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REPORT OF THE INTERNATIONAL BOTTOM TRAWL SURVEY WORKING GROUP

Copenhagen, 12-14 January 1994

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TABLE OF CONTENTS

1 TERMS OF REFERENCE AND PARTICIPATION

At the 1993 ICES Statutory Meeting the Council decided (C. Res. 1993/2:34), that the International Bottom Trawl Survey Working Group should meet at ICES Headquarters from 12 to 14 January 1994 to:

a) evaluate the quarterly bottom trawl surveys in Subarea IV and Division IIIa;

b) propose any improvements in the collection of biological and environmental data;

c) propose any improvements in the survey manual;

d) propose any improvements in data exchange and the data base;

e) coordinate future surveys.

The meeting was attended by the following:

Asgeir Aglen	Norway
Trevor Boon	UK (England)
Henrik Degel	Denmark
Siegfried Ehrich	Germany
Olle Hagström	Sweden
Henk Heessen (Chairman)	Netherlands
Andrew Newton	UK (Scotland)
Arnauld Souplet	France

Henrik Sparholt and Roger Bailey from the ICES Secretariat also attended the meeting.

2 INTRODUCTION

The International Bottom Trawl Survey Working Group co-ordinates surveys carried out in the North Sea, the Skagerrak, and the Kattegat. Up till and including 1990 an internationally co-ordinated survey was only carried out in February (the International Young Fish Survey, IYFS). In 1990 it was decided to carry out quarterly co-ordinated surveys covering the whole North Sea, the Skagerrak, and the Kattegat, which would run for a period of 5 years (1991-1995).

During the meeting of this Working Group in 1992 a first evaluation of the quarterly surveys took place. Since then 8 surveys have been carried out and a first evaluation is presented in this report. The Group further discussed the continuation of the quarterly surveys and their co-ordination.

Apart from a number of Assessment Working Groups the IBTS data provide valuable information for a wide variety of users, and the ICES Secretariat receives several requests for data at different levels of aggregation from within, and outside ICES. The Working Group discussed the availability of the data for other users than the institutes participating in the surveys (Section 7.6), and decided to express its concern about the distribution of raw survey data in a letter to the General Secretary of ICES.

3 EVALUATION OF THE QUARTERLY SURVEYS

The original plan for the quarterly IBTS was to carry out these surveys for a period of 5 years and thereafter to evaluate the usefulness of the results. This evaluation should form the basis for the decision whether or not to continue the quarterly surveys.

Relevant for an evaluation are the survey coverage and the sampling levels of otoliths of the target species. Ideally an evaluation should also cover spatial distribution of the target species, changes in abundance throughout the year and the correlation of recruitment indices with VPA. For most of the surveys, except for the first quarter survey, only preliminary abundance estimates are available. Also, for the comparison of recruitment estimates with VPA the time series is far too short. A full evaluation of the quarterly IBTS is, therefore, not yet possible.

3.1 Coverage of the Survey Area

The maps 3.1-3.3 give the number of valid hauls per rectangle for all quarterly surveys in the years 1991-1993. Table 3.1 gives the number of hauls by country and quarter and the number of days spent at sea.

The overall coverage, both in the North Sea and in the Skagerrak and Kattegat, has been remarkably good. In 1991 the total number of hauls was higher than in 1992 and 1993 due to additional sampling for the ICES Stomach Sampling Project. In the fourth quarter of 1991 the weather conditions were rather bad, and some gaps appeared in the coverage. In all quarters of 1993 there has been additional sampling in the south eastern North Sea for an additional Dutch research project. In the second quarter of 1993 the German vessel had serious engine problems, which reduced the overall sampling intensity.

In most cases two hauls were made per rectangle during each quarter. There has certainly been no gross oversampling.

3.2 Otolith Sampling Levels

Sampling levels of otoliths of the seven target species are shown for each of the quarterly surveys in Tables 3.2-4. No apparent gaps in otolith collection are obvious from these tables. In 1992 and 1993 also some otoliths

were collected for a restricted number of by-catch species (Table 3.5 and 3.6) for which relatively little information is available from literature.

3.3 Comparison of quarterly indices

Indices for 1- and 2- group fish from the first quarter surveys are compared to preliminary indices (length based age split) for 1- group from the other quarters in Figure 3.4. All indices shown are based on the species specific standard areas. The preliminary indices for older age groups were only available for plus groups and were therefore not comparable to the first quarter indices.

A fairly consistent ratio between the year classes seems to exist in all quarters from quarter 1 as 1- group to quarter 1 as 2- group for haddock and partly for whiting, although the level of the index seems to vary in the course of the year. For cod, the level seems stable in quarter 2, 3 and 4, while the first quarter gives a lower index for year classes 90 and 91. This is probably caused by the more coastal distribution during the first quarter, partly outside the standard area. Norway pout shows considerable variations both in level and ratio between year classes through the year. The smallest between year-class variation seems to occur in quarters 1 and 3. Mackerel shows extreme variations between quarters. For this species quarter 3 seems to be the most promising one. The variations are presumably caused both by immigration of mackerel into the North Sea during quarter 2 and 3, and by changes in vertical distribution. During summer mackerel tends to stay close to the surface, thus being available to bottom trawls only in the most shallow areas. The distribution maps, as shown in Figure 3.5, indicate the migration patterns.

4 FURTHER STANDARDIZATION OF THE GOV-TRAWL

Extensive information on the construction and rigging of the GOV 36/47 trawl is contained in the report by the FTFB Subgroup (CM 1992/B:39) and some of this information has been included in the last revision (Revision IV) of the Manual for the International Bottom Trawl Surveys (Addendum to CM 1992/H:3). This has helped in further standardization of the GOV 36/47 trawl as used during the IBTS and participants are recommended to move towards this specification as soon as is practicable. During the survey frequent reference should be made to trawl parameters such as headline height, door spread and wing spread as indicators of deviation from the gear specifications.

The indicated method for providing the necessary additional weight on the groundrope is to use a chain wrapping. It was, however, agreed that alternative methods are acceptable. Two of the methods presently in use include replacing some rubber disks in the groundrope with steel disks, and attaching chain closely behind the groundrope. It is stressed that where chain is used as the additional weight, it must not be allowed to become so loose that the weight is no longer on the groundrope and it is behaving as a tickler chain instead.

Germany has offered to obtain data during 1994 to help evaluate the difference in catch rates between the GOV rigged with short sweeps (50 m + 10 m backstrop) and the GOV rigged with long sweeps (100 m + 10 m backstrop). This will help to decide whether to remove the need to use 100 m sweeps in depths over 70 m during quarter 1 surveys.

Further experiments have been made with a method for constraining the spread of the trawl doors (ICES C.M. 1993/B:18). This method was successful in providing a more standard configuration of the GOV while fishing, but this implies a standardization in fishing power. Because of the potential effects this method may have on the IBTS indices for quarter 1 it was decided not to adopt the constrain method for the International Bottom Trawl Survey.

5 IMPROVEMENTS IN DATA COLLECTION

5.1 Biological Data

Collecting and reading of the prescribed otolith target numbers is proving difficult for some survey participants. It was stressed that collection of the full target by individual participants is very important. Should, however, participants have trouble reading all collected otoliths, they should contact the quarter co-ordinator who will determine which otoliths must be read. The co-ordinator must ensure that sufficient otoliths are read from each length group and that material is selected from at least two countries and from the whole of the roundfish sampling area involved.

It was agreed that the collection of biological data for non-target species would continue for 1994 but would only take place in 1995 if there was a specific request. Attempts should be made to find experienced readers for the otoliths of non-target species.

5.2 Environmental Data

Hydrographical and nutrient data collected during the first quarter IBTS are a very valuable source of information. The amount of nutrient samples collected in the first quarter is still increasing.

The collection of data on temperature and salinity for the other quarters is necessary for the objectives of the IBTS. Other oceanographic data, for example informa-

tion on nutrients and oxygen, are useful for determining long term trends in the North Sea, particularly in the bottom waters. Although not mandatory to obtain such observations for the IBTS, institutes are encouraged to collect and submit the data if convenient for them to do so.

6 AMENDMENTS TO THE SURVEY MANUAL

Some amendments and/or additions were made to the IBTS Manual (Addendum to C.M. 1992/H:3).

Maturity key (Appendix II of the Manual): The description of stage 4 (SPENT) has led to some confusions. A small addition should therefore be made: this stage should be named SPENT & RESTING.

Length split used for preliminary indices: Table 6.1 which identifies the length splits used to provide preliminary numbers at age for each quarter should be added to the Manual.

Time table for day-night coding in all quarters: The fact that a certain haul is classified as a daylight or as a night-haul is especially relevant for the calculation of indices for herring. For this species only daylight hauls should be used in the analysis. Table 6.2 provides times of sunrise and sunset for the whole year.

New NODC codes: The NODC codes given in Appendix VI and VII of the last version of the IBTS Manual contain some errors and need some additions. The changes are given in Appendix I to this report.

7 IBTS DATA BASE MATTERS

7.1 Software and Hardware

The ICES Secretariat has decided to keep the IBTS data in the SIR data base system in the medium-term future, i.e. the coming few years. This decision was taken because no obviously better data base system for the IBTS data seems to exist, and a huge amount of resources would be needed to set up the IBTS data in another data base system. Especially SAS and INGRESS were considered as alternatives, as these systems are used in several of the national institutes involved in the IBTS. The problems encountered previously, concerning difficulties in extracting various kinds of aggregated data from the data base, have now been solved by the creation of some standard extraction files from which most of the requests for data can be answered.

The data base has been moved from the University computer to an HP workstation at ICES Headquarters. This is saving the ICES Secretariat a significant amount of money each year and it speeds up data handling.

The quarterly data bases, one for each quarter, are now established. No decision has yet been taken in which way information about sex at length in the HL exchange record type should be stored. The best way to do this would depend on the likely use of such data. The Working Group was of the opinion that 'sex' could be regarded as a similar entry as 'species', because it is likely that the standard aggregations should be by sex for the relevant species. This relates to aggregations like no/hr by rectangle, age, year, and sex and indices by sex.

7.2 Data Checking

Some problems have been encountered in the NODC codes, Rubin codes, Latin names, and English names held in the data base. The ICES Secretariat will have a file with the most recent NODC codes.

New checking programs should be developed to check ALK data. In the past errors in the age determination of herring and cod have been observed (in one country the ages of herring were altered by one year). Some overview tables, or other means of checking the data, are needed.

It has also been observed that the catch in No/hr in a particular haul was out by a factor of ten due to punching errors. This error was only discovered because it increased the total index by 40%, which was far out of line with the preliminary index. A checking procedure which links the catch in numbers to the catch in weight (by assuming some reasonable condition factor) might have captured this error, although for at least one country the catch in weight is not given.

Another problem which has been observed is that of "missing" records. One country had failed in one year to include ALK data for herring and sprat in the exchange file. As the ICES Secretariat does not beforehand know what to expect in terms of numbers of hauls and ALK records this is an error which is very difficult to capture in the checking procedure. A possible solution would be to ask the national co-ordinators to state in a letter accompanying the exchange data how many records are included in the exchange file and how many otoliths have been processed. ICES could then check whether this matches what is actually on the exchange file.

Maximum and minimum values for some selected parameters in the exchange format are sometimes exceeded. In many cases this is due to errors and these are thus corrected by the ICES Secretariat or referred back to the country in question. Sometimes, however, especially regarding the haul and gear specifications, hauls declared

valid by the country have (correct) parameters which are outside the defined range. For instance a haul could have a net opening of less than 2.2 m, which is the minimum value in the checking procedure. It was agreed that such information should not be discarded, because such hauls might contain valuable information for some special studies. It was suggested that for such hauls the validity code should be changed to a different value by the ICES Secretariat. The new value will be "S" for "strange".

Checking and correcting exchange data costs the ICES Secretariat a substantial amount of resources. A lot of time could be saved if the exchange data were properly checked before they are submitted to ICES. The Working Group recommends that the ICES Secretariat develops a program for PCs which, in an executable form, can be used by the countries involved in the IBTS survey, to check the data before they are submitted to ICES. The checking program should work directly on the exchange data files which are in flat ASCII format. The present Cobol checking program (running on a HP workstation) used by the ICES Secretariat should be the basis for the new program but improvements should be considered too when developing the program.

It is at present uncertain whether the ICES Cobol program can be transferred to a PC. The program may be too big for a PC to handle. However, if it is possible, it may be the best solution to just distribute an executable version of the Cobol program (including some simple corrections and improvements) to the various laboratories.

It was agreed that the new checking program should be made for experts and much effort would thus not be needed for developing a sophisticated user interface.

The ICES Secretariat and those countries which have checking programs should send a description of these to Mr. Trevor Boon, Fisheries Laboratory, Lowestoft, UK (England). He will then make a list of checking procedures to be included in the new checking program.

The new checking program should be distributed to the various countries and implemented as soon as possible.

7.3 Indices for 1970-1987

The indices given in the annual IBTS report for quarter 1 for the years 1970-1987 were not calculated using the ICES data base, but they were calculated by the IJmuiden Institute. Table 7.1 gives the deviations between the indices given in the annual IBTS reports and new indices calculated using the ICES data base. For the period 1983-1987 the deviations are usually rather small. From 1988 and onwards there are no deviations because the data base indices are the ones given in the annual report. For the years prior to 1983 there are large discrepancies. This is due to the lack of data for several countries in the data base and, sometimes, to the total lack of ALKs in one or more sampling areas. The later problem can be solved by using ALKs from neighbouring areas, which is easily done in the data base. Nevertheless, there will still be inconsistencies between the indices given in the annual report and the indices calculated from the data base.

Missing ALKs for some sampling areas can only be provided for by using ALKs from other areas. It was agreed that a standard procedure can be applied where ALKs for neighbouring areas are used. If no data from neighbouring areas are available, an ALK from the total North Sea will be used. In this procedure Division IIIa should be dealt with separately.

As already mentioned, the ICES Secretariat has still not received data for some countries for the years 1972-1982 (Table 7.2). From 1975 onwards the total number of trawl hauls taken has been on a high and fairly constant level (Figure 7.1) and all countries concerned are strongly requested to submit the missing data to ICES as soon as possible. Especially data from GOV hauls are important.

7.4 New Format of Exchange Data

At the last meeting of this Working Group it was decided that the exchange format should be changed so that: a) sex can be reported on the HL records, b) the same maturity code (1 to 4) can be used for all species, and c) data for all fish species are allowed to be entered into the data base.

For quarter 2, 3, and 4 all data from 1991 and onwards should be reported in the new format.

Data for quarter 1 in 1994 and onwards should be reported in the new format and data from 1991, 1992, and 1993 should be resubmitted to ICES in the new format as soon as possible.

7.5 Integration of Biological and Environmental Data

When IBTS data are sent to ICES the hydrographical station number for each haul must be given, to allow for the combination of biological data with data on temperature and salinity from the ICES Oceanographic Data Bank.

When ICES receives hydrographical data the accuracy of the data is checked against long-term average values, and the information is rejected only if the data are well outside long term observations. Hydrographical data coming from the IBTS are kept in a separate data base

and if validated also stored in the ICES Oceanographic Data Bank.

The ICES Oceanographic Secretary has provided the Working Group with an overview of data sets that he was able to classify as originating from the IBTS from 1990 onwards. From that list it is apparent that, with the exception of the first quarter data, not all countries have provided data for the surveys in the other quarters. The ICES Oceanographic Secretary strongly recommends that cruise summary reports (ROSCOP forms) are used when hydrographical data are sent to ICES and that on these forms the cruise is classified as an IBTS cruise.

7.6 Access to the IBTS Data Base

The IBTS data base contains valuable information on abundance and spatial distribution of a large number of commercial and non commercial species which could be of interest to a large number of users both within and outside ICES. This is demonstrated by an increasing amount of requests for data from the data base at different levels of aggregation. The data could therefore be used for quite different purposes than initially intended. The need of multidisciplinary approaches to marine issues will lead to extended use of various data bases within ICES. The growing interest has raised questions and some concerns about the rules and principles of access to the data and at which level of aggregation different users should have access.

Over the years the IBTS Working Group has evolved and operated a gentlemen's agreement on principles of access to the data. It has been understood that full access to the data base is only granted, via the national contact persons, to the national laboratories involved in the survey, as well as to working groups within ICES. It has also been understood that this user-group should never export raw data from other participating laboratories without prior contact with the national contact persons. Other users of results from the surveys have been referred to published ICES reports or aggregated data which have been in the public domain.

The IBTS data base is only a small part of the data collection within ICES and the Working Group therefore felt that there is a need for more general guide-lines on data access and data security.

8 FUTURE SURVEYS AND THEIR CO-ORDINATION

8.1 Survey Design, Standard Areas, Co-ordination

The impact of the conclusions of the Workshop on the Analysis of Trawl Survey Data in Woods Hole (ICES C.M. 1992/D: 6) on the IBTS was discussed in general.

One of the conclusions of the Woods Hole workshop was, that sophisticated methods for the calculation of indices do not produce a significantly better result than the simple arithmetic mean which is calculated as standard index so far. Therefore, it was decided not to change the present procedure for calculating the survey indices.

It was discussed whether a redefinition of the sampling areas could lead to less overall variance of the abundance estimates. Taking into account the inconsistency of high density areas from year to year, and the lack of similarity of the ideal definition of the survey design for each of the target species, it was decided not to change the areas.

The recommendation from the Woods Hole workshop to achieve maximum balance in the data was also discussed. Some suggestions were given to change the design of the first quarter survey from the present rather complementary nature, where each ship covers more or less a certain part of the survey area with only spatial overlap with few other research vessels in a limited area, towards the design suggested for quarters 2, 3, and 4 (ICES C.M. 1990/H:3). The advantage would be the possibility to produce a number of independent indices (one per species from each ship) as well as combined indices similar to the one obtained up till now. It was argued that the existence of several independent indices would give the possibility to evaluate the reliability of the pattern observed in the indices, without destroying the established time series. Although the hauls per day rate does not vary significantly between quarters, the extensive MIK sampling of herring larvae is only conducted during quarter 1. Because of this, no costing, in terms of ships time, was attempted for a redesigned quarter 1 survey. It was agreed not to change the present design for quarter 1.

The Woods Hole Workshop observed an unbalance in Division IIIa, because that area was only fished by the Swedish research vessel. A future increase in effort from another research vessel may improve the situation.

As recommended by the Herring Working Group it was decided in the future not to calculate herring indices based on the herring standard area, but instead to use the data for all day-light hauls made in the entire survey

area (North Sea + Skagerrak/Kattegat). In the calculation a correction was applied for the surface area in certain squares for the part of the rectangle that was unlikely to contain 1-ringers (land, shallow water, water depth > 150 m). The weighting factors are given in Table 8.1. No correction was applied for rectangles where no daylight haul was made.

It was revealed that despite the agreement to include only hauls taken on positions within the depth range between 10 and 200 meters in the North Sea, and 10 and 250 meters in Division IIIa, in the past all hauls in fact have been included when calculating the indices. The Working Group agreed that for future indices only hauls within the depth ranges mentioned should be used.

The present countries which co-ordinate the surveys in each quarter will continue to do so. The co-ordinators for the next two years will be:

Quarter 1	Henk Heessen (The Netherlands)
Quarter 2	Andrew Newton (UK, Scotland)
Quarter 3	Yves Verin (France)
Quarter 4	Trevor Boon (UK, England)

8.2 Continuation of the Quarterly Surveys

As mentioned earlier, the original plan for the quarterly IBTS was to carry out these surveys for a period of 5 years. Although some countries foresee problems in continuing their effort on the present level, at the same time at least one country expects to be able to increase its survey effort. Therefore, it is to be expected that the quarterly surveys will be continued up to and including 1995.

The situation for 1996 and following years is yet uncertain, and will, at least partly, depend on the further evaluation of the results obtained so far. A recommendation to continue 4 quarterly surveys, or to limit the number of surveys for example to one winter and one summer survey, can presently not be given.

8.3 Preliminary and Final Survey Reports

For all quarterly surveys conducted so far, preliminary reports giving the distribution and abundance of the seven target species have been circulated by the appropriate co-ordinators to the various national contact persons and to ICES as soon as possible after the completion of the survey. These reports also contain a series of provisional indices based on pre-defined length delimiters. Understandably submission of the full data set to ICES takes rather longer and in addition the ICES Secretariat had to extend the original IYFS data base in order to accommodate the information from the additional three quarters. All the data from 1991 are now loaded into the ICES IBTS data base (see Table 8.2) and provisional runs for quarters 2, 3 and 4 have been made. Some errors have been identified but these are of a minor nature and final survey reports for the second, third and fourth quarter should be available shortly.

During the course of the Working Group the Secretariat made available provisional final indices, i.e. indices based on age determination, for quarters 2 and 3 of 1991. These new indices were compared against preliminary indices which were produced immediately after the surveys, with reference to pre-defined length groupings (Table 8.3). Overall there is good agreement between most of the indices but in some cases eg 1-year-old cod in both quarters and in 1-year-old haddock in quarter 2, the preliminary index appears to be significantly lower than the final index. A possible explanation is that for these indices the upper length delimiter in the preliminary index has been set too low. When more final indices become available the length delimiters in the preliminary indices should be re-examined.

In recognition of the known and anticipated demands of this new enlarged data base it is recommended that, in addition to the normal charts attached to the final report, data will be down-loaded, as a matter of standard procedure, to floppy discs. The information on the diskette will consist of the numbers per hour and mean length per rectangle for all species encountered during the survey; for the seven target species the information will be extended to include numbers at age. These diskettes would, in the first instance, only be distributed to national contact persons with further copies being held at the ICES Secretariat. As these data would be considered to be in the public domain it would be possible for ICES to provide diskettes to other interested parties if so requested.

The information will be stored in one or two files as ASCII comma separated data, but the Secretariat will also produce data in a flat ASCII format suitable for use on those occasions when software such as SAS is to be used by the customer.

All data files should contain the following data:

a) for the target species (cod, haddock, whiting, Norway pout, herring, sprat and mackerel): rectangle, total no/hour, no/hour 0-group, no/hour 1-group etc., mean length at age 1,

b) for by-catch species: rectangle, total no/hour, mean length,

c) a list of valid hauls per rectangle.

Preferably the data should be stored using an agreed list of standard rectangles which are liable to be fished

during any IBTS survey. The final format of the data files will be decided by the ICES Secretariat.

9 RECOMMENDATIONS

Recommendations requiring action by members of the Working Group:

1. To enable the combination of data from the IBTS data base with data from the Oceanographic data base it is recommended that, when hydrographical data are sent to ICES, ROSCOP forms are used on which the cruise is identified as IBTS cruise.

2. Data for all quarterly surveys in the years 1991-1993 should be resubmitted to ICES in the new exchange format, if not yet done so.

3. When exchange files are submitted to ICES an overview should be added with the number of records of each record type.

Recommendations for the 1994 Statutory Meeting:

1. It is recommended that countries provide full historic data to the IBTS data base, at least back to 1977, when the GOV-trawl was introduced.

2. The Working Group recommends that ICES develops a computer program, which can run on a PC, to check exchange files before these are submitted to ICES.

3. The Working Group recommends that ICES, in addition to the standard survey output, produces a floppy disk with numbers per hour and mean length per rectangle for all species encountered during the survey. For the target species also the numbers at age should be included.

4. It is recommended that the IBTS Working Group meets again in 1995 to further evaluate the quarterly surveys.

Table 3.1 Number of hauls and days at sea (between brackets) per country for each of the quarterly surveys 1991-1993

YEAR	1991							
QUARTER	1		2		3		4	
COUNTRY								
DENMARK	40	*(15)*	-	-	-	-	70	*(19)*
FRANCE	77	*(23)*	-	-	-	-	-	-
GERMANY	92	*(22)*	70	*(19)*	-	-	-	-
NETHERLANDS	69	*(22)*	93	*(26)*	73	*(19)*	72	*(27)*
NORWAY	53	*(17)*	38	*(15)*	-	-	47	*(17)*
SWEDEN	54	*(20)*	43	*(15)*	52	*(15)*	-	-
UK (ENGLAND)	-	-	73	*(30)*	87	*(27)*	61	*(28)*
UK (SCOTLAND)	59	*(20)*	54	*(20)*	90	*(20)*	-	-
TOTAL	444	*(139)*	371	*(125)*	302	*(81)*	250	*(91)*

YEAR	1992							
QUARTER	1		2		3		4	
COUNTRY								
DENMARK	40	*(16)*	-	-	-	-	58	*(21)*
FRANCE	53	*(19)*	-	-	61	*(17)*	-	-
GERMANY	92	*(27)*	65	*(18)*	48	*(12)*	-	-
NETHERLANDS	45	*(14)*	67	*(17)*	32	*(11)*	70	*(19)*
NORWAY	49	*(15)*	55	*(16)*	-	-	69	*(24)*
SWEDEN	44	*(15)*	-	-	47	*(15)*	-	-
UK (ENGLAND)	-	-	-	-	72	*(31)*	73	*(31)*
UK (SCOTLAND)	57	*(20)*	69	*(20)*	87	*(20)*	-	-
TOTAL	380	*(126)*	256	*(71)*	347	*(106)*	270	*(95)*

YEAR	1993							
QUARTER	1		2		3		4	
COUNTRY								
DENMARK	45	*(13)*	-	-	-	-	49	*(14)*
FRANCE	51	*(20)*	-	-	70	*(19)*	-	-
GERMANY	65	*(19)*	12	*(4)*	-	-	-	-
NETHERLANDS	74	*(24)*	68	*(19)*	65	*(17)*	80	*(22)*
NORWAY	49	*(25)*	34	*(10)*	-	-	60	*(25)*
SWEDEN	46	*(15)*	48	*(14)*	50	*(15)*	-	-
UK (ENGLAND)	-	-	-	-	71	*(27)*	72	*(28)*
UK (SCOTLAND)	50	*(20)*	71	*(20)*	87	*(20)*	-	-
TOTAL	380	*(136)*	233	*(67)*	343	*(98)*	261	*(89)*

Table 3.2 Number of otoliths per target species, by roundfish area, and quarter: 1991

Quarter: 1

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	814	421	168	121	44	538	261	0	0	2367
Haddock	1222	1210	704	386	0	0	276	0	0	3798
Whiting	833	927	686	662	421	1345	640	0	0	5514
N. pout	332	167	108	62	0	0	76	0	0	745
Herring	1895	610	460	1149	382	2929	2118	412	719	10674
Mackerel	73	1	2	0	0	0	0	0	0	76
Sprat	14	5	190	379	200	1912	650	39	245	3634

Quarter: 2

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	656	683	194	109	55	754	282	278	256	3267
Haddock	1173	909	558	387	3	15	322	111	23	3501
Whiting	710	753	464	454	368	966	433	197	156	4501
N. pout	347	196	122	126	0	13	39	0	0	843
Herring	702	505	594	636	263	344	147	240	346	3777
Mackerel	56	91	38	18	28	392	0	0	0	623
Sprat	0	43	91	166	215	177	31	33	155	911

Quarter: 3

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	503	419	272	106	14	86	146	0	0	1546
Haddock	645	1266	823	538	102	2	178	0	0	3554
Whiting	1133	636	724	321	210	435	262	0	0	3721
N. pout	229	96	96	39	0	0	25	0	0	485
Herring	225	386	374	339	41	144	54	0	0	1563
Mackerel	153	101	136	30	25	109	0	0	0	554
Sprat	0	0	17	25	0	66	0	0	0	108

Quarter: 4

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	374	150	31	27	30	354	112	97	325	1500
Haddock	2362	569	395	49	0	23	168	162	76	3804
Whiting	469	532	372	184	157	890	337	209	333	3483
N. pout	218	186	135	50	0	16	3	106	18	732
Herring	330	455	0	103	18	463	50	0	352	1771
Mackerel	125	3	88	0	0	93	0	0	0	309
Sprat	100	313	100	117	180	513	100	0	28	1451

Table 3.3 Number of otoliths per target species, by roundfish area, and quarter: 1992

Quarter: 1

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	483	365	305	142	51	673	67	221	362	2669
Haddock	972	689	900	317	0	128	249	202	57	3514
Whiting	850	644	819	328	419	1060	484	222	200	5026
N. pout	279	158	190	71	0	0	75	101	61	935
Herring	808	643	306	500	228	775	562	352	462	4636
Mackerel	109	23	5	0	5	6	0	0	1	149
Sprat	18	58	111	33	130	719	0	92	161	1322

Quarter: 2

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	424	619	347	493	70	585	476	156	57	3227
Haddock	876	913	777	652	2	8	381	52	0	3661
Whiting	661	631	716	499	186	683	347	67	34	3824
N. pout	245	251	147	224	0	0	48	21	0	936
Herring	451	343	477	239	66	543	396	371	500	3386
Mackerel	90	102	46	98	3	168	5	0	0	512
Sprat	20	88	90	111	36	92	45	149	184	815

Quarter: 3

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	763	614	228	559	72	782	248	279	225	3770
Haddock	1912	1232	1049	503	1	3	197	0	0	4897
Whiting	1299	958	960	573	404	808	454	176	166	5798
N. pout	502	189	119	142	0	0	13	59	4	1028
Herring	512	598	479	411	206	218	239	249	604	3516
Mackerel	101	322	189	123	107	210	92	71	33	1248
Sprat	25	43	40	132	71	231	40	57	117	756

Quarter: 4

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	749	453	117	413	81	308	190	144	136	2591
Haddock	1158	731	1029	529	0	22	260	154	26	3909
Whiting	1147	647	669	595	285	804	480	170	204	5001
N. pout	540	250	163	272	0	0	28	99	0	1352
Herring	731	311	113	751	190	399	410	187	0	3092
Mackerel	206	62	16	24	79	157	4	0	15	563
Sprat	24	180	36	106	135	537	291	134	100	1543

Table 3.4 Number of otoliths per target species, by roundfish area, and quarter: 1993

Quarter: 1

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	959	464	263	310	39	335	243	278	362	3253
Haddock	1383	725	848	481	0	12	265	144	57	3915
Whiting	1019	620	715	629	561	1370	189	209	200	5512
N. pout	268	174	154	199	0	0	0	95	61	951
Herring	637	726	668	227	212	890	855	446	462	5123
Mackerel	113	0	0	0	0	0	0	3	1	117
Sprat	0	87	133	158	113	471	320	21	161	1464

Quarter: 2

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	525	365	200	544	15	149	196	622	406	3022
Haddock	587	614	576	355	3	10	451	204	55	2855
Whiting	453	469	491	370	167	423	206	183	177	2939
N. pout	173	133	86	148	0	1	11	77	41	670
Herring	337	339	385	361	376	430	260	428	672	3588
Mackerel	27	17	49	92	45	284	0	4	0	518
Sprat	0	105	143	187	163	232	100	138	171	1239

Quarter: 3

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	738	470	126	633	57	388	175	277	215	3079
Haddock	1929	1083	994	593	0	14	201	167	36	5017
Whiting	1283	805	752	1005	504	1047	394	149	154	6093
N. pout	378	129	138	163	0	28	14	109	75	1034
Herring	543	628	659	694	101	306	287	331	591	4140
Mackerel	227	266	166	137	108	368	135	13	0	1420
Sprat	17	156	147	179	177	266	24	33	163	1162

Quarter: 4

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Cod	597	218	37	99	36	350	201	118	51	1707
Haddock	962	618	626	233	3	8	229	160	14	2853
Whiting	790	525	462	355	157	783	117	124	126	3439
N. pout	350	186	52	84	0	0	77	0	0	749
Herring	842	677	206	263	211	263	518	0	0	2980
Mackerel	183	241	51	0	13	254	22	0	0	764
Sprat	0	114	318	97	190	290	73	0	0	1082

Table 3.5 Number of otoliths per bycatch species, by roundfish area, and quarter: 1992

Quarter: 1

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Saithe	161	2	0	0	0	0	0	0	0	163
Grey gurnard	127	107	46	0	0	70	17	127	33	527
Angler	11	4	10	0	0	0	0	7	0	32
Pollack	7	0	0	0	0	0	0	2	1	10
Tusk	2	0	0	0	0	0	0	0	0	2
Rockling	0	26	0	0	0	0	0	77	59	162

Quarter: 2

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Saithe	443	79	15	5	0	0	8	46	0	596
Grey gurnard	0	91	49	97	123	121	55	0	0	536
Angler	3	12	5	2	0	0	2	0	0	24
Pollack	0	0	0	0	0	0	1	0	0	1
Rockling	30	2	0	0	0	7	0	0	0	39

Quarter: 3

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Saithe	727	9	19	0	0	1	7	109	36	908
Grey gurnard	0	0	0	0	0	0	0	75	0	75
Angler	25	4	1	0	0	0	1	7	0	38
Rockling	38	0	0	11	8	5	0	75		137

Quarter: 4

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Saithe	344	1	1	0	0	0	30	0	0	376
Grey gurnard	57	36	41	51	0	182	33	0	0	400
Angler	30	6	4	0	1	0	0	0	0	41
Pollack	9	0	0	0	0	0	1	0	0	10
Tusk	13	0	0	0	0	0	0	0	0	13
Rockling	34	2	0	0	7	42	0	0	0	85

Table 3.6 Number of otoliths per bycatch species, by roundfish area, and quarter: 1993

Quarter: 1

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Saithe	661	3	9	0	0	0	0	0	0	673
Grey gurnard	0	0	0	0	0	0	0	0	33	33
Angler	162	24	44	0	0	0	9	21	0	260
Pollack	4	0	0	0	0	0	2	0	1	7
Tusk	9	0	0	0	0	0	0	0	0	9
Rockling	0	0	0	0	0	0	0	0	59	59
Catfish	4	1	0	0	0	0	0	0	0	5
Hake	3	0	8	0	0	0	0	4	0	15

Quarter: 2

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Saithe	139	13	52	0	0	1	0	21	0	226
Angler	69	8	25	8	0	0	1	5	1	117
Pollack	10	0	0	0	0	0	15	44	0	69
Tusk	2	0	0	0	0	0	0	0	0	2
Catfish	10	4	6	1	0	0	1	13	5	40
Hake	6	2	6	0	0	2	3	21	26	66

Quarter: 3

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Saithe	789	70	31	2	0	0	19	0	0	911
Angler	26	7	10	2	0	0	2	3	1	51
Pollack	8	0	0	0	0	0	3	8	0	19
Tusk	14	0	0	0	0	0	1	0	0	15
Catfish	11	10	1	0	0	0	1	1	0	24
Hake	33	3	5	0	0	5	5	91	16	158

Quarter: 4

SPECIES	AREA									
	1	2	3	4	5	6	7	8	9	total
Saithe	659	12	4	0	0	1	25	16	2	719
Angler	38	3	2	1	0	0	0	0	0	44
Pollack	2	0	0	0	0	0	3	0	0	5
Tusk	6	0	0	0	0	0	0	0	0	6
Rockling	4	0	0	0	5	15	0	0	0	24
Catfish	2	0	0	0	0	0	0	0	0	2
Hake	18	0	0	0	0	2	0	0	0	20

Table 6.1 Length splits used to provide preliminary numbers at age for IBTS surveys in quarters 1 - 4. NB: the lengths indicated are 'less than' lengths, ie O-group cod in quarter 2 are fish < 11 cm

Age	O-group			1-group			
Quarter	2	3	4	1	2	3	4
cod	11	18	23	25	33	38	44
haddock	12	17	20	20	27	30	32
whiting	9	17	20	20	23	24	26
Norway pout		13	14	15	15	16	20
herring		15.5	17.5	20.0	21.0	23.0	24.5
sprat			10.0	10.0	10.5	13.0	14.0
mackerel		17	24	25	25	30	31
saithe		22	25	25	25	33	38
plaice		10	12			19	21

Table 6.2 Daylight period in UTC at 0 degrees longitude.

		South of 57° 30' N	North of 57° 30' N			South of 57° 30' N	North of 57° 30' N
1 - 10	Jan	08.09-15.58	08.45-15.25	1 - 10	Jul	03.15-20.55	02.28-21.40
10 - 20	Jan	08.01-16.17	08.31-15.45	10 - 20	Jul	03.26-20.47	02.49-21.24
20 - 31	Jan	07.47-16.35	08.15-16.07	20 - 31	Jul	03.41-20.33	03.08-21.03
1 - 10	Feb	07.29-16.58	07.49-16.36	1 - 10	Aug	04.00-20.12	03.34-20.38
10 - 20	Feb	07.08-17.20	07.23-17.05	10 - 20	Aug	04.19-19.50	03.59-20.09
20 - 28	Feb	06.47-17.41	06.55-17.30	20 - 31	Aug	04.37-19.26	04.23-19.42
1 - 10	Mar	06.27-17.57	06.32-17.50	1 - 10	Sep	04.57-19.00	04.48-19.09
10 - 20	Mar	06.03-18.18	06.05-18.15	10 - 20	Sep	05.16-18.34	05.12-18.38
20 - 31	Mar	05.35-18.38	05.32-18.39	20 - 30	Sep	05.35-18.08	05.35-18.08
1 - 10	Apr	05.07-18.59	05.00-19.07	1 - 10	Oct	05.54-17.43	06.00-17.38
10 - 20	Apr	04.43-19.18	04.29-19.32	10 - 20	Oct	06.14-17.18	06.24-17.10
20 - 30	Apr	04.21-19.37	04.03-19.56	20 - 31	Oct	06.34-16.54	06.47-16.40
1 - 10	May	03.58-19.57	03.36-20.20	1 - 10	Nov	06.55-16.31	07.15-16.09
10 - 20	May	03.39-20.16	03.08-20.44	10 - 20	Nov	07.18-16.12	07.43-15.47
20 - 31	May	03.23-20.33	02.47-21.08	20 - 30	Nov	07.37-15.57	08.07-15.27
1 - 10	Jun	03.09-20.49	02.30-21.30	1 - 10	Dec	07.53-15.48	08.26-15.14
10 - 20	Jun	03.05-20.58	02.21-21.45	10 - 20	Dec	08.06-15.45	08.43-15.06
20 - 30	Jun	03.05-21.01	02.20-21.47	20 - 31	Dec	08.12-15.49	08.48-15.11

For each degree longitude west, 4 minutes should be added.
For each degree longitude east, 4 minutes should be subtracted.

(Source: "The Times Atlas" 1972, p 33)

Table 7.1 Difference between index values given in the annual IBTS reports (old) and index values calculated from the data base.

year class	COD age 1 old	COD age 1 diff.	COD age 2 old	COD age 2 diff.	HADDOCK age 1 old	HADDOCK age 1 diff.	HADDOCK age 2 old	HADDOCK age 2 diff.	WHITING age 1 old	WHITING age 1 diff.	WHITING age 2 old	WHITING age 2 diff.	NORWAY POUT age 1 old	NORWAY POUT age 1 diff.	NORWAY POUT age 2 old	NORWAY POUT age 2 diff.
1981	-	-	16.6	0.1	-	-	400	3	-	-	126	1	-	-	663	-35
1982	3.9	0.8	8.0	0.9	307	1	219	8	128	-1	179	3	2,331	-5	802	45
1983	15.2	0.4	17.6	0.8	1,057	41	828	0	436	11	359	1	3,925	276	1,423	0
1984	0.9	0	3.6	-0.1	229	0	244	14	341	0	261	11	2,109	8	384	13
1985	17.0	-0.3	28.8	0.6	579	20	326	-1	456	10	544	7	2,043	69	469	30
1986	8.8	0.7	6.1	-0.1	885	36	688	-2	669	22	862	0	3,023	221	760	-12
1987	3.6	0	6.3	0	92	0	97	0	394	9	542	0	127	0	260	0
1988	13.1	0	15.2	0	210	0	114	0	1,465	0	887	0	2,079	0	773	0
1989	3.4	0	4.1	0	219	0	131	0	509	0	675	0	1,320	0	677	0
1990	2.4	0	4.5	0	679	0	371	0	1,014	0	748	0	2,497	0	902	0
1991	13.0	0	19.9	0	1,115	0	543	0	916	0	524	0	5,121	0	2,644	0
1992	12.7	0			1,242	0			1,087	0			2,681	0		

year class	HERRING 1-ring old	HERRING 1-ring diff.	SPRAT age 1 old	SPRAT age 1 diff.	SPRAT age 2 old	SPRAT age 2 diff.	MACKEREL age 1 old	MACKEREL age 1 diff.	MACKEREL age 2 old	MACKEREL age 2 diff.
1981	1,797	93	-	-	-	-	-	-	5.2	1.4
1982	2,663	-136	-	-	-	-	1.9	0.3	0.4	0.4
1983	3,416	-206	-	-	295	3	0.1	0	0.0	0
1984	3,667	-6	659	1	101	2	0.7	0.6	2.1	0.3
1985	5,717	3	72	-1	71	10	0.5	0.1	+	0
1986	4,192	0	807	46	1,433	0	8.9	95.9	0.1	0
1987	3,468	0	145	0	442	0	1.2	0.1	1.8	0
1988	2,146	0	4,246	0	557	0	1.1	0	1.2	0
1989	2,433	0	177	0	116	0	35.0	0	0.2	0
1990	2,099	0	1,121	0	340	0	6.9	0	0.4	0
1991	1,995	0	1,561	0	588	0	16.0	0	0.8	0
1992			1,692	0			1.0	0		

Table 7.2 Data available in the ICES IBTS data base for the years 1972-1982

Country	72	73	74	75	76	77	78	79	80	81	82
Denmark	+	+	+	+	+	+	+	+	o	o	+
France	o	o	o	o	+	o	o	+	+	o	+
Germany	-	-	-	-	-	-	-	-	-	-	-
Netherlands	+	+	+	+	+	+	+	+	+	+	+
Norway	-	-	-	-	-	-	-	-	-	-	-
Sweden	-	-	-	-	-	-	-	-	-	-	-
UK England	-	-	-	-	-	-	-	-	-	+	+
UK Scotland	o	o	+	+	+	+	+	+	+	+	+
Russia	o	o	+	+	+	+	o	+	o	+	+

o No survey
+ Survey data in data base
- Survey made but data not submitted

Table 8.1 Weighting factors used for the calculation of the herring 1-ringer index (copied from ICES C.M. 1993/Assess:15).

Weight	Statistical rectangle
0.1	35F5
0.2	37E9
0.3	33F1, 38F8, 43G2
0.4	33F4, 34F1, 36F7, 39F8, 42E7, 45E6, 46E6, 49E8
0.5	36F8, 39E8, 44E6, 44E7
0.6	31F1, 34F4, 47E7, 44G1
0.7	50E8, 43G1
0.8	31F2, 32F3, 35F0, 37F8, 40E8, 41E7, 44F9
0.9	32F1, 35F4, 36F0, 36F6, 38E9, 43E8, 44E8, 46E7, 48E8, 50E9
0.02	45F9
0.21	43G0
0.24	45G0
0.25	44F8
0.41	43F9
0.52	46G0
0.53	41G2
0.55	45G1
0.64	42G2
0.89	42G1
0.94	43F8, 44G0
0.97	41G1
1.00	All rectangles not mentioned above

Table 8.2 Overview of the data from the quarterly surveys in the IBTS data base.

Year	1991				1992				1993			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Denmark	RTL	o	o	R	RTL	o	o	R	RTL	o	o	R
France	RTL	o	o	o	RTL	o	R	o	RTL	o	-	o
Germany	RTL	R	o	o	RTL	R	R	o	RTL	-	o	o
Netherlands	RTL	RTL	RTL	RTL	RTL	R	R	R	RTL	-	-	-
Norway	RTL	RTL	o	RTL	RTL	-	o	-	RTL	-	o	-
Sweden	RTL	RTL	RTL	o	RTL	o	R	o	RTL	-	-	o
UK (England)	o	RTL	RTL	RTL	o	o	R	R	o	o	R	R
UK (Scotland)	RTL	RTL	RTL	o	RTL	R	R	o	RTL	R	R	o

R Received
T Tested
L Loaded
o No survey
- Survey made but data not submitted

Table 8.3 Preliminary and final indices for quarter 2 and 3 in 1991.

		quarter 2		quarter 3	
	age-group	prelim.	final	prelim.	final
cod	0	2.9	0.2	16.9	16.7
	1	8.5	13.5	7.4	20.9
haddock	0	1	1	585	591
	1	502	708	238	236
whiting	0	2	0	514	490
	1	1298	1369	632	705
Norway pout	0	7	0	4834	5220
	1	2337	2596	467	930
Herring	0	118	0	673	650
	1	5490	4426	6352	6521
sprat	0	0	0	0	39
	1	485	1144	354	416
mackerel	0	0.0	0.3	0.0	0.0
	1	11.0	12.5	30.8	26.1

preliminary indices: based on length separation
final indices: based on age readings

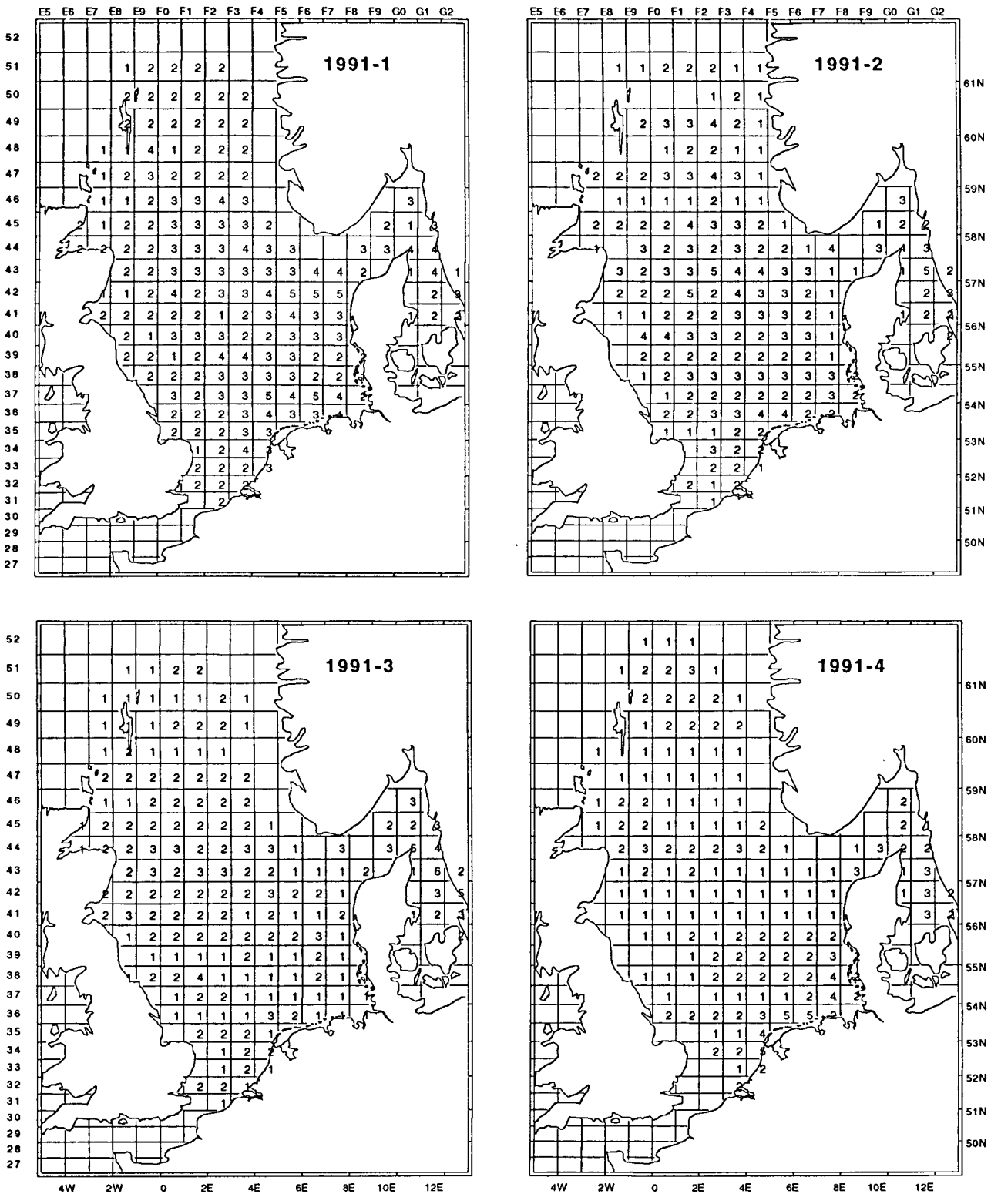

Figure 3.1 Number of GOV-hauls per statistical rectangle during each quarter in 1991.

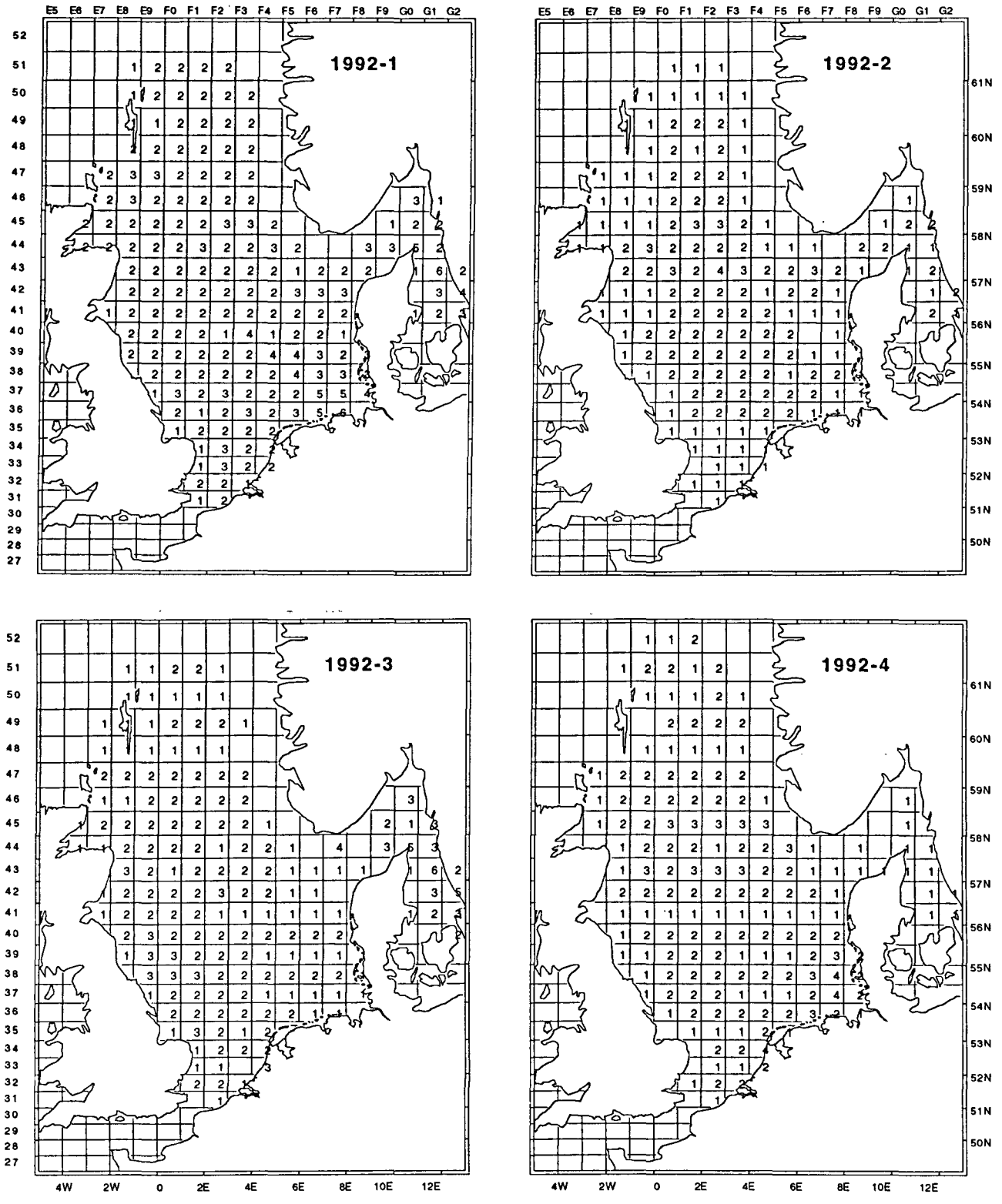

Figure 3.2 Number of GOV-hauls per statistical rectangle during each quarter in 1992.

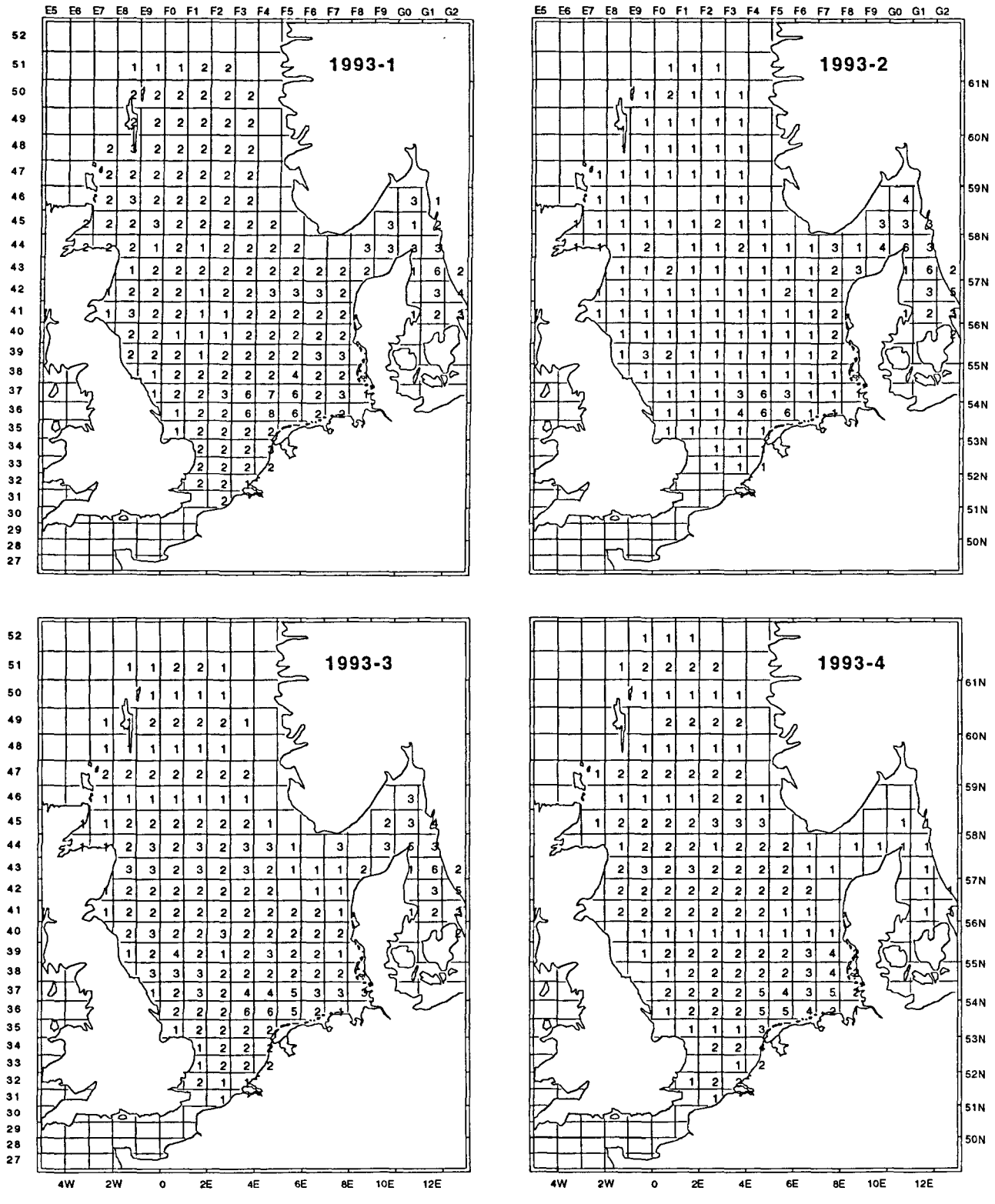

Figure 3.3 Number of GOV-hauls per statistical rectangle during each quarter in 1993.

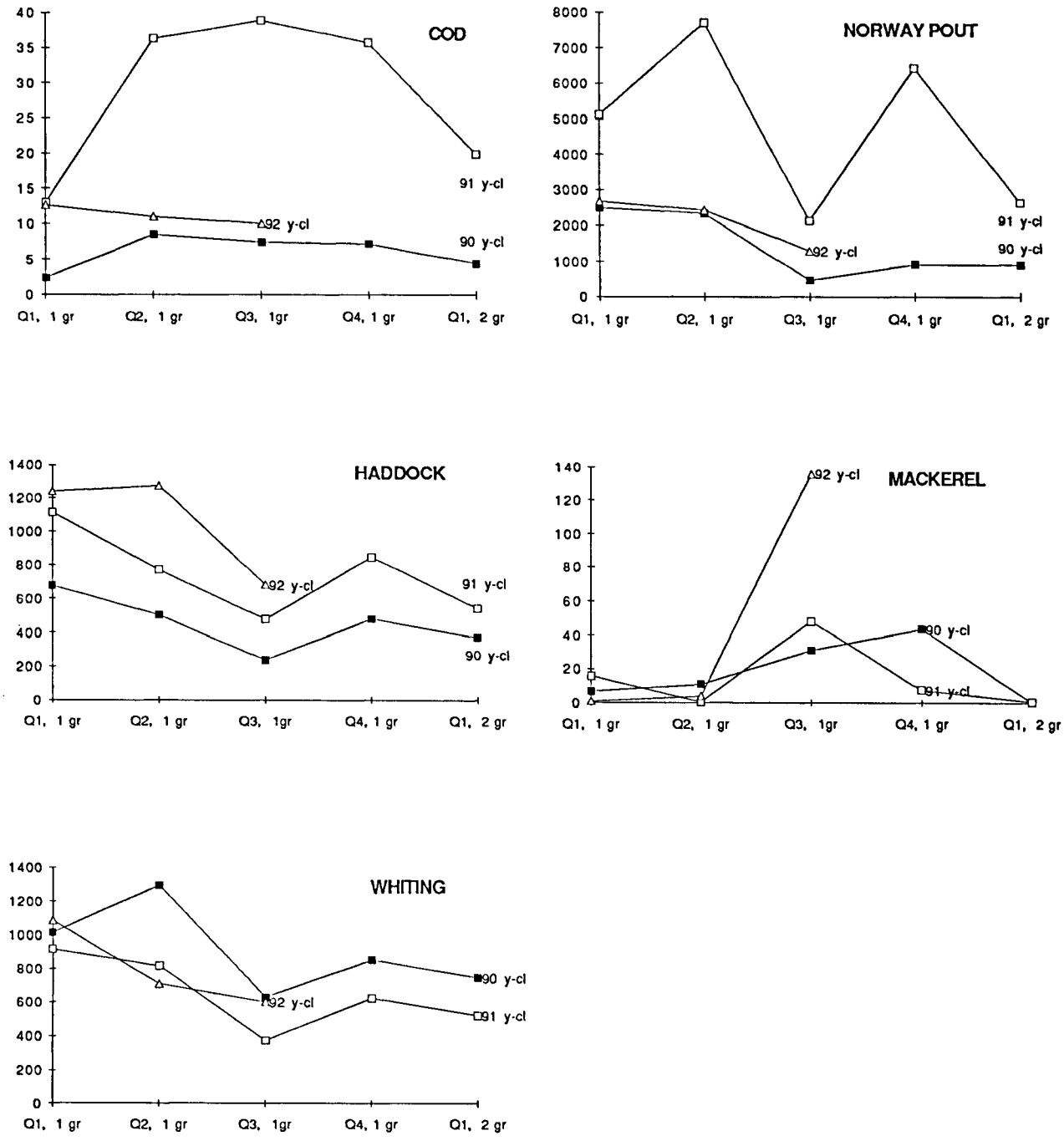

Figure 3.4 Comparison of (final) indices for 1- and 2-group fish from the first quarter survey with preliminary 1-group indices from the other quarters.

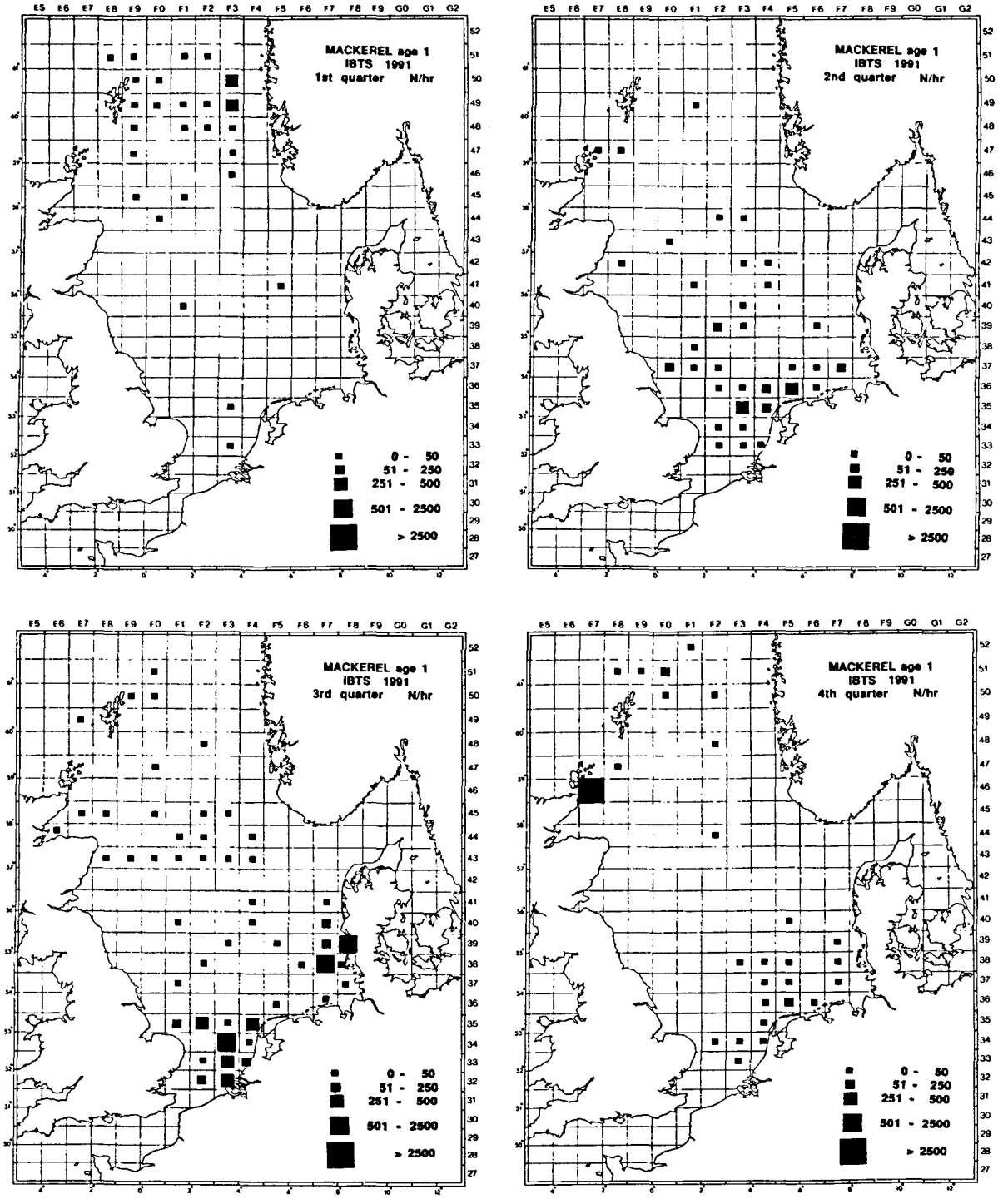

Figure 3.5 Distribution of 1-group mackerel during 1991.

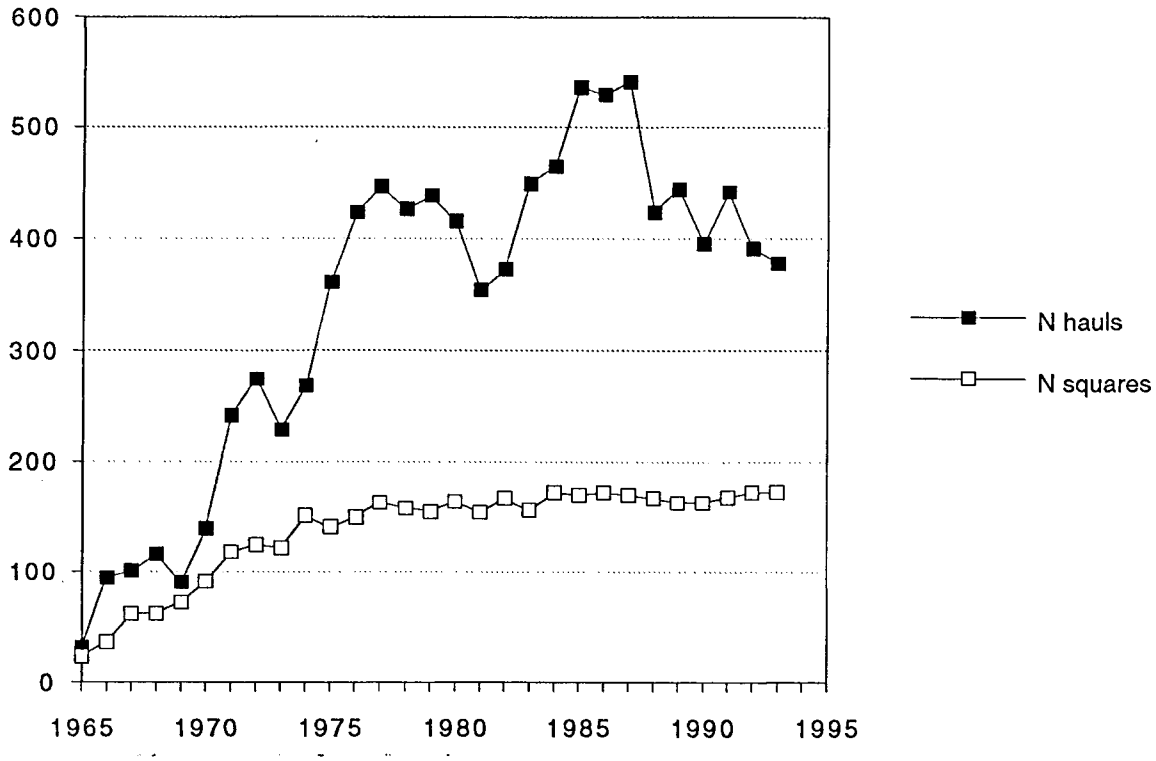

Figure 7.1 Total number of trawl-hauls during the first quarter IBTS since 1965, and the total number of statistical rectangles covered each year.

Appendix I Description of changes to Appendix VI and VII of the IBTS Manual (Addendum to CM 1992/H:3):

CHANGES TO APPENDIX VI

Code changes:

Lesser silversmelt	8756010237	becomes	8756010209

CHANGES TO APPENDIX VII

Code changes:

Squalus blainvillei	8710010204	becomes	8710010202
Dasyatis pastinacus	8713050141	becomes	8713050111
Argentina sphyraena	8756010237	becomes	8756010209
Histrio	8787020200	becomes	8787020100
Histrio histrio	8787020201	becomes	8787020101
Liparis montagui	8831090860	becomes	8831090831
Dentex	8835430100	becomes	8835431000
Dentex macropthalmus	8835430102	becomes	8835431002
Dentex dentex	8835430105	becomes	8835431005
Thunnus obesus	8850030404	becomes	8850030405
Hyperoglyphe	8851030200	becomes	8851010200
Hyperoglyphe perciforma	8851030201	becomes	8851010201

Deletions (replaced by codes in the list below):

Taractes longipinnis	8835710401
Schedophilus	8851030400
Schedophilus medusophagus	8851030401

Insertions:

Apristurus	8708010100
Apristurus laurussoni	8708010103
Galeus murinus	8708010204
Conocara	8760010700
Conocara salmonea	8760010704
Ceratiidae	8788080000
Ceratias	8788080100
Ceratias holboelli	8788080101
Coelorinchus	8794010400
Coelorinchus coelorhinchus	8794010405
Cottunculidae	8831060000
Cottunculus	8831060100
Cottunculus microps	8831060101
Pagellus acarne	8835430802
Taractichthys	8835710700
Taractichthys longipinnis	8835710701
Centrolophus medusophagus	8851010302

Changes of names:

8755010115	Coregonus oxyrhynchus	becomes	Coregonus lavaretus
8758020103	Umbrakrameri	becomes	Umbra krameri
8835720000	Dicentrarchidae	becomes	Percichthyidae
8850010000	Gemplydae	becomes	Gempylidae