned above, spring spawners have always been excluded in calculating the mean density during previous years.

The 90% confidence limits for the mean were calculated according to the procedure used in previous reports (ICES 1975). For this purpose, the hauls are grouped by strata, and the stratified mean and variance for the whole standard area are calculated. The results of this calculation are summarized below.

stratum	I	II	III
number of rectangles	37	15	5
number of hauls	81	84	24
stratum mean	136	91	301
stratum variance	335 356	46 942	397 336
stratified mean whole standard area		139	
variance stratified mean		1910	
standard error		44	
90% confidence limits		139 ± 72	

Because of the abnormal distribution of the juvenile herring in 1979, the application of stratified sampling was of little use; the mean density in stratum II was even lower than the one in stratum I.

In order to estimate the strength of the year class in absolute numbers on the basis of the abundance index from the Young Fish Surveys, the following regression formula has been used in recent years (ICES 1978):

$$y = 0.0031\,x - 0.21$$

where y is the absolute size of the year class in numbers x 10^9, and x is the mean catch of I-group herring per hour for the herring standard area.

During the latest meeting of the Herring Assessment Working Group for the area south of 62° N, it was decided that a regression line through the origin would be more appropriate when dealing with extremely low year class sizes (ICES 1979). This Working Group therefore used the formula

$$y = 0.0031\,x$$

to calculate the strength of year-class 1977 on the basis of preliminary results from the Young Fish Survey in 1979.

The preliminary abundance index for year-class 1977, used by the Herring Assessment Working Group was 144 fish/hour. This corresponded to an absolute year-class size of 0.45 x 10^9. Substituting the final figure of 139 fish/hour, given in this report, the absolute size of the year-class is estimated at 0.43 x 10^9. The preliminary figure used by the Working Group thus appears to have been a very good approximation of the final outcome of the survey.

It was mentioned earlier that the exceptionally low water temperatures during February may have affected the distribution of juvenile herring, and thereby the abundance estimate derived from the Young Fish Survey. The relatively high catches in the northwestern North Sea would suggest a shift of the distribution area towards deeper and less cold water. If this were true, the juvenile herring in 1979 would not have been sampled as effectively as in normal years. At the present moment, however, there is no way to verify this hypothesis, and for the time being the figure of 0.43 x 109 I-ringers should be accepted as the best estimate of year class 1977.

Distribution and abundance of 2-ringed herring.

Mean numbers per square of 2-ringed herring and their mean lengths are shown in figure 5-6. Also this age group was extremely scarce in the southeastern North Sea. Slightly higher catches were obtained in the western half of the North Sea, particularly north of 58°N. Reasonable numbers were also taken in the Kattegat; an area where this year-class had been very abundant in 1978 as 1-ringers.

References.

Corten, A., 1978 — Report on the ICES Young Herring Survey in the North Sea in 1978. ICES CM 1978/H:6.

ICES 1975 — Report of the Working Group on North Sea Young Herring Surveys.

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

ICES 1978 — Report of the Working Group on North Sea Young Herring Surveys, 1977. ICES Coop. Res. Rep. No. 81.

ICES 1979 — Report of the Herring Assessment Working Group for the area south of 62°N. ICES CM 1979/H:6.

Table I - Mean abundance indices of 1-ringed herring for the herring standard area of 57 squares.

survey year	year class	No/hour
1970	1968	822
1971	1969	2647
1972	1970	1629
1973	1971	827
1974	1972	1195
1975	1973	1529
1976	1974	452
1977	1975	342
1978	1976	575
1979	1977	139

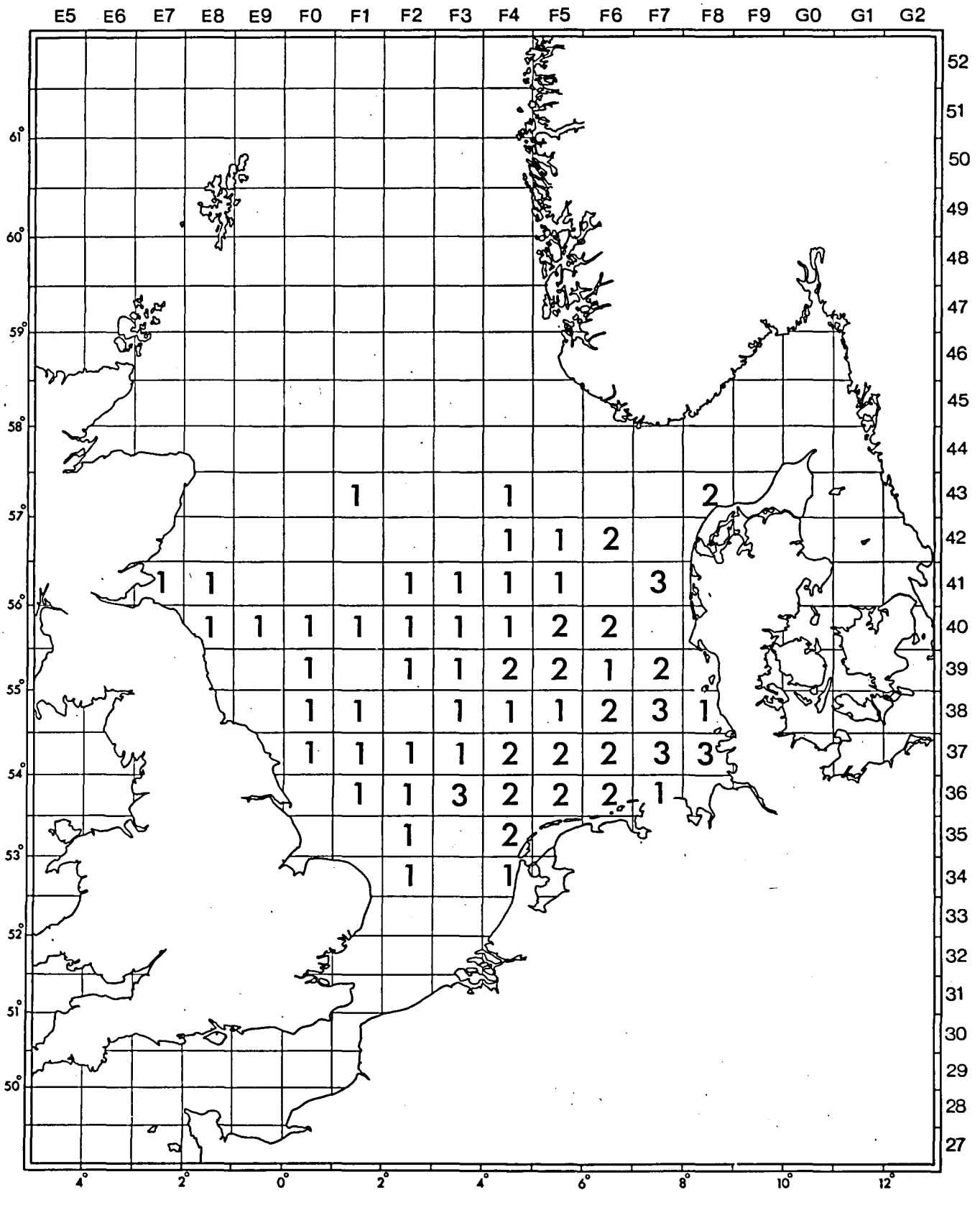
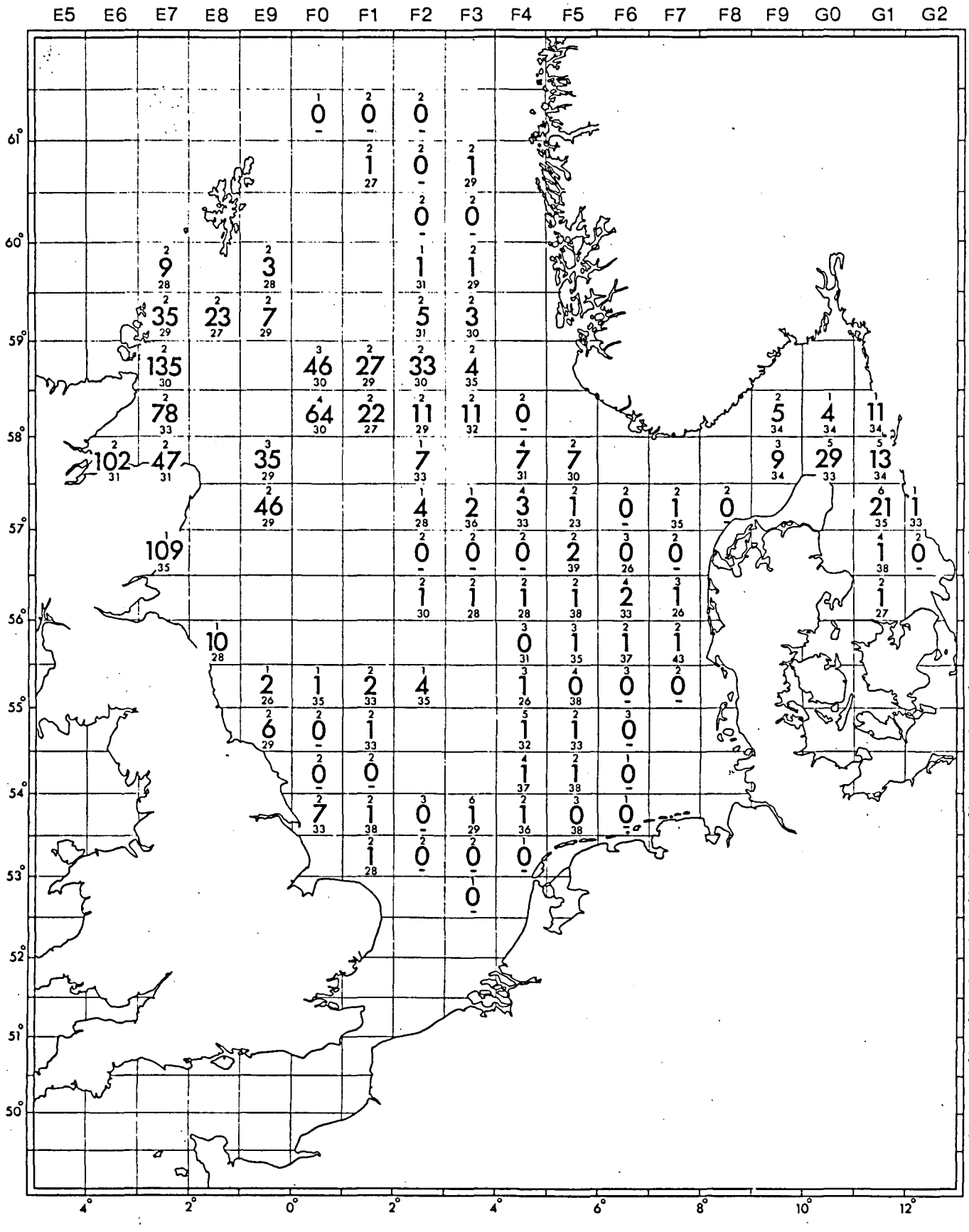


fig. 1. Herring standard area of 57 rectangles, and allocation of rectangles to different strata.



9.

fig. 2. Results of IKMT sampling in February 1979.
Middle figures in heavy print represent mean catches of O-group herring (year class 1978 autumn spawners).
Top figure : number of tows.
Bottom figure : mean length of larvae.

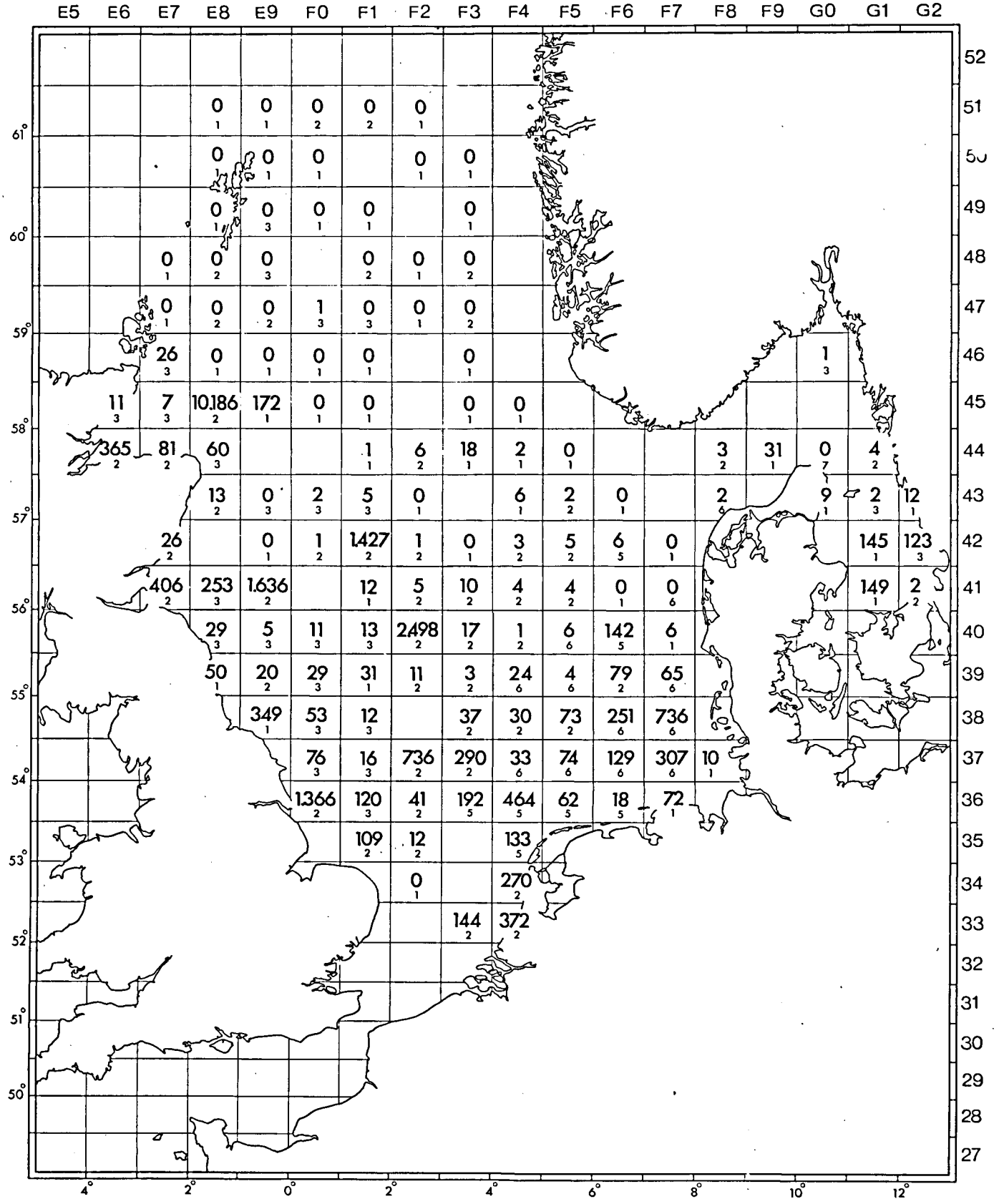


fig. 3. Mean numbers/square of 1-ringed herring (mainly year class 1977 autumn spawners) in February 1979.
Bottom figure :. number of hauls.

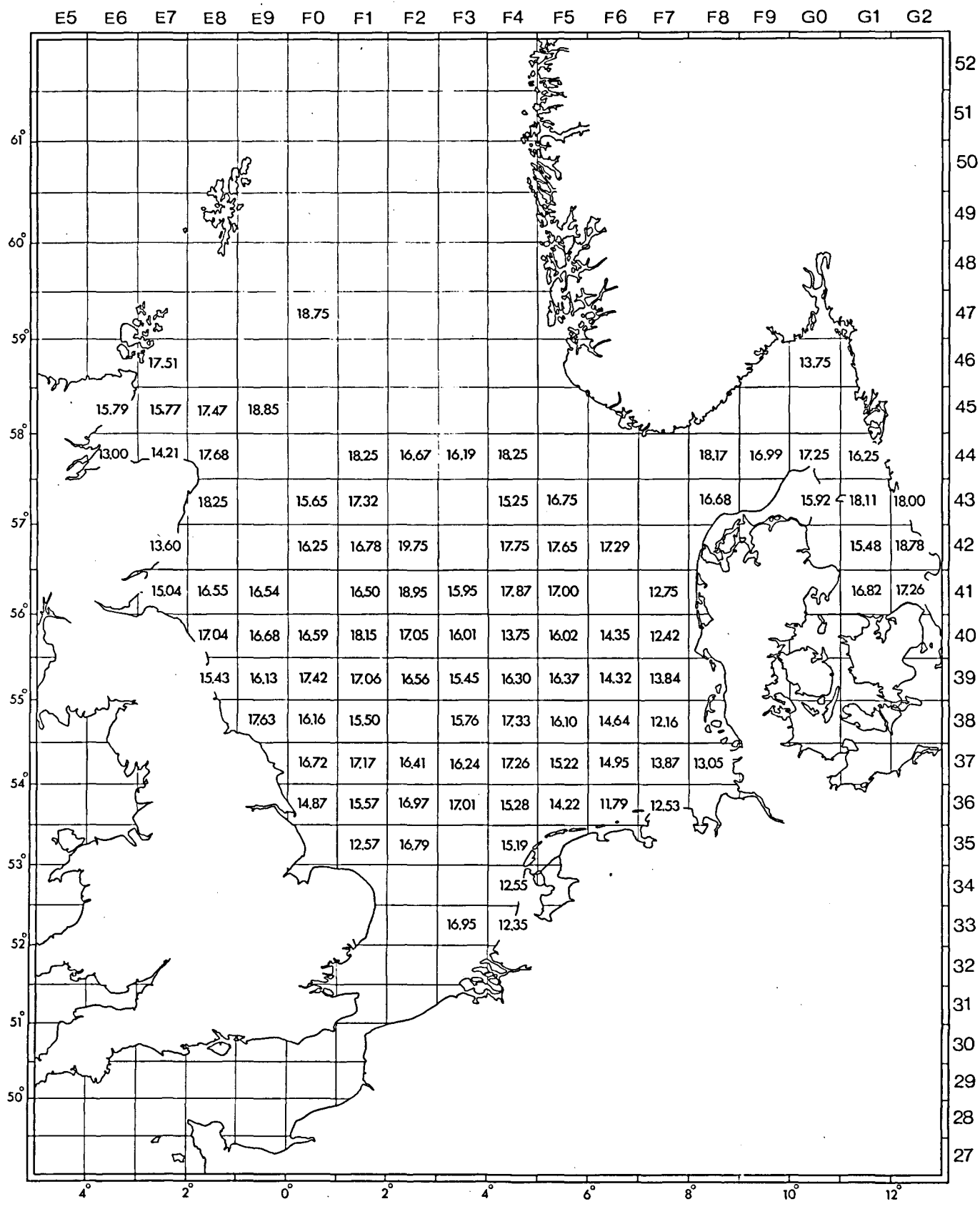


fig. 4. Mean length/square of 1-ringed herring (mainly year class 1977 autumn spawners) in February 1979.

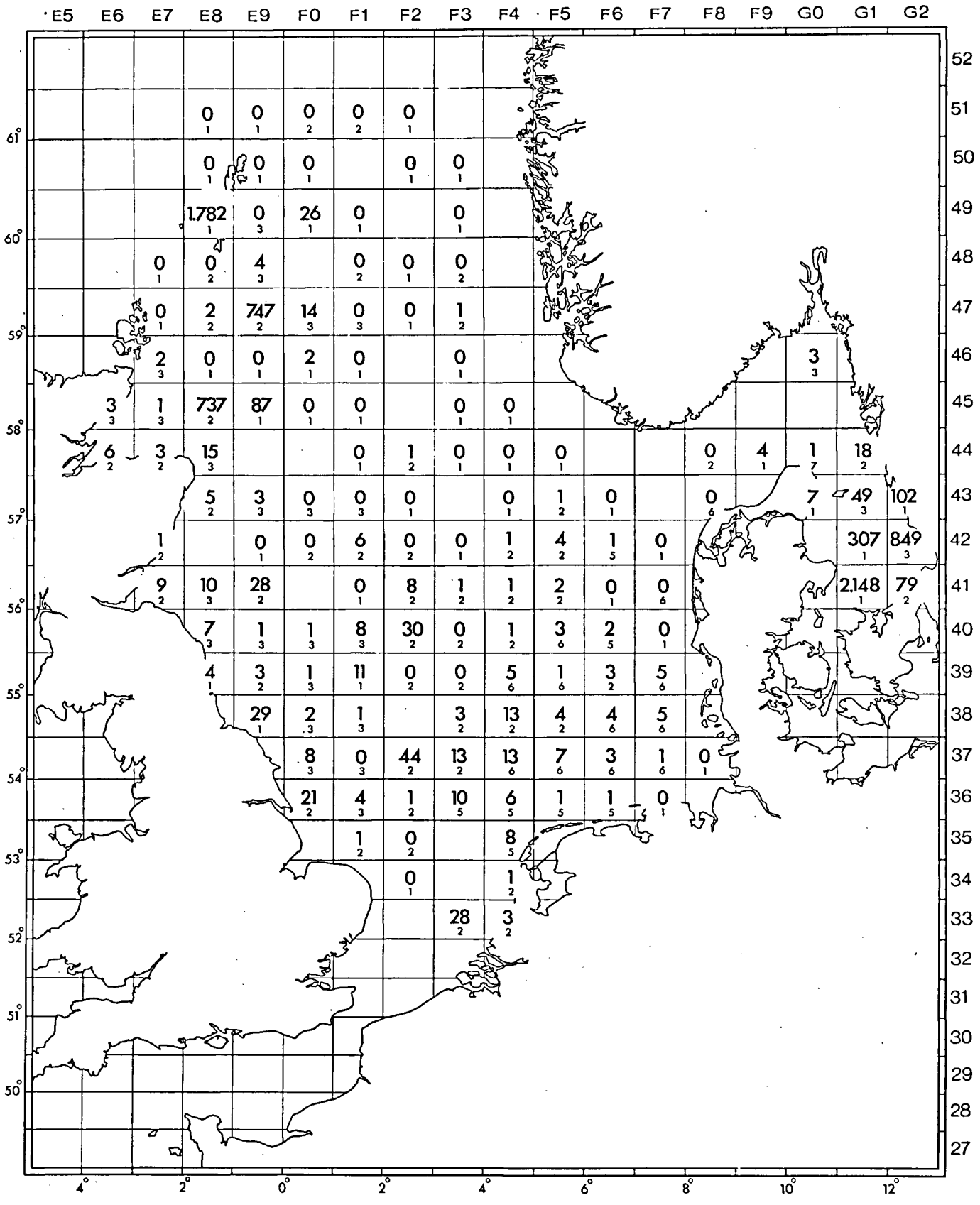


fig. 5. Mean numbers/square of 2-ringed herring (mainly year class 1976 autumn spawners) in February 1979. Bottom figure : number of hauls.

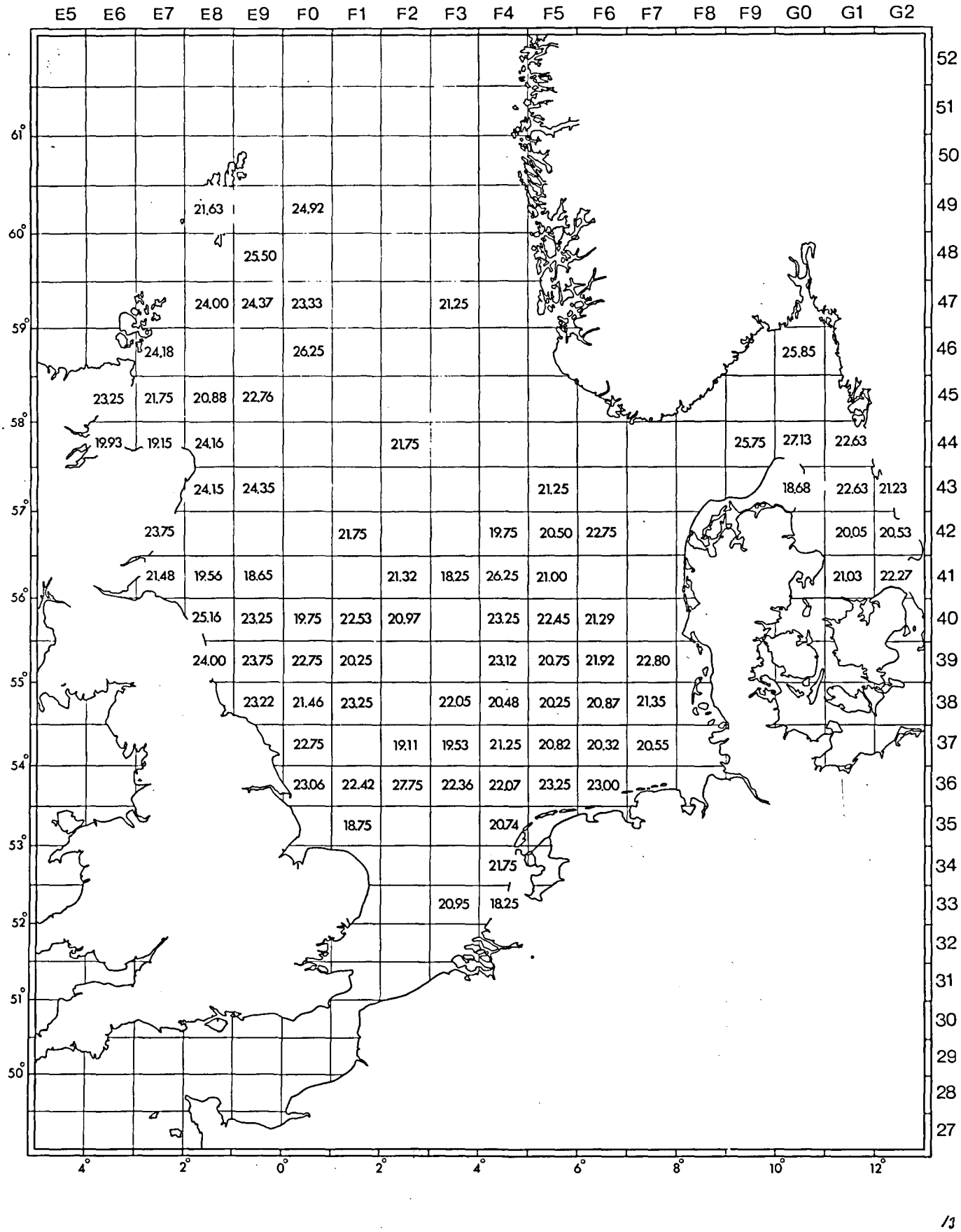


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fig. 6. Mean length/square of 2-ringed herring (mainly year class 1976 and spawners) in February 1979.