Pelagic Fish Committee

ICES CM1996/H:1
Ref.: G

REPORT OF THE INTERNATIONAL BOTTOM TRAWL SURVEY WORKING GROUP

ICES Headquarters, Copenhagen, Denmark

20 - 24 November 1995

This report is not to be quoted without prior consultation with the General Secretary. The document is a report of an expert group under the auspices of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council.

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

Palægade 2–4 DK–1261 Copenhagen K Denmark

TABLE OF CONTENTS

1. TERMS OF REFERENCE AND PARTICIPATION

During the ICES Science Conference in St. John's in 1994 it was decided (C. Res. 1994/2:35), that the International Bottom Trawl Survey Working Group should incorporate the work of the Study Group on the Coordination of Bottom Trawl Surveys in Sub-Areas VI, VII and VIII and Division IXa and meet at ICES Headquarters from 20 to 24 November 1995 to:

a) analyse the results of the 1991-1994 quarterly bottom trawl surveys in Sub-Area IV and Division IIIa;

b) review progress in carrying out surveys in Sub-Areas VI, VII and VIII and Division IXa, advise on future coordination and provide specifications (including resource implications) for a data base for these areas;

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

d) propose any improvements in the survey manual;

e) propose any improvements to data exchange and the databases;

f) evaluate the need and prepare proposals for surveys in 1997 and future years;

g) determine the feasibility of coordination of both International Bottom Trawl Surveys (IBTS) and Beam Trawl Surveys (BTS) by a single Working Group.

The meeting was attended by:

Trevor Boon	UK (England)
John Cotter	UK (England)
Jorgen Dalskov	Denmark
Siegfried Ehrich	Germany
Guus Eltink	Netherlands
Olle Hagström	Sweden
Henk Heessen (Chairman)	Netherlands
Andrew Newton	UK (Scotland)
Jean-Charles Poulard	France
Odd Smedstad	Norway
Arnauld Souplet (*)	France
Yves Verin	France

(*) part-time. Henrik Sparholt from the ICES Secretariat also attended the meeting.

2. INTRODUCTION

Since 1991 the International Bottom Trawl Surveys in the North Sea, Skagerrak and Kattegat have been carried out on a quarterly basis. From the coverage reported here, and in earlier reports, it may be concluded that the quarterly surveys have been highly successful. With only a few exceptions all ICES rectangles in the area have been fished every year with at least one, and usually two, hauls per quarter. In all cases, except for the English contribution in the third quarter of 1991, and the Scottish contribution during the third quarter in all years, the standard GOV-trawl has been used. Also, with only very few exceptions, the sampling levels of the 7 target species of the IBTS have been good. In addition to sampling otoliths for the target species, several institutes have found time to collect otoliths, and information on the reproductive stage, for a number of non-target species for which only few published data are available.

When it was decided in 1990 to start the ICES coordinated quarterly surveys, it was agreed that these surveys should run for a period of at least 5 years. The continuation of the surveys after the first five years should depend on an evaluation of the results. At the start of the meeting, (almost final) results of the standard analysis of the quarterly IBTS surveys were available for the target species for the years 1991 to 1994. In this report some analyses of these data are presented, and conclusions are drawn on the continuation of these surveys.

From this meeting onwards, the IBTS Working Group also includes the work of the former Study Group on the Coordination of Bottom Trawl Surveys in Sub-Areas VI, VII and VIII and Division IXa. In this report an overview of the bottom trawl surveys in the western and southern areas is given.

The possible progress, as far as future coordination and standardisation of these surveys is concerned, was severely hampered by the absence of representatives of Ireland, Spain and Portugal in the Working Group. However, suggestions for coordination, a manual, data exchange and data base requirements are given.

In the course of the meeting, the coordinator for France of the International Bottom Trawl Survey in the Mediterranean (MEDIST), Arnauld Souplet, gave a short presentation on this survey. A description of the survey is included in this report.

3. SURVEYS IN THE NORTH SEA, SKAGERRAK AND KATTEGAT

3.1 Evaluation of the Quarterly Surveys

In 1990 it was decided that the International Bottom Trawl Survey should be carried out on a quarterly basis for a period of 5 years. Thereafter, an evaluation of the usefulness of these surveys should be performed. This evaluation should form the basis for the decision whether or not to continue the quarterly surveys. In the following sections of the report, different aspects of the surveys carried out so far, will be discussed, and conclusions on the continuation of the surveys will be drawn.

3.1.1 Coverage of the survey area

Table 3.1 gives the number of hauls by country and quarter and the number of days spent at sea for the years 1991 to 1995. The text table below shows the total number of hauls and number of days spent at sea for the years 1991-1995.

Quarter	1		2		3		4		Total	
	No. hauls	Days at sea	No. hauls	Days at sea	No. hauls	Days at sea	No. hauls	Days at sea	No. hauls	Days at sea
1991	444	139	371	125	302	81	250	91	1367	436
1992	380	126	256	71	347	106	270	95	1253	398
1993	380	136	233	67	343	98	261	89	1217	390
1994	365	139	318	87	309	87	290	107	1282	420
1995	342	142	286	85	246	74	317	116	1191	417

The high number of hauls in 1991 was due to additional sampling for the ICES Stomach Sampling Project. Also in the years 1992 to 1995, however, the effort was kept at a high level.

Figures 3.1 - 3.5 give the number of valid hauls per rectangle for all quarterly surveys in the years 1991 - 1995. The overall coverage has been quite good. Only a few rectangles have not been covered at all during some of the surveys, but in most cases two hauls were made per rectangle during each quarter. In the quarter 4 survey some rectangles in the northern North Sea were covered with up to 7-8 hauls due to a special Danish Pandalus programme. No gross oversampling is apparent.

Only the coverage of Division IIIa has sometimes been rather poor. To cover this area adequately, according to rectangles and depth strata, at least 40 hauls per survey are needed. In fact, the development of a depth stratified survey grid for this area should be considered.

3.1.2 Otolith sampling levels

In Table 3.2 - 3.6 the sampling levels of otoliths of the seven target species and saithe are shown per quarter. No gaps in the otolith collection are obvious from these tables. The figures for 1995 are preliminary. The total sampling level has been rather constant over the period, at around 60-70,000 otoliths per year.

From 1992 onwards, otoliths from some non target species were collected. Table 3.7 shows the sampling of otoliths of these species in 1994. Data for 1995 were only available from some countries and therefore not included in the report. The non target species were selected because relatively little information is available in the literature on their age structure and reproduction.

3.1.3 Abundance indices

Preliminary and final indices:

The preliminary and final indices for the years 1991 to 1994 for 1-group fish in the first quarter and for 0- and 1-group fish in quarters 2 to 4 are presented in Table 3.8. It may be seen that the ability of the preliminary indices to predict the final indices varies between species, quarters and years. However, the first quarter does appear to perform better than the rest. Preliminary length splits for quarters 2 to 4 were based on only few age data.

In future, survey time in other than the first quarter will possibly be concentrated in quarter 3. As it may prove difficult to provide age based combined indices in time to the North Sea Demersal Working Group, reliable preliminary indices will be required. It is therefore suggested that new age related length splits are calculated, making use of the age material collected during the 1991 to 1995 surveys. To test the reliability of the new length splits, the preliminary indices for the years 1991 to 1995 could be recalculated.

Meanwhile, however, it should be attempted to follow the same procedure as practised after the quarter 1 IBTS for herring data. This means that all countries participating in the quarter 3 IBTS should provide the ICES Secretariat with length composition data immediately after the survey. If, in addition, some countries are able to provide Age Length Keys, more reliable preliminary indices could then be calculated from the database.

Performance:

Quarterly indices for ages 1 to 6+ of the target species are plotted in Figures 3.6 to 3.12 together with VPA values when available. The evaluation of the performance of the different quarterly surveys is difficult because the time series are short, and the corresponding VPA values are in the nonconverged part of the VPA.

For cod, haddock and whiting all quarterly surveys give more or less the same signals from year to year, except quarter 1 for 1-year-old cod. The signals given by the surveys correspond well with the signals in the VPA.

For Norway pout there is also a relatively good agreement between the surveys, and between the surveys and VPA except for age 3. For herring the picture is more variable. Quarter 1 and 4 give similar signals, while the two other quarters are more variable. For mackerel, quarter 2 and 4 give more or less similar signals while in quarter 3 the abundance is much higher. In quarter 1 very few mackerel are caught. The indices for sprat vary a lot. There is some agreement between quarter 3 and 4, but the other two quarters differ considerably.

In Figure 3.13 the indices for year classes 1990, 1991, 1992 and 1993 are plotted against time for cod, haddock, whiting and herring. This figure shows that the surveys perform poorly for 0-group gadoids. It is only the 1992 year class of cod, haddock and whiting that are caught in reasonable numbers. For cod there seem to be problems in catching 1-group in the first quarter. In 1994 the problems even seem to continue until quarter 4. Catching 1-group haddock and whiting does not seem to be a problem, but Figure 3.13 shows that the indices in the 3rd quarter are rather low for all ages. The indices for herring vary a lot, from one quarter to the next. In quarter 2 often the highest abundance is observed.

The fact that the quarter 3 survey produces low indices compared to other quarters does not necessarily mean that the survey performs less well than the others. The low catches may be caused by seasonal differences in behaviour and catchability, but it may also partly be due to the fact that one country is using another trawl (with a bigger mesh size) in that quarter.

3.1.4 Variability of quarterly abundance indices for herring and cod

The procedure to calculate a joint international abundance index (IBTS index) for each target species in the North Sea, is firstly to average the catches-at-age by the different survey vessels fishing in each ICES rectangle, and then to average the rectangle averages over a species specific standard area. For herring, coastal and shallow rectangles are down-weighted. Often, the indices so calculated are averages of many low and a few very high values. Variability of the indices therefore depends on the frequency of occurrence of the high values, or in statistical terms, on the skewness of the distribution, i.e. the third moment about the mean. The fourth moment, the kurtosis, measures the weight of the tails of the distribution and is also relevant. The smaller the estimates of skewness and kurtosis, the more closely will the distribution of the mean approximate the normal distribution, and the smaller will be the coefficient of variation. In biological terms, low values for the third and fourth moments reflect a homogeneous distribution of the fish species in the North Sea, and uniform catchability by trawling. Since these factors will vary by season for most species, the expected precision of the four quarterly surveys for different species and age-groups may be compared by estimating these statistical parameters.

Tables 3.9 and 3.10 show results for herring and cod for the quarterly IBTS for 1991 to 1994. The raw data arose from N individual hauls, and averaging by rectangles was not applied. Therefore the mean is not quite the same as the IBTS index. CV% denotes the coefficient of variation of the mean; it is inversely proportional to the square root of N. The variance, skewness and kurtosis were calculated with the SAS Univariate procedure using the usual formulae; in contrast to the CV, their values are not dependent on N.

Herring:

There are no 0-ringers in the first and second quarters. The means for the 4th quarter shows lower CVs than those of the 3rd, despite the slightly smaller N. Skewness and kurtosis are also lower. 1-ringed herring are most efficiently estimated during the 1st quarter. This lends confirmation to this choice of season for surveying herring recruits with maximum effort. However, when the larger numbers of hauls made in the first quarter is taken into account, the 2nd and 4th quarters appear almost as efficient. 2- and 3-ringed herring appear to be most efficiently estimated during the second or third quarters (see also section 3.1.5 where the distribution of herring is discussed).

Cod:

0-group cod starts to appear regularly in the 3rd and 4th quarter surveys, with perhaps the third being marginally more efficient for estimating the mean. 1-year-olds are most precisely estimated in the 4th quarter, while season makes little difference for 2- and 3-year-olds.

Comments:

This analysis takes as given that the IBTS practice of locating hauls evenly over the North Sea by ICES rectangle is unlikely to change. Various statistical sampling schemes could be considered greatly to improve the efficiency of surveys of a spatially heterogeneous population. However, optimisation for one species or age group could create severe inefficiency for others.

It is recommended that a similar analysis should be done for the other IBTS target species.

3.1.5 Distribution

For the standard species, distribution charts are now available for each quarter of the years 1991 up to and including the first quarter of 1995. To illustrate some of the potential use of this information about the temporal and spatial distribution by age group and quarter, data of two species, cod and herring, were selected. The distribution of year class 1991 of cod and 1990 of herring can be followed in the standard output until they recruit to the 3+ group after eleven quarters.

The first sign of 0-group cod appears in the catches in the second quarter, but generally the age group is not well sampled before the third or the fourth quarter, when the highest indices are obtained. In order to demonstrate the availability or catchability of a cohort in the survey, the total mortality calculated as the mean abundance in year N to year N+1 is shown in Table 3.11. The negative values for the 0-group stage, and in some years also in quarter 1 for the 1-group, suggest that maximum catchability is not established until this age.

In the case of herring (Table 3.12), positive Z-values in 2nd or 3rd quarter as 0-group, indicate that a higher catchability is obtained earlier than for cod.

The gradual increase in catchability may be caused by a combination of behaviour and gear selection. As long as the relative catchability is not too variable between years, this will not influence the use of an index derived from the 0-group stage. If, however, the variation is large it may severely hamper the use. Large between-year variation in catchability may also distort the distribution pattern derived from the survey. The current time series is too short for a conclusive evaluation.

A preliminary analysis of the distribution pattern of the cod year classes 1991 and 1994 (Figures 3.14 and 3.15) indicates that consistency between years may exist, but also that major variations occur. The highest abundance of juvenile cod generally occurs in the central eastern North Sea, extending into the Skagerrak-Kattegat. With increasing age, the cod is distributed more to the north and to the west into deeper waters, and the abundance in the south-eastern North Sea and Division IIIa decreases. From approximately age 1 onwards, fishing mortality may contribute to this pattern. This pattern seems typical for year classes 1991 to 1993. The distribution of year class 1991 as 0-, 1- and 2-group is given by quarter in Figure 3.14 as representative for this pattern. In contrast, the 1994 year class showed a more northerly distribution, which can already be observed at the 0-group stage (Figure 3.15). This year class was also very abundant in Division IIIa.

The close relation between North Sea and Division IIIa cod, and the importance of Division IIIa as a nursery area for cod from the North Sea as reported by Munk *et.al.* (in press) is apparent for all year classes since 1991.

A similar analysis for herring year classes 1990 to 1993 indicates a more consistent distribution pattern with only minor variation between years. The distribution by quarter of the 1990 year class as 0-, 1- and 2-ringers in 1991 to 1993 is given in Figure 3.16 as an illustration. Juveniles are confined to the south-eastern North Sea and Division IIIa, whereas 2-ringers and older herring are found in the western and northern areas. The distribution pattern in the first quarter is similar to the pattern observed in the period 1983-1993 (Lorance, 1995).

3.1.6 Conclusions

Some Working Groups have been asked in their terms of reference to consider the potential usefulness of quarterly IBTS data in their assessments.

Since several years the North Sea Demersal Working Group uses abundance indices from quarter 1 (IBTS), quarter 3 (English and Scottish Groundfish Surveys) and quarter 4 (Dutch Groundfish Survey). In its recent meeting (ICES, Doc. C.M.1996/Assess:6) the Working Group analysed the influence of the inclusion of some additional preliminary IBTS data for quarters 2 and 4 for cod, haddock and whiting in the RCT3 program, which is used for the estimation of recruitment, and also in tuning the VPA. The Working Group concluded that the quarterly surveys were found 'to provide useful contributions to the assessments for several stocks as indicated by the weights assigned to these data in trial VPA tunings and recruitment estimations'. The Working Group was however 'hesitant to use the data yet, in order not to put large weight on something which may prove to be spurious correlations'. The general opinion was that the quarterly surveys are potentially very useful in the assessments, but that it was too early to reach firm conclusions.

Also the Herring Assessment Working Group for the Area South of 62° N (ICES, Doc. C.M.1995/Assess:13) analysed preliminary survey indices for herring for all quarters of 1991-1994, but concluded that the time series was too short for a statistical evaluation. The Herring Assessment Working Group did not expect that the quarterly surveys would provide better information than already provided by the first quarter IBTS for 1-ringers, and the MIK estimate for 0-ringers. Only for sprat the fourth quarter data might provide a usable 1-group index, which would be valuable as an early predictor of year class strength.

Based on the analyses by the present Working Group it can be concluded that possibilities for a better use of IBTS data, seem to exist for several species / quarter / age-group combinations. At the same time, however, due to the poor coverage in quarter 4 in Division IIIa in the years 1992-1994, it is not to be expected that certain indices, such as those for 0- and 1-group herring, will be better than the ones used so far.

All quarters, however, provide valuable information for one or more of the target species. If possible, continued coverage of the total area in all four quarters should be considered. Ideally, the effort should be spread evenly over time and space.

Quarterly surveys provide four times more information on stock abundances in the form of time series than annual surveys. This additional information offers considerable potential for improved estimation of recruitment and tuning of VPA results, especially seen in the light of the decreased reliability of official landings statistics.

The results of the quarterly IBTS surveys in the North Sea, Skagerrak and Kattegat are not only relevant for the estimation of recruitment and VPA tuning, but for a variety of research topics, such as: multispecies modelling, the study of migration, technical measures (e.g. spatial / temporal boxes), and environmental assessments which study the spread of contaminants in fish or fish diseases.

3.2 Future Surveys and their Coordination

In Section 3.1.6 it was concluded that continued coverage of the total area in all four quarters should be considered.

For some countries, however, it has proved impossible to keep the research vessel effort at the same high level as in the last 5 years. In the light of recommendation C.Res. 1994/4:5 most countries have focused on quarters 1 and 3 when they asked for ships time for 1996. The ships time that probably will be available for the IBTS in 1996 is:

	Ship time (days)			
Country/quarter	1	2	3	4
Denmark	20	-	-	22
England	-	-	28	31
France	20	-	20	-
Germany	25	-	10	-
Netherlands	19	-	5	-
Norway	32	23	-	32
Scotland	19	21	21	-
Sweden	15	-	15	-
Total	150	44	99	85

Complete coverage of the North Sea, Skagerrak and Kattegat should be possible in quarters 1 and 3 in 1996. In the first quarter more ships time is needed than in the other quarters, because of the additional sampling of herring larvae. In addition, the weather conditions in quarters 1 and 4 are often rather poor.

As far as the second quarter is concerned, Norway and Scotland will undertake a joint survey.

In the 3rd quarter the Netherlands has planned a beam trawl survey in the central North Sea. This will enable a comparison between the catchabilities of the GOV-trawl and the beam trawl for different flatfish species and rays.

England prefers to continue its coverage during the fourth quarter for at least another two years, to have a sufficient long time series to judge the usefulness of this quarter's data for assessment purposes. Norway is also likely to continue its contribution in quarter 4. In order to improve the coverage during quarter 4, Denmark has shifted its ships time from the third to the fourth quarter.

If it proves impossible to keep enough ships time for all quarters, it would be most appropriate to focus on quarters 1 and 3. For quarter 1 the longest time series exist, and the results of this survey are used in the assessments of several species. For quarter 3 the second longest time series exists. Also for this quarter it can be said that survey results have proven to be useful in the assessments of a number of species. Furthermore, the greatest difference in the fish community of the North Sea in the course of the year, can be seen between quarters 1 and 3, e.g. due to the immigration of mackerel and horsemackerel in summer.

On the other hand, an argument for the continuation of the quarter 4 surveys, would be the simultaneous coverage of western and southern areas and the North Sea, which would result in a complete coverage of the distribution area of mackerel and horse-mackerel.

For the near future, Norway and Scotland will cooperate to achieve the best coverage possible in quarter 2. The Netherlands (Henk Heessen) will continue the coordination of the IBTS survey in quarter 1, England (Trevor Boon) will coordinate the surveys in quarters 3 and 4.

3.3 GOV Rigging: Influence of Different Sweep Lengths

For historic reasons the manual of the IBTS survey recommends, only for the quarter 1 survey, sweep lengths of 60m for fishing in shallow areas and 110m at stations deeper than 70m to avoid possible changes in gear parameters due to depth and to the length of the warp. For the other three quarters only sweep lengths of 60m should be used. To standardise the fishing method for all quarters, it was recommended at the last meeting of this Working Group to investigate the influence of different sweep lengths on the catch.

During five days in June 1994 and three days in June 1995 aboard the German FRV "Walther Herwig III" two experiments were carried out within a small area of 100 nm^2 off the east coast of Scotland, to estimate the difference in catch rate using 60m and 110m sweep lengths. The position of the stations and the tow directions were randomly selected at a daily basis, to minimise the effects of variables like wind and current on the catch. Within the area the depth varied from 92 to 101m. In 1994 20 hauls were carried out using sweep lengths of 60m and 19 hauls with lengths of 110m and in 1995 12 and 11 hauls respectively. Unfortunately the gear parameters could not be measured during the experiments, due to problems with the wireless echosounders.

For cod, haddock, whiting and herring the analysis of the catch data shows differences in the mean catch, especially for herring (Figures 3.17). Using the more extensive data set for 1994 and the nonparametric Mann-Whitney U-test for comparing the frequency distributions of the catch in weight data for each species, the differences are statistically not significant at the 5% level.

Figures 3.18 - 3.21 show the length distributions for each species and sweep length in the catches of 1994. The length range of each species covers mainly the youngest year classes and the numbers for cod are low. For the young gadoids there are no differences. Only for herring, the portion of smaller fish is bigger when 60m sweeps are used. This seems to be more an effect of the higher variability of the herring catches due to the schooling behaviour, and the higher mobility of this pelagically living species in entering and leaving the small study area.

After a lengthy discussion the Working Group concluded that the results of these experiments are not clear enough to change the procedure of using different sweep lengths in the first quarter. This analysis only deals with the youngest year-classes and the IBTS-data are not used by the assessment Working Groups only to calculate recruitment indices, but also to tune the VPA for the older age-groups. Norwegian experiments demonstrated a herding effect of longer sweeps, especially for large cod in the Barents Sea (Engås and Godo, 1989). Furthermore the number of hauls is rather small.

The ICES Secretariat offered to extract data from the IBTS Database for hauls where different sweep lengths are used. MAFF will analyse these data for possible differences in the catch rates due to the use of different sweep lengths, and if possible calculate conversion factors.

3.4 Improvements in Data Collection

3.4.1 Biological data

As far as the collection of biological data is concerned, it was decided that no data for otoliths of fish with growth deficiencies (deformed fish) should be submitted to the ICES IBTS Database.

3.4.2 Environmental data

Hydrographic and nutrient data, collected during IBTS cruises, are submitted to the ICES Oceanographic Data Bank on a regular basis. For proper identification of the data, it is important that cruise summary reports (ROSCOP forms) are used when data are sent to ICES. The ICES Hydrographic Officer provided the Working Group with an overview of the data he received for 1994 and 1995. Since no problems exist in the present submission of the data, no suggestions for further improvements are made.

3.5 Database Matters

3.5.1 Status

The ICES Secretariat has received data from all countries participating in the IBTS for all quarters of the years 1991-1994. Only few countries have already supplied data for 1995 quarters 2, 3, and 4. Table 3.13 gives an overview of the present status. The data for 1991-1994 have been checked and corrected. There are, however, still some minor problems with the ALK data (see below), which will have to be sorted out in the near future.

The tasks given to the ICES Secretariat by the present Working Group, regarding the update of the IBTS database and the processing of the quarterly survey data, have together with a large number of requests of IBTS data (and the increased administration regarding these requests) meant an increase in workload of the Secretariat. Several tasks are still far from finalised. Pending tasks are:

- Change the SIR database so that sex disaggregated length data (HL records) can be stored and handled.
- Change the SIR database so that 0-group data can be stored and handled.
- Develop a retrieval program in SIR that can produce maturity ogives.
- Develop a new mapping program since the old HP plotter is outfaced.
- Develop a SIR program that can produce files with aggregated data as specified in the 1994 IBTS Working Group report.
- Include correction factors for Granton and Aberdeen trawls in SIR calculations for Q3 data.
- Document the changes to the SIR database.
- Develop a checking program which can be distributed to participating countries.
- Finalise the revision of Q1 data for 1991-1993 according to the new format, including ALK substitutions and comparisons with "old format" data.
- Checking, revising, loading, compiling of corrected ALK data for 2nd, 3rd, and 4th quarter 1991-1994.
- Process Q2, 3 and 4 data from 1995.
- Produce reports on quarterly surveys.
- Develop a database for environmental data.
- Develop a checking program, checking and loading of environmental data.
- Data requests.

With the present amount of resources allocated to the IBTS tasks in the Secretariat it is estimated to take about 1.5 years to finalise the above jobs. In reality it will take longer because also the survey data for 1996 and 1997 have to be processed. In addition it is not unlikely that within the next couple of years the computer system will have to be upgraded and experience indicates that this seldom happens without problems for the IBTS database (as well as for other databases).

During this meeting it was considered important, to add saithe to the list of IBTS standard species. This means that saithe should be included in the annual IBTS reports. It also means that the SIR database must be revised. It is not very simple to include a new standard species in the SIR database, although it is difficult to judge exactly how difficult it will be. The main problem is that the species specific settings of ALK threshold limits, index standard areas etc., are imbedded in the coding of the program (which is about 25 000 lines of code).

It was suggested that the production of a checking program not necessarily must be done by the ICES Secretariat. It could also be part of an EU financed IBTS project dealing with the input of historic IBTS data. Also for this project a checking program would be very helpful.

Particular errors are difficult to check by any checking program. Such errors include missing ALK records (by mistake not submitted to ICES) and wrong data in the right format (for instance ICES received data from another year than stated in the data!!!). These errors are extremely difficult to discover, but can have a large impact on the indices calculated. To overcome part of the problems, the following recommendation from the last Working Group meeting was reiterated: countries should clearly specify the number of records per record type and the number of CA records per species when data are submitted to the ICES Secretariat.

3.5.2 ALK data

The ICES Secretariat provided the Working Group with the age/length keys for the seven target species for quarters 2, 3, and 4 for the years 1991-1994. The new form of presentation, where all data for a given species and RF area are presented on one page, and where zeros are blank filled make checking much easier.

It is suggested that the relevant length distribution, to which the ALK will be applied, be included in the layout.

It is also suggested that instead of combining areas 1 to 9 as total ALK, summations are made of areas 1 to 7 and of 8 plus 9.

Problems encountered with the ALK data for quarters 2, 3, and 4 of 1991-1994 fell into three categories:

a) single fish falling outside the main body of the ALK, i.e. large young fish or small old fish;
b) blocks of fish falling outside the main body of the ALK;
c) ends missing from, or gaps within the main body of the ALK.

In a) these fish may be correct or either the age or the length may be incorrect. For ICES staff to identify individual fish, and then refer the problem back to the submitting institute and await a reply, is a time consuming process. The recommended solution, therefore, is simply to delete the offending fish.

In b) the problem may be more serious. The data may be incorrect due to ageing mistakes, or the data may be correct but not suitable for inclusion in the ALK. For example there may be spring spawners in the herring, or fish from a local slow growing stock or they may be, as occurs occasionally with haddock, deformed fish with compacted spines. It is recommended that these problems are referred back to the submitting institute. It is also recommended that institutes take special care to avoid submitting such data.

In c) the problem should be solved by adding in age/length data from adjacent areas (see Table 3.14). Where doubt exists the ALK's should be inspected by dedicated pelagic or demersal members of the Working Group, who should indicate which keys to use. Addition of the length distribution to which the key should be applied to the print of the ALK will facilitate decision making.

3.6 Reports of the Quarterly Surveys

The reports of the quarterly surveys will be produced with the tables and charts which are standard for the quarter 1 reports. The additional text will be minimal, and only provide some basic information.

4. SURVEYS IN SUB-AREAS VI, VII AND VIII AND DIVISION IXA

4.1 Introduction

Pelagic fish stocks, such as mackerel and horse mackerel, are distributed over an extensive part of the western European continental shelf. In contrast, stocks of demersal species in this area, are usually limited to much more confined areas. Recruitment surveys which have the pelagic species either as primary or secondary target, require an international approach. A clear need for coordination and, if possible, standardisation of these surveys exists.

In 1991 a Study Group was established to investigate the area coverage by quarter in Sub-areas VI, VII and VIII and Division IXa, and to improve the coordination and standardisation of the existing surveys (Anon., 1991). At the ICES Annual Science Conference in St. Johns in 1994 it was decided to incorporate this Study Group into the International Bottom Trawl Survey Working Group.

In the text below Sub-areas VI, VII and VIII and Division IXa will be referred to as 'Western and Southern areas'.

4.2 Overview of Existing Bottom Trawl Surveys

An extensive overview of the bottom trawl surveys carried out in the western and southern areas until 1991 was presented in Anon. (1991). An updated list is presented in Table 4.1, which contains information available to the Working Group at the time of the meeting. Table 4.2 summarises information on the possible continuation of these surveys in 1996 and 1997.

The main differences between the previous (Anon., 1991) and the present list (Table 4.1) are:

- the Scottish Groundfish Survey now includes also Division VIb;
- the Irish Sea Recruit Survey (ISRS) in Division VIIa, which started in 1983, is included;
- the West and South Coast of Ireland Recruit Survey (WSCRS), which started in 1992, is included;
- the North Wales Gadoid Survey (NWGF) stopped in 1991;
- the Celtic Sea and Western Approaches Groundfish Survey (CLGF) is not longer carried out in quarter 4;
- the Northern Ireland Groundfish Survey, which started in 1990, is included;
- the English Channel Groundfish Survey (ECGF) stopped in 1991;
- the German Survey in the Western Waters (GSWW), which started in 1991, is included;
- the Spanish Survey in the Bay of Cadiz (SpGOC) is included.

4.3 Area Coverage

The bottom trawl surveys in the first, second and third quarter cover only a part of the western shelf (see Figures 3.1 - 3.3 in Anon., 1991). The surveys in quarter 4, however, have a more or less comprehensive coverage of the area as shown in Figure 4.1. Since 1991 the area coverage in quarter 4 has remained more or less unchanged. Some changes, however, could take place in the near future, depending on the use of the mackerel recruitment indices in the assessment by the Working Group on the Assessment of Mackerel, Horse mackerel, Sardine and Anchovy. Both in 1994 and in 1995 it was decided not to use the mackerel indices (Anon., 1994 and 1995). If the indices are still not used in the next few years, it is likely that some surveys will not be continued.

This holds especially for the Dutch Mackerel/Horse Mackerel Recruit Survey in quarter 4. Also, the Scottish Mackerel Recruit survey in quarter 4 will possibly be restricted to the area north of 55°N and become mainly targeted towards roundfish for the same reason.

Even in case the Dutch survey would stop completely, and the area of the Scottish survey would be restricted, the coverage of the western European shelf in quarter 4 would still be quite good. This is due to the large degree of overlap between the Scottish and the Irish West of Ireland survey, and between the Dutch and the French survey. However, an important area such as the western Channel would no longer be covered.

The IBTS Working Group therefore, recommends continuation of all quarter 4 bottom trawl surveys in the western and southern areas to achieve complete coverage. This is expected to improve the recruitment indices of the pelagic species.

4.4 Target Species and Use of Data

The present surveys in the western and southern areas are mainly designed to satisfy national needs and to provide information on, predominantly demersal, commercially important species (see Table 4.1). Cod, haddock and whiting are the main species in the northern part of the area (Sub-areas VI and VII) while hake, angler and megrim are more important in the southern part. The mackerel recruitment indices are presently obtained by combining the results of seven surveys carried out in the western areas.

Data from most of the present national surveys are used by ICES assessment Working Groups (see Table 4.3) in VPA tuning and in the estimation of recruitment.

Approximately 1000 bottom trawl hauls are carried out annually in the western and southern area, half of which are taken in quarter 4. The Working Group has, however, the impression that, despite the enormous amount of effort, better use could be made of the data.

4.5 Data Exchange

Following the recommendation of the former Study Group (Anon., 1991), the IBTS Working Group recommends that the IBTS exchange format is used as standard in the exchange of data and requests the national laboratories to make their data available in this format.

4.6 Database

The IBTS Working Group recommends the establishment of an ICES database for the western and southern bottom trawl surveys. Once this database is established it should contain data from the surveys listed in Table 4.1.

The total number of hauls per year throughout the western and southern areas is about 1000: 170 tows in quarter 1, 110 in quarter 2, 210 in quarter 3 and 520 in quarter 4.

When establishing this database, priority should be given to the surveys carried out during quarter 4.

As a rough estimate, one man year would be needed to modify the skeleton of the existing IBTS database. Half a man year would be needed to import the data from the surveys carried out during the fourth quarter over the last 10 years. It is, at present, impossible to indicate the specifications for a standard analysis of the survey data.

4.7 Coordination and Standardisation

The former Study Group (Anon., 1991) only achieved limited progress in coordination and standardisation. This is, partly, because the Study Group only worked by correspondence since its first meeting in 1991. It is expected that more progress will be made now the Study Group is merged with the IBTS Working Group.

Jean-Charles Poulard (IFREMER, Nantes) was appointed as coordinator of the western and southern trawl surveys.

Ideally, a completely new depth and area/latitude stratified station grid should be prepared. However, a newly stratified station grid for the whole area would not be acceptable, because it would disrupt all existing time series. It is, therefore, proposed to incorporate the depth stratified station grids of existing surveys into a new station grid for the whole western European shelf, even though the existing surveys are carried out with different gears. This has the advantage that the existing surveys can be continued, while at the same time an international coordinated survey can start. Partly overlapping coverage by the GOV trawl with areas where another gear is used, and overlap for example between the Spanish and Portuguese surveys, will in future provide the possibility to combine the data from different surveys.

4.8 Manual

The Working Group recommends that the surveys in the western and southern area are coordinated and preferably standardised according to a new manual.

A proposed manual for the western and southern areas is added to the existing IBTS manual (see section 5).

4.9 Conclusions

A more or less complete coverage of the western European shelf is achieved in the fourth quarter by a variety of national bottom trawl surveys, whereas in the other quarters the coverage is less complete. To achieve a better use of the survey data, the Working Group recommends that these surveys are coordinated and preferably standardised. Furthermore, it is recommended that all fourth quarter surveys in the area are continued in order to maintain complete coverage of the whole area.

The Working Group recommends that a depth and area/latitude stratified station grid for an international coordinated survey should be prepared and discussed at its next meeting. This station grid should include all depth stratified station grids of existing surveys, even though some of these surveys are carried out by other gears than the GOV trawl.

The Working Group recommends that an ICES database is established for the western and southern surveys to allow a better use of the survey data.

The coordinator of the western and southern surveys (J.C. Poulard) will continue to collect the data of all fourth quarter bottom trawl surveys in these areas in IBTS exchange format, to enable an easy exchange of data between participants and to prepare the data exchange as soon as an ICES database is established.

Countries involved in surveys in the fourth quarter are encouraged to participate in an international trawl survey. The Working Group recommends that at its next meeting all contact persons of the present national surveys are represented.

In order to achieve as much progress as possible in a relatively short time, the Working Group recommends that its next meeting should be held in January 1997 with terms of reference only dealing with the bottom trawl surveys in the western and southern areas.

5. MANUAL

The IBTS manual was revised during the meeting. The amendments and additions agreed at the previous meeting of the Working Group (ICES, Doc. C.M.1994/H:6) were incorporated and some minor alterations were made to the net drawing (Figure 2.1 of the Manual). In addition the following amendments or alterations agreed at the current meeting were included in the manual :

1. Sampling by depth stratification is recognised as an important consideration in some statistical rectangles with steep depth gradients and attention is drawn to this feature.

2. An alternative method of weighting the groundrope by interspersing steel discs with the rubber discs is recommended.

3. A description is given of the method to achieve good bottom contact by adjusting the chain between the lower leg and the bumper bobbins.

4. It is preferable to only conduct trawling during daylight hours, although it is recognised that some institutes may wish to trawl both during day and night.

5. Fish with growth deformities should not be otolithed.

6. More otoliths should be obtained from target species at the larger length classes.

7. The period of fishing with the Methot Isaac Kidd (MIK) net is re-defined.

One of the main Terms of Reference for the Working Group was to implement the coordination of surveys in Sub-Areas VI, VII and VIII and Division IXa. In order that these surveys could be conducted to a recognised standard, it was found necessary to produce a manual. There was much discussion whether it was best to produce a separate manual for the new areas, or whether the current North Sea manual was also suitable for the additional western and southern areas. It was found that a significant proportion of the current manual could be applied to the western and southern areas, but certain procedures were unique either to the North Sea or to the other areas. The text for the new areas was written, but because some countries closely associated with these surveys were unable to attend the meeting, this text is only included in the manual as an appendix for further discussion. If approved by all participants, these draft proposals may be included in the manual at a later date.

Amendments were made to the IBTS exchange format to accommodate its future use in the western and southern surveys.

6. OTHER MATTERS

6.1 Coordination of Beam Trawl Surveys

Beam trawl surveys in the North Sea are presently being coordinated by the Study Group on Beam Trawl Surveys. No effort has yet been made in preparing the beam trawl data for an international database, and progress in this direction will take some time (a meeting of the Study Group is planned to take place in March 1996). If the Study Group on Beam Trawl Surveys would be combined with the IBTS Working Group, the work load of the extended IBTS Working Group will increase, and, seen in the light of the problems encountered with the inclusion of the responsibilities for the western and southern surveys during the present meeting, it is inevitable that not all delegates from both groups will be able/allowed to attend.

The IBTS Working Group is of the opinion that it should be given some years to fully integrate with the Study Group on surveys in Sub-Areas VI, VII, VIII and Division IXa, before merging with yet another Study Group should be considered.

6.2 EU Project: Input of Historic IBTS Data

For years prior to 1983 the ICES IBTS Database contains only data for a limited number of countries. Although countries have been asked for many years to supply the missing data from first quarter surveys, not much progress to achieve this has been made. An EU project, in which the Netherlands, England, Scotland, Norway, Sweden, Germany and ICES participate, aims at submitting data on the missing surveys as far back in time (1965) as possible. The project is coordinated by RIVO IJmuiden. It will begin in 1996 and last for 3 years.

6.3 EU Project: Monitoring Marine Biodiversity

Final contract negotiations are underway with the Commission of the European Community for a research project which is intended to find ways to use existing groundfish surveys for monitoring marine biodiversity, in addition to their primary role for monitoring commercial fish stocks. Marine biodiversity has become increasingly important following signing of the Convention on Biodiversity in Rio de Janeiro by the EU and several european countries. Small beam trawls, dredges, grabs and other sampling devices will be assessed for their suitability for deployment on groundfish surveys, either between stations or when fishing has stopped overnight. It is expected that a wide range of fish and epibenthic species could be collected in this way, and when the best sampling techniques are established, a coordinated biodiversity monitoring programme begun. The project will also involve analysis of existing data on non-commercial species taken in trawls, the development of taxonomic keys for easy use on survey vessels, and consideration of the biodiversity measures to monitor, and the ways of reporting them. Partners in the project, which is due to start in 1996 and last for 3 years, are Norway, Denmark, Germany, England and Scotland. Coordination is by MAFF at Lowestoft.

6.4 Intercalibration of Groundfish Surveys

A working paper which addressed the problem of intercalibrating groundfish surveys was presented to the Working Group by J. Cotter. The method described uses multivariate autoregression to model abundance indices taking into account the lack of independence between the results for different age groups and species within each year. The models permit intercalibration factors to be estimated for the different surveys to reflect their different geographic and temporal coverage, as well as gear differences or deliberate changes. Further development at MAFF Lowestoft is intended.

6.5 The International Bottom Trawl Survey in the Mediterranean (MEDITS)

6.5.1 Background

For many years, the four Mediterranean countries of the EU (Spain, France, Italy and Greece) have conducted bottom trawl surveys in their national waters, but these surveys used different methodologies (gear, sampling scheme, etc.). For management purposes, the European Commission (DG XIV) expressed the need of a more integrated programme. The results could also be used in developing new regulations in the Mediterranean. Because the commercial data (landings statistics, age or length composition of the catches, fishing effort, etc.) are far from reliable, it was decided to estimate stock sizes by a trawling survey.

6.5.2 Geographical context

The Mediterranean Sea is characterised by rather small continental shelves and very steep slopes (for example, off the Provence coast, the 1000 m depth line is only at two nautical miles from the coast). Hence the exploitable areas are very limited and the commercial trawlers are used to work in rather small areas, down to around 400 m depth, off the Spanish coast, around the Balearic Islands, in the Gulf of Lion, alongside the western Italian coast and the eastern coast of Corsica (Ligurian and Tyrrhenian Seas), around Sardinia, around Sicily, off the southern Italian coast (Ionian Sea), in the Adriatic Sea and in the Aegean Sea. To investigate these areas in more detail than the commercial fleets are currently doing, the programme has been designed to trawl to a depth of 800 m.

Furthermore, due to the constant temperature throughout the year of around 14 degrees under the thermocline, it is rather difficult to read otholiths. It has therefore been decided to report only length frequencies.

6.5.3 Basis of the survey

The programme started by the end of 1993 with the establishing of a survey protocol. The first survey took place in spring and early summer 1994 and the second in the same period in 1995. The sampling scheme is random stratified by depth. The depth limits are: 10-50, 50-100, 100-200, 200-500 and 500-800 m. Using these limits and some lines perpendicular to the coast, the strata are defined. In total 176 strata are sampled representing a total surface of 464 000 km^2. Sampling intensity is about one haul per 60 nm^2 in all areas except for the Adriatic Sea, where it is one haul by 200 nm^2, due to the rather flat and monotonous grounds of that sea. For practical purposes, the survey area has been divided into 8 sub-areas: Spain, France, Italy Tyrrhenian Sea, Italy Sardinia, Italy Sicily and Calabria, Italy Ionian Sea and southern Adriatic, Italy northern Adriatic and Greece. In the present programme 8 vessels and 11 research institutes are involved.

6.5.4 Sampling gear

To allow trawling with the same efficiency at depths between 10 and 800 m, it was necessary to design a new trawl. The design of this trawl (Ref. IFREMER GOC 73) is given in Figure 6.1. The mesh size in the codend is 20 mm (stretched). The 1994 survey together with an ad hoc survey conducted in Italy in winter 1995 have been used to define the proper rigging. As far as possible all hauls are made with a Scanmar device to measure the vertical net opening and wingspread. These average around 2.5 and 17 m respectively.

6.5.5 Sampling methodology

Hauls are made during daylight only (between 30 minutes after sunrise and 30 minutes before sunset). Trawling speed over the ground is 3 knots. Due to the gear behaviour in various depths and grounds, the precision of the speed measurement is very crucial (0.2 kts). Haul duration is 30 minutes at depths less than 200 m and one hour at greater depths. The course during the trawling operation should be as rectilinear as possible (this is not possible in certain cases such as in the Aegean Sea where the course can be nearly circular around some rocks) and, if possible, the depth should be kept constant (within 10%) during the haul.

The catch is divided into five categories: fish, crustaceans, cephalopods, other commercial species, other animal species. For all species, at least the total weight and number are reported. Furthermore, for 30 standard species, the length frequencies should also be reported by sex and with an indication of the maturity stage.

6.5.6 Data exchange

A common exchange format has been defined. The data are presented in three data files containing respectively: haul information, catch composition for each haul (total weight, total number, number by sex) and length frequencies by haul for the 30 standard species. A data checking program has been written and distributed to all participants allowing them to check and correct the data before these are sent to the international coordinator.

6.5.7 First results

After the first two years, it has been possible to calculate abundance indices in weight and in number (total, by sex, by length) by stratum and for each of the eight sub-areas. These indices can also be calculated, in each sub-area, from 10 to 200 m and from 200 to 800 m. The indices are calculated using the towed surface and the surface of the strata and sub-areas as stratificator. The program performing these calculations also provides length frequencies by stratum for the standard species.

6.5.8 Future of the programme

In 1996, four new countries should join the programme: Slovenia, Croatia and Albania, to cover completely the Adriatic Sea, and Tunisia, to cover the Sicily Channel. Syria and Lebanon also show interest in the programme. Two Working Groups will be established: a data base Working Group to explore the possibility (hardware, software, concepts) of the creation of a common database allowing all kinds of request, and a methods Working Group which will explore possible improvements of the sampling scheme, new indices which could be calculated, other use of the data (factorial analysis, GIS, etc.). In 1997, a symposium is planned to allow the scientific community to expose any related work in this field. A call for papers will be widely distributed in Europe and North Africa.

7. RECOMMENDATIONS

For the IBTS Working Group:

1. It is recommended that a similar analysis of the variability of quarterly indices, as presented for cod and herring in Section 3.1.4, should be carried out for the other IBTS target species.

2. When IBTS exchange data are submitted to ICES, the number of records for each record type and the number of CA records per species should be specified.

3. The Working Group recommends that a depth and rectangle stratified station grid is prepared for the Skagerrak/Kattegat area.

4. The Working Group recommends that a depth and area/latitude stratified station grid for the western and southern area is prepared, which incorporates existing depth-stratified survey grids, and which is to be discussed at the next Working Group meeting.

For the Pelagic and Demersal Fish Committees:

1. The Working Group recommends continued coverage of the total North Sea, Skagerrak and Kattegat in all four quarters. Ideally, the effort should be spread evenly over time and space.

2. The Working Group recommends continuation of all 4th quarter bottom trawl surveys in Sub-areas VI, VII and VIII and Division IXa.

3. The Working Group recommends that the surveys in the western and southern areas be coordinated and preferably standardised.

4. The Working Group recommends that in January 1997 a meeting is held for 5 days (preferably in one of the southern countries) with terms of reference only dealing with the surveys in the western and southern areas in order improve coordination and standardisation.

5. The Working Group recommends that at its next meeting all coordinators of western and southern surveys be present.

6. The Working Group recommends that ICES establishes a database for the western and southern surveys.

7. The Working Group recommends that the IBTS exchange format be used for the western and southern surveys.

8. The Working Group recommends that it should be given some years to fully integrate with the former Study Group on surveys in Sub-Areas VI, VII, VIII and Division IXa, before merging with yet another Study Group is considered.

8. REFERENCES

Anon. 1991. Report of the Study Group on the Coordination of Bottom Trawl Surveys in Sub-areas VI, VII and VIII and Division IXa. ICES, Doc. C.M. 1991/G:13 pp 33.

Anon., 1994. Report of the Working Group on the Assessment of Mackerel, Horse mackerel, Sardine and Anchovy, June 1994. ICES, Doc. C.M. 1995/Assess:2.

Anon.1995. Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks. ICES, Doc. C.M. 1995/Assess :1.

Anon.1995. Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks. ICES, Doc. C.M. 1995/Assess :6.

Anon., 1996. Report of the Working Group on the Assessment of Mackerel, Horse mackerel, Sardine and Anchovy, October 1995. ICES, Doc. C.M. 1996/Assess:7.

Engås, A. and O.R. Godø, 1989. The effect of different sweep lengths on the length composition of bottom-sampling trawl catches. J. Cons. int. Explor. Mer 45: 263-268.

Lorance P. Herring distribution in the North Sea: Changes with age within adult population. ICES, Doc. C.M. 1995/H:17.

Munk P., P-O. Larsson, D. Danielsen and E. Moksnes. Larval and juvenile cod (*Gadus morhua*) concentrated in the highly productive areas of a shelf break front. Marine Ecology Progress Series. (in press).

Table 3.1 Number of hauls and days at sea per country for each of the quarterly surveys 1991 - 1995

Year	1991								Total	
Quarter	1		2		3		4		Total	
	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea
Denmark	40	15					70	19	110	34
France	77	23							77	23
Germany	92	22	70	19					162	41
Netherlands	69	22	93	26	73	19	72	27	307	94
Norway	53	17	38	15			47	17	138	49
Sweden	54	20	43	15	52	15			149	50
UK (England)			73	30	87	27	61	28	221	85
UK (Scotland)	59	20	54	20	90	20			203	60
Total	444	139	371	125	302	81	250	91	1367	436

Year	1992									
Quarter	1		2		3		4		Total	
	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea
Denmark	40	16					58	21	98	37
France	53	19			61	17			114	36
Germany	92	27	65	18	48	12			205	57
Netherlands	45	14	67	17	32	11	70	19	214	61
Norway	49	15	55	16			69	24	173	55
Sweden	44	15			47	15			91	30
UK (England)					72	31	73	31	145	62
UK (Scotland)	57	20	69	20	87	20			213	60
Total	380	126	256	71	347	106	270	95	1253	398

Year	1993									
Quarter	1		2		3		4		Total	
	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea
Denmark	45	13					49	14	94	27
France	51	20			70	19			121	39
Germany	65	19	12	4					77	23
Netherlands	74	24	68	19	65	17	80	22	287	82
Norway	49	25	34	10			60	25	143	60
Sweden	46	15	48	14	50	15			144	44
UK (England)					71	27	72	28	143	55
UK (Scotland)	50	20	71	20	87	20			208	60
Total	380	136	233	67	343	98	261	89	1217	390

Year	1994									
Quarter	1		2		3		4		Total	
	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea
Denmark	50	18					72	26	122	44
France	54	18			55	19			109	37
Germany	84	25	71	19					155	44
Netherlands	46	20	52	17	42	10	55	20	195	67
Norway	27	21	67	15			89	28	183	64
Sweden	48	15	51	15	50	15			149	45
UK (England)					73	23	74	33	147	56
UK (Scotland)	56	22	77	21	89	20			222	63
Total	365	139	318	87	309	87	290	107	1282	420

Year	1995									
Quarter	1		2		3		4		Total	
	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea	No. Hauls	Days at sea
Denmark	45	17					78	26	123	43
France	50	16					46	15	96	31
Germany	68	21	71	20					139	41
Netherlands	35	14	28	8	34	9	39	15	136	46
Norway	49	37	72	25			80	31	201	93
Sweden	49	15	49	15	51	15			149	45
UK (England)					74	30	74	29	148	59
UK (Scotland)	46	22	66	17	87	20			199	59
Total	342	142	286	85	246	74	317	116	1191	417

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

Quarter 1

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	814	421	168	121	44	538	261	0	0	2,367
Haddock	1,222	1,210	704	386	0	0	276	0	0	3,798
Whiting	833	927	686	662	421	1,345	640	0	0	5,514
Norway Pout	332	167	108	62	0	0	76	0	0	745
Herring	1,895	610	460	1,149	382	2,929	2,118	412	719	10,674
Mackerel	73	1	2	0	0	0	0	0	0	76
Sprat	14	5	190	379	200	1,912	650	39	245	3,634

Quarter 2

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	656	683	194	109	55	754	282	278	256	3,267
Haddock	1,173	909	558	387	3	15	322	111	23	3,501
Whiting	710	753	464	454	368	966	433	197	156	4,501
Norway Pout	347	196	122	126	0	13	39	0	0	843
Herring	702	505	594	636	263	344	147	240	346	3,777
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	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	503	419	272	106	14	86	146	0	0	1,546
Haddock	645	1,266	823	538	102	2	178	0	0	3,554
Whiting	1,133	636	724	321	210	435	262	0	0	3,721
Norway Pout	229	96	96	39	0	0	25	0	0	485
Herring	225	386	374	339	41	144	54	0	0	1,563
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	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	374	150	31	27	30	354	112	97	325	1,500
Haddock	2,362	569	395	49	0	23	168	162	76	3,804
Whiting	469	532	372	184	157	890	337	209	333	3,483
Norway Pout	218	186	135	50	0	16	3	106	18	732
Herring	330	455	0	103	18	463	50	0	352	1,771
Mackerel	125	3	88	0	0	93	0	0	0	309
Sprat	100	303	100	117	180	513	100	0	28	1,441

TOTAL YEAR

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	2,347	1,673	665	363	143	1,732	801	375	581	8,680
Haddock	5,402	3,954	2,480	1,360	105	40	944	273	99	14,657
Whiting	3,145	2,848	2,246	1,621	1,156	3,636	1,672	406	489	17,219
Norway Pout	1,126	645	461	277	0	29	143	106	18	2,805
Herring	3,152	1,956	1,428	2,227	704	3,880	2,369	652	1,417	17,785
Mackerel	407	196	264	48	53	594	0	0	0	1,562
Sprat	114	351	398	687	595	2,668	781	72	428	6,094

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

Quarter 1

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	483	365	305	142	51	673	67	221	362	2,669
Haddock	972	689	900	317	0	128	249	202	57	3,514
Whiting	850	644	819	328	419	1,060	484	222	200	5,026
Norway Pout	279	158	190	71	0	0	75	101	61	935
Herring	808	643	306	500	228	775	562	352	462	4,636
Mackerel	109	23	5	0	5	6	0	0	1	149
Sprat	18	58	111	33	130	719	0	92	161	1,322
Saithe	161	2	0	0	0	0	0	0	0	163

Quarter 2

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	424	619	347	493	70	585	476	156	57	3,227
Haddock	876	913	777	652	2	8	381	52	0	3,661
Whiting	661	631	716	499	186	683	347	67	34	3,824
Norway Pout	245	251	147	224	0	0	48	21	0	936
Herring	451	343	477	239	66	543	396	371	500	3,386
Mackerel	90	102	46	98	3	168	5	0	0	512
Sprat	20	88	90	111	36	92	45	149	184	815
Saithe	443	79	15	5	0	0	8	46	0	596

Quarter 3

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	763	614	228	559	72	782	248	279	225	3,770
Haddock	1,912	1,232	1,049	503	1	3	197	0	0	4,897
Whiting	1,299	958	960	573	404	808	454	176	166	5,798
Norway Pout	502	189	119	142	0	0	13	59	4	1,028
Herring	512	598	479	411	206	218	239	249	604	3,516
Mackerel	101	322	189	123	107	210	92	71	33	1,248
Sprat	25	43	40	132	71	231	40	57	117	756
Saithe	727	9	19	0	0	1	7	109	36	908

Quarter 4

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	749	453	117	413	81	308	190	144	136	2,591
Haddock	1,158	731	1,029	529	0	22	260	154	26	3,909
Whiting	1,147	647	669	595	285	804	480	170	204	5,001
Norway Pout	540	250	163	272	0	0	28	99	0	1,352
Herring	731	311	113	751	190	399	410	187	0	3,092
Mackerel	206	62	16	24	79	157	4	0	15	563
Sprat	24	180	36	106	135	537	291	134	100	1,543
Saithe	344	1	1	0	0	0	30	0	0	376

TOTAL YEAR

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	2,419	2,051	997	1,607	274	2,348	981	800	780	12,257
Haddock	4,918	3,565	3,755	2,001	3	161	1,087	408	83	15,981
Whiting	3,957	2,880	3,164	1,995	1,294	3,355	1,765	635	604	19,649
Norway Pout	1,566	848	619	709	0	0	164	280	65	4,251
Herring	2,502	1,895	1,375	1,901	690	1,935	1,607	1,159	1,566	14,630
Mackerel	506	509	256	245	194	541	101	71	49	2,472
Sprat	87	369	277	382	372	1,579	376	432	562	4,436
Saithe	1,675	91	35	5	0	1	45	155	36	2,043

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

Quarter 1

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	959	464	263	310	39	335	243	278	362	3,253
Haddock	1,383	725	848	481	0	12	265	144	57	3,915
Whiting	1,019	620	715	629	561	1,370	189	209	200	5,512
Norway Pout	268	174	154	199	0	0	0	95	61	951
Herring	637	726	668	227	212	890	855	446	462	5,123
Mackerel	113	0	0	0	0	0	0	3	1	117
Sprat	0	87	133	158	113	471	320	21	161	1,464
Saithe	661	3	9	0	0	0	0	0	0	673

Quarter 2

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	525	365	200	544	15	149	196	622	406	3,022
Haddock	587	614	576	355	3	10	451	204	55	2,855
Whiting	453	469	491	370	167	423	206	183	177	2,939
Norway Pout	173	133	86	148	0	1	11	77	41	670
Herring	337	339	385	361	376	430	260	428	672	3,588
Mackerel	27	17	49	92	45	284	0	4	0	518
Sprat	0	105	143	187	163	232	100	138	171	1,239
Saithe	139	13	52	0	0	1	0	21	0	226

Quarter 3

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	738	470	126	633	57	388	175	277	215	3,079
Haddock	1,929	1,083	994	593	0	14	201	167	36	5,017
Whiting	1,283	805	752	1,005	504	1,047	394	149	154	6,093
Norway Pout	378	129	138	163	0	28	14	109	75	1,034
Herring	543	628	659	694	101	306	287	331	591	4,140
Mackerel	227	266	166	137	108	368	135	13	0	1,420
Sprat	17	156	147	179	177	266	24	33	163	1,162
Saithe	789	70	31	2	0	0	19	0	0	911

Quarter 4

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	597	218	37	99	36	350	201	188	51	1,777
Haddock	962	618	626	233	3	8	229	160	14	2,853
Whiting	790	525	462	355	157	783	117	124	126	3,439
Norway Pout	350	186	52	84	0	0	77	0	0	749
Herring	842	677	206	263	211	263	518	0	0	2,980
Mackerel	183	241	51	0	13	254	22	0	0	764
Sprat	0	114	318	97	190	290	73	0	0	1,082
Saithe	659	12	4	0	0	1	25	16	2	719

TOTAL YEAR

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	2,819	1,517	626	1,586	147	1,222	815	1,365	1,034	11,131
Haddock	4,861	3,040	3,044	1,662	6	44	1,146	675	162	14,640
Whiting	3,545	2,419	2,420	2,359	1,389	3,623	906	665	657	17,983
Norway Pout	1,169	622	430	594	0	29	102	281	177	3,404
Herring	2,359	2,370	1,918	1,545	900	1,889	1,920	1,205	1,725	15,831
Mackerel	550	524	266	229	166	906	157	20	1	2,819
Sprat	17	462	741	621	643	1,259	517	192	495	4,947
Saithe	2,248	98	96	2	0	2	44	37	2	2,529

Table 3.5 Number of otoliths per target species, by roundfish area and by quarter in 1994

Quarter 1

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	389	679	158	254	30	247	112	244	267	2,380
Haddock	704	1,129	944	328	0	2	234	210	70	3,621
Whiting	534	851	714	362	410	559	171	163	175	3,939
Norway Pout	231	347	218	158	0	0	72	74	70	1,170
Herring	549	690	530	433	95	566	486	740	584	4,673
Mackerel	0	32	2	0	0	0	0	0	2	36
Sprat	70	202	180	135	102	294	0	161	284	1,428
Saithe	27	1	8	0	0	0	0	0	0	36

Quarter 2

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	441	486	253	252	29	298	386	213	200	2,558
Haddock	755	651	689	427	1	0	246	135	60	2,964
Whiting	565	522	620	463	108	288	284	131	156	3,137
Norway Pout	193	206	118	153	0	0	65	65	43	843
Herring	557	961	495	499	293	396	645	604	465	4,915
Mackerel	122	36	19	51	14	239	73	40	1	595
Sprat	19	211	179	437	119	305	356	193	293	2,112
Saithe	278	7	37	1	0	1	7	0	0	331

Quarter 3

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	802	872	136	451	109	451	265	272	236	3,594
Haddock	1,682	947	844	416	0	1	140	189	37	4,256
Whiting	984	649	637	483	328	484	172	139	161	4,037
Norway Pout	326	147	114	157	0	0	9	84	40	877
Herring	607	701	626	336	150	253	242	533	640	4,088
Mackerel	170	137	174	76	214	387	0	245	12	1,415
Sprat	27	177	201	235	130	198	76	306	174	1,524
Saithe	548	17	21	0	0	0	3	0	0	589

Quarter 4

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	922	507	113	312	48	421	375	186	146	3,030
Haddock	1,130	2,584	556	272	0	3	230	0	0	4,775
Whiting	976	517	488	402	214	672	284	127	134	3,814
Norway Pout	450	120	55	142	0	0	25	82	0	874
Herring	1,141	834	132	478	260	435	523	100	100	4,003
Mackerel	143	91	40	72	50	182	12	0	0	590
Sprat	19	145	91	224	142	283	194	100	100	1,298
Saithe	346	1	0	0	1	0	19	12	0	379

TOTAL YEAR

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	2,554	2,544	660	1,269	216	1,417	1,138	915	849	11,562
Haddock	4,271	5,311	3,033	1,443	1	6	850	534	167	15,616
Whiting	3,059	2,539	2,459	1,710	1,060	2,003	911	560	626	14,927
Norway Pout	1,200	820	505	610	0	0	171	305	153	3,764
Herring	2,854	3,186	1,783	1,746	798	1,650	1,896	1,977	1,789	17,679
Mackerel	435	296	235	199	278	808	85	285	15	2,636
Sprat	135	735	651	1,031	493	1,080	626	760	851	6,362
Saithe	1,199	26	66	1	1	1	29	12	0	1,335

Table 3.6 Number of otoliths per target species, by roundfish area and by quarter in 1995 (preliminary)

Quarter 1

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	770	874	110	269	55	416	309	411	492	3,706
Haddock	762	962	848	321	0	0	310	237	80	3,520
Whiting	568	854	707	344	252	499	314	165	168	3,871
Norway Pout	272	271	272	146	0	0	45	98	59	1,163
Herring	604	863	414	387	173	663	558	791	579	5,032
Mackerel	0	6	5	0	0	0	0	0	0	11
Sprat	13	93	121	128	135	264	307	0	0	1,061
Saithe	361	5	0	0	0	0	0	0	0	366

Quarter 2

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	708	739	380	249	24	411	429	118	119	3,177
Haddock	679	599	685	319	50	64	237	488	427	3,548
Whiting	548	448	550	355	245	426	142	275	99	3,088
Norway Pout	213	171	217	138	6	5	41	162	224	1,177
Herring	601	750	631	709	157	493	433	190	126	4,090
Mackerel	109	162	83	100	35	217	74	493	644	1,917
Sprat	59	163	155	197	177	486	398	131	120	1,886
Saithe	106	1	6	0	0	0	0	221	320	654

Quarter 3

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	977	771	154	280	182	176	246	8	9	2,803
Haddock	1,599	1,028	859	372	36	33	132	383	330	4,772
Whiting	999	708	621	344	131	229	71	257	81	3,441
Norway Pout	390	161	137	117	0	0	6	213	216	1,240
Herring	333	527	418	330	0	48	25	118	48	1,847
Mackerel	126	108	110	15	25	25	0	476	649	1,534
Sprat	0	104	69	107	25	50	0	0	0	355
Saithe	843	12	29	11	0	0	15	71	216	1,197

Quarter 4

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	524	269	193	99	14	358	249	8	9	1,723
Haddock	667	344	397	119	1	43	194	0	0	1,765
Whiting	470	251	292	130	63	377	225	0	0	1,808
Norway Pout	185	87	81	28	0	0	4	0	0	385
Herring	100	100	100	0	0	0	100	0	0	400
Mackerel	0	0	0	0	0	0	0	0	0	0
Sprat	0	50	50	0	0	0	50	0	0	150
Saithe	165	13	0	0	0	0	9	0	0	187

TOTAL YEAR

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Cod	2,979	2,653	837	897	275	1,361	1,233	545	629	11,409
Haddock	3,707	2,933	2,789	1,131	87	140	873	1,108	837	13,605
Whiting	2,585	2,261	2,170	1,173	691	1,531	752	697	348	12,208
Norway Pout	1,060	690	707	429	6	5	96	473	499	3,965
Herring	1,638	2,240	1,563	1,426	330	1,204	1,116	1,099	753	11,369
Mackerel	235	276	198	115	60	242	74	969	1,293	3,462
Sprat	72	410	395	432	337	800	755	131	120	3,452
Saithe	1,475	31	35	11	0	0	24	292	536	2,404

Table 3.7 Number of otoliths per target species, by roundfish area and by quarter in 1994

Quarter 1

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Lemon sole	0	0	0	0	0	0	0	0	0	0
L.r. dab	0	0	0	0	0	0	0	0	0	0
Silver Pout	4	0	0	0	0	0	0	0	0	4
Poor Cod	3	79	32	29	28	0	0	0	0	171
Catfish	3	1	2	0	0	0	4	1	0	11
Ling	25	5	4	0	0	0	0	2	3	39

Quarter 2

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Lemon sole	0	27	39	33	0	4	5	0	0	108
L.r. dab	0	0	0	15	0	0	50	0	0	65
Silver Pout	13	0	1	0	0	0	0	5	0	19
Poor Cod	12	21	64	88	24	1	4	0	0	214
Catfish	0	1	0	0	0	0	6	4	3	14
Ling	13	0	1	0	0	0	1	0	0	15

Quarter 3

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Lemon sole	0	20	30	46	0	25	28	0	0	149
L.r. dab	0	23	20	22	0	25	21	0	0	111
Silver Pout	100	0	18	0	0	0	0	4	0	122
Poor Cod	0	0	0	0	4	19	0	0	0	23
Catfish	2	1	0	0	0	0	0	2	5	10
Ling	116	4	4	1	0	0	0	3	1	129

Quarter 4

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Lemon sole	0	0	0	25	0	3	0	0	0	28
L.r. dab	0	0	0	38	0	38	0	0	0	76
Silver Pout	46	0	0	0	0	0	0	0	0	46
Poor Cod	0	0	0	0	58	25	0	0	0	83
Catfish	0	0	0	0	0	0	0	0	0	0
Ling	17	1	1	1	0	0	0	0	0	20

TOTAL YEAR

Species	Roundfish Area									
	1	2	3	4	5	6	7	8	9	Total
Lemon sole	0	47	69	104	0	32	33	0	0	285
L.r. dab	0	23	20	75	0	63	71	0	0	252
Silver Pout	163	0	19	0	0	0	0	9	0	191
Poor Cod	15	100	96	117	114	45	4	0	0	491
Catfish	5	3	2	0	0	0	10	7	8	35
Ling	171	10	10	2	0	0	1	5	4	203

T37.XLS

Table 3.8 Comparison of preliminary and final indices

Q1 1'group

	cod		had		whg		nop		her		spr		mac	
	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final
1991	4.3	2.4	628	679	949	1014	2800	2497	2393	1784	940	1121	6.8	6.9
1992	14.3	13.0	1072	1115	766	916	4964	5121	2158	1664	1639	1561	16.7	16.0
1993	15.8	12.7	1147	1242	972	1087	3078	2681	2267	3268	1725	1755	0.8	1.0
1994	16.0	14.8	230	229	823	721	1838	1868	2367	2416	4135	4003	2.8	2.2

Q2 0'group

	cod		had		whg		nop		her		spr		mac	
	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final
1991	2.9	3.5	0	1	2	0	7	3	118	6	0	0	0.0	0.0
1992	3.0	2.9	2	2	2	0	72	0	160	2	0	0	0.3	0.0
1993	2.1	2.1	0	0	8	7	0	0	103	1	1	0	0.0	0.0
1994	0.4	0.0	0	0	3	0	36	0	13	0	120	0	0.0	0.0

Q2 1'group

	cod		had		whg		nop		her		spr		mac	
	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final
1991	8.5	11.2	502	788	1298	1410	2337	2810	5490	4812	485	1118	11.0	11.3
1992	36.3	51.2	772	740	816	881	7708	7134	6689	6328	2290	2389	0.6	0.8
1993	11.0	8.4	1276	1121	710	743	2428	2075	3817	3636	9333	7815	4.0	3.8
1994	32.0	30.8	495	249	806	737	2978	2814	5627	5732	2531	2403	2.8	2.5

Q3 0'group

	cod		had		whg		nop		her		spr		mac	
	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final
1991	16.9	29.4	585	720	514	529	4834	7383	673	873	0	17	0.0	0.0
1992	16.2	19.7	1955	2717	713	1381	1681	2588	3103	2606	49	57	0.2	0.1
1993	15.0	16.9	360	572	959	911	3948	4104	4716	4105	1503	7	5.3	5.3
1994	14.5	16.0	1707	1770	565	610	3584	3196	1857	1977	0		0.0	0.0

Q3 1'group

	cod		had		whg		nop		her		spr		mac	
	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final
1991	7.4	8.2	238	232	632	1695	467	3910	6352	6168	354	417	30.8	25.6
1992	38.9	43.8	478	590	376	594	2132	4366	1316	1278	6141	3992	48.0	39.8
1993	10.0	10.0	681	604	602	634	1305	1832	999	1272	3713	2575	135.9	91.3
1994	38.1	43.9	381	195	654	674	336	706	2311	1914	4117		123.0	82.6

Q4 0'group

	cod		had		whg		nop		her		spr		mac	
	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final
1991	28.2	28.4	1126	1132	761	759	7373	7451	1655	2105	1565	1518	0.6	0.2
1992	42.6	51.4	2462	2542	1219	1195	7418	5984	3512	4900	3584	2916	1.5	1.4
1993	25.6	25.4	636	678	1326	1015	4665	4775	6500	8402	4825	5701	9.8	11.9
1994	24.4	20.5	3169	3405	1318	926	22651	18086	4153	6064	3119	1051	0.5	0.2

Q4 1'group

	cod		had		whg		nop		her		spr		mac	
	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final	prelim	final
1991	7.2	6.9	481	497	853	917	907	863	662	811	5610	5279	43.4	59.9
1992	35.7	40.4	846	768	625	681	6425	4658	1170	1395	11196	8340	7.6	5.8
1993	9.3	9.1	1006	906	807	755	2534	1767	272	359	13917	6902	30.3	8.5
1994	53.2	52.9	645	346	1136	926	2181	1971	984	1757	12150	7936	95.4	88.4

Table 3.9 HERRING: IBTS univariate statistics for numbers/hour by individual hauls

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
Age 0: 1st quarter						
1991	425	0	-	-	-	-
1992	382	0	-	-	-	-
1993	374	0	-	-	-	-
1994	310	0	-	-	-	-
Age 0: 2nd quarter						
1991	344	0	-	-	-	-
1992	250	0	-	-	-	-
1993	230	0	-	-	-	-
1994	314	0	-	-	-	-
Age 0: 3rd quarter						
1991	295	694	42	25500000	12.1	165
1992	363	4554	28	594500000	8.7	82
1993	342	6883	43	2959000000	16.1	280
1994	307	1681	37	121500000	13.2	199
Age 0: 4th quarter						
1991	250	1460	32	53200000	8.9	94
1992	280	2244	23	74700000	6.0	41
1993	273	3734	24	224800000	7.9	77
1994	277	2023	23	60400000	7.8	82

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
Age 1: 1st quarter						
1991	425	1376	16	21900000	6.9	59
1992	382	1376	15	15230000	4.9	29
1993	374	4648	26	559170000	10.8	138
1994	310	2328	13	27640000	4.2	23
Age 1: 2nd quarter						
1991	344	1771	32	108700000	10.0	113
1992	250	2390	35	174100000	10.4	123
1993	230	4208	21	172800000	5.7	39
1994	314	2888	21	115300000	7.4	67
Age 1: 3rd quarter						
1991	295	1538	65	298300000	15.7	258
1992	363	1033	32	38700000	11.2	147
1993	342	2356	68	867300000	18.2	335
1994	307	1660	36	108100000	9.7	107
Age 1: 4th quarter						
1991	250	383	44	7000000	12.1	162
1992	280	489	35	8300000	9.0	91
1993	273	240	25	970000	7.8	74
1994	277	506	31	6820000	9.5	111

Table 3.9 continued

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
Age 2: 1st quarter						
1991	425	712	30	19830000	10.7	125
1992	382	406	30	5780000	11.8	170
1993	374	865	24	15480000	9.3	101
1994	310	1141	48	93760000	12.3	158
Age 2: 2nd quarter						
1991	344	662	22	7080000	6.9	54
1992	250	821	26	10980000	8.1	82
1993	230	703	19	4040000	5.7	43
1994	314	679	21	6350000	6.0	40
Age 2: 3rd quarter						
1991	295	216	24	790000	6.6	51
1992	363	585	26	8600000	9.3	107
1993	342	415	25	3700000	7.1	57
1994	307	962	44	55150000	11.3	139
Age 2: 4th quarter						
1991	250	20	32	10000	8.8	91
1992	280	200	47	2250000	12.0	159
1993	273	76	23	83000	6.6	53
1994	277	111	39	518000	13.1	192

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
Age 3: 1st quarter						
1991	425	343	32	5130000	13.1	202
1992	382	147	46	1760000	13.8	204
1993	374	227	31	1910000	8.9	83
1994	310	246	39	2900000	10.4	120
Age 3: 2nd quarter						
1991	344	308	21	1480000	6.5	49
1992	250	126	21	170000	5.3	32
1993	230	484	50	13590000	14.0	204
1994	314	159	21	340000	5.8	39
Age 3: 3rd quarter						
1991	295	132	26	340000	7.5	68
1992	363	221	22	830000	5.9	38
1993	342	196	27	940000	6.9	54
1994	307	261	40	3430000	11.6	151
Age 3: 4th quarter						
1991	250	9	36	2400	11.7	158
1992	280	44	43	96000	14.1	215
1993	273	22	36	16000	11.3	140
1994	277	27	25	13000	6.8	49

Table 3.10 COD: IBTS univariate statistics for numbers/hour by individual hauls

Age 0: 1st quarter

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
1991		-	-	-	-	-
1992		-	-	-	-	-
1993		-	-	-	-	-
1994		-	-	-	-	-
Age 0: 2nd quarter						
1991	344	1	78	190	17.7	321
1992	250	0	-	-	-	-
1993	230	0	-	-	-	-
1994	314	0	-	-	-	-
Age 0: 3rd quarter						
1991	295	93	23	136000	5.6	35
1992	363	38	29	45000	8.6	84
1993	342	43	41	109000	10.3	114
1994	307	49	23	37500	8.2	79
Age 0: 4th quarter						
1991	249	67	38	161000	12.9	182
1992	280	37	43	70500	10.9	124
1993	273	33	36	37400	10.7	131
1994	276	40	25	28100	9.2	94

Age 1: 1st quarter

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
1991	383	7	49	4550	18.1	343
1992	382	24	17	6600	11.6	174
1993						
1994						
Age 1: 2nd quarter						
1991	344	14	24	4260	11.0	148
1992	250	50	24	35120	9.2	99
1993	230	19	17	2240	5.8	42
1994	314	33	30	29800	12.0	161
Age 1: 3rd quarter						
1991	295	9	15	510	5.1	31
1992	363	47	11	9600	3.9	18
1993	342	16	27	6520	14.9	250
1994	307	67	13	21850	4.3	23
Age 1: 4th quarter						
1991	249	8	13	250	4.1	22
1992	280	44	12	7440	4.2	22
1993	273	8	15	360	5.1	34
1994	276	59	15	20720	7.5	78

Table 3.10 continued

Age 2: 1st quarter

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
1991	383	5	11	107	5.2	38
1992	382	7	12	283	6.3	54
1993						
1994						

Age 2: 2nd quarter

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
1991	344	12	14	972	5.9	43
1992	250	6	13	142	5.4	41
1993	230	12	10	341	2.8	8.6
1994	314	4	12	79	4.6	28

Age 2: 3rd quarter

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
1991	295	4	16	136	4.9	30
1992	363	4	16	163	7.3	69
1993	342	8	9	184	3.0	11
1994	307	7	15	310	6.2	50

Age 2: 4th quarter

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
1991	249	2	15	24	4.2	22
1992	280	3	13	54	4.8	34
1993	273	6	12	125	4.1	23
1994	276	6	11	121	2.9	9.3

Age 3: 1st quarter

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
1991	383	3	12	68	8.0	97
1992	382	3	18	128	8.3	86
1993						
1994						

Age 3: 2nd quarter

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
1991	344	7	14	341	7.6	78
1992	250	2	18	34	8.8	101
1993	230	3	15	37	7.9	88
1994	314	3	10	20	3.1	11

Age 3: 3rd quarter

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
1991	295	2	14	22	5.0	34
1992	363	1	16	7	7.3	76
1993	342	1	14	6	3.8	16
1994	307	2	12	18	3.7	18

Age 3: 4th quarter

Year	N	Mean	CV %	Variance	Skewness	Kurtosis
1991	249	1	19	11	6.6	53
1992	280	1	18	14	6.0	46
1993	273	1	19	7	5.5	39
1994	276	2	13	25	3.1	10

Table 3.11 Cod: estimates of total mortality calculated from final IBTS indices based on standard areas.

Year of sampling	1991				1992				1993				1994				1995
Age	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
0	-	3.5	29.4	28.4	-	2.9	19.7	51.4	-	2.1	16.9	25.4	-	0	16	20.5	-
1	2.4	11.2	8.2	6.9	13	51.2	43.8	40.4	12.7	8.4	10	9.1	14.8	30.8	43.9	52.9	9.7
2	4.1	7.1	2.5	1.9	4.5	5.2	3.6	3	19.9	13.6	8	5.6	4.4	4.1	5.2	5.8	22.1

Z values = LN [(n(age, year)+1)/(n(age+1, year+1)+1)]

Year of sampling	1991				1992				1993				1994				1995
Age	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
0		-2.45	-0.39	-0.34		-0.88	0.63	1.65		-2.33	-0.92	-0.71					
1	-0.48	0.68	0.69	0.68	-0.40	1.27	1.60	1.84	0.93	0.61	0.57	0.40	-0.38				

Table 3.12 Herring: estimates of total mortality calculated from final IBTS indices based on standard areas.

Year of sampling	1991				1992				1993				1994				1995
Age	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
0	-	2	830	1423	-	4	4351	3650	-	6	4284	3954	-	0	1553	3436	-
1	1159	2015	2327	537	1162	3058	1047	756	2934	2734	1337	291	1667	3204	1787	909	1186
2	794	731	187	21	377	776	447	318	762	722	335	72	1094	716	781	174	1285

Z values = LN [(n(age, year)+1)/(n(age+1, year+1)+1)]

Year of sampling	1991				1992				1993				1994				1995
Age	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
0		-6.86	-0.23	0.63		-6.27	1.18	2.52		-6.11	0.87	1.47					
1	1.12	0.95	1.65	0.52	0.42	1.44	1.14	2.34	0.99	1.34	0.54	0.51	0.26				

Table 3.13 Data available in the ICES IBTS data base as at 26 January 1996.

First Quarter.

✓ = Data available
- = No data available
x = No survey made

Country	1972	1973	1974	1975	1976	1977	1978	1979	1980
Denmark	✓	✓	✓	✓	✓	✓	✓	✓	x
France	x	x	x	x	✓	x	x	✓	✓
Germany	-	-	-	-	-	-	-	-	-
Netherlands	✓	✓	✓	✓	✓	✓	✓	✓	✓
Norway	-	-	-	-	-	-	-	-	-
Sweden	-	-	-	-	-	-	-	-	-
UK England	-	-	-	-	-	-	-	-	-
UK Scotland	x	x	✓	✓	✓	✓	✓	✓	✓
USSR	x	x	✓	✓	✓	✓	x	✓	x

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989
Denmark	x	✓	✓	✓	✓	✓	✓	✓	✓
France	x	✓	✓	✓	✓	✓	✓	✓	✓
Germany	-	-	✓	✓	✓	✓	✓	✓	✓
Netherlands	✓	✓	✓	✓	✓	✓	✓	✓	✓
Norway	-	-	✓	✓	✓	✓	✓	✓	✓
Sweden	-	-	✓	✓	✓	✓	✓	✓	✓
UK England	✓	✓	✓	✓	✓	✓	✓	✓	✓
UK Scotland	✓	✓	✓	✓	✓	✓	✓	✓	✓
USSR	✓	✓	x	x	x	x	x	x	x

Country	1990	1991	1992	1993	1994	1995
Denmark	✓	✓	✓	✓	✓	✓
France	✓	✓	✓	✓	✓	✓
Germany	✓	✓	✓	✓	✓	✓
Netherlands	✓	✓	✓	✓	✓	✓
Norway	✓	✓	✓	✓	✓	✓
Sweden	✓	✓	✓	✓	✓	✓
UK England	✓	x	x	x	x	x
UK Scotland	✓	✓	✓	✓	✓	✓
USSR	x	x	x	x	x	x

Table 3.14

Order for accumulating age/length keys

Roundfish Area	Choice 1	2	3	4
1	2	3	7	all
2	1	6	7	all
3	1	2	4	all
4	3	2	5	all
5	6	4	all	
6	7	5	2	all
7	6	2	all	
8	9	7	all	
9	8	7	all	

For areas 1-7 "all" refers to the sum of areas 1-7
For areas 8 and 9 "all" refers to the sum of areas 1-9

Table 4.1 List of bottom trawl surveys in 1995 in Sub-areas VI, VII and VIII and Division XIa.

<u>The Scottish Groundfish Survey in Division VIa</u> (code: SGF6a)

Start:	1981
Gear:	36/47 GOV trawl with heavy ground gear
Timing:	quarter 1 (March since 1986)
Target:	cod, haddock, whiting, saithe and herring
Stratification:	by rectangle
No of hauls:	40
Continuation:	continued in 1996 and 1997
Contact:	Andrew Newton, SOAEFD, Aberdeen, Scotland UK

<u>The Scottish Groundfish Survey in Division VIb</u> (code: SGF6b)

Start:	1985
Gear:	48' Aberdeen trawl with 35 mm cover
Timing:	quarter 3 (September)
Target:	haddock
Stratification:	by rectangle
No of hauls:	45
Continuation:	continued in 1996 and 1997
Contact:	Andrew Newton, SOAEFD, Aberdeen, Scotland UK

<u>The Scottish Mackerel Recruit Survey</u> (code: SMR)

Start:	1985
Gear:	36/47 GOV trawl with heavy ground gear
Timing:	quarter 4 (November / December)
Target:	mackerel until 1995 (possibly changed in cod, haddock, whiting, herring and mackerel in 1996)
Stratification:	by rectangle
No of hauls:	50
Continuation:	continued in 1996 and 1997, possibly restricted to the area north of 55° N
Contact:	Martin Walsh, SOAEFD, Aberdeen, Scotland UK

<u>The West of Ireland Survey</u> (code: WI)

Start:	1981
Gear:	commercial bottom trawl with a sprat bag
Timing:	quarter 4 (October / November)
Stratification:	by depth, fixed stations
Depth strata:	?
Target:	commercially important species
No of hauls:	70
Continuation:	continued in 1996 and 1997
Contact:	John Molloy, FRC, Dublin, Ireland

<u>The Irish Sea Recruit Survey</u> (code: ISRS)

Start:	1983
Gear:	3-bridle otter trawl with 10 mm codend
Timing:	quarter 2 (June) and quarter 3 (September)
Stratification:	by depth, fixed stations
Depth strata:	?
Target:	cod, whiting, haddock and plaice
No of hauls:	28 in each quarter

Continuation:	continued in 1996 and 1997
Contact:	John Molloy, FRC, Dublin, Ireland

<u>The West and South Coast of Ireland Recruit Survey</u> (code: WSCRS)

Start:	1992
Gear:	dual purpose with 10 mm codend
Timing:	quarter 3 (July)
Stratification:	by depth, fixed stations
Depth strata:	?
Target:	inshore juvenile fish
No of hauls:	70
Continuation:	continued in 1996 and 1997
Contact:	John Molloy, FRC, Dublin, Ireland

<u>The Irish Sea Gadoid Survey</u> (code: ISG)

Start:	1993
Gear:	Granton trawl with 20 mm liner
Timing:	quarter 1 (March)
Stratification:	by depth and area, fixed(?) stations
Depth strata:	?
Target:	cod and whiting
No of hauls:	20
Continuation:	continued in 1996 and 1997
Contact:	Steve Flatman, MAFF, Lowestoft, England UK

<u>The Celtic Sea and Western Approaches Groundfish Survey</u> (codes: CSGF)

Start:	1981
Gear:	Portuguese high-headline trawl
Timing:	quarter 1 (March)
Stratification:	by depth and latitude
Depth strata:	0-89, 90-114, 115-139, 140-179, >180m
Target:	mackerel and commercially important species
No of hauls:	75
Continuation:	continued in 1996 and 1997
Contact:	John Nichols, MAFF, Lowestoft, England UK

<u>The Northern Ireland Groundfish Survey in Division VIIa</u> (code: NIGFS)

Start:	1990
Gear:	Rockhopper otter trawl with 20 mm liner
Timing:	quarter 1 (March), quarter 2 (June) and quarter 3/4 (September/October)
Stratification:	by depth and area (5), fixed stations
Depth strata:	?
Target:	commercially important species
No of hauls:	45 per survey
Continuation:	March + September surveys to be continued in 1996 and 1997
Contact:	Mike Armstrong, DANI, Belfast, Northern Ireland UK

<u>The German Survey in the western waters</u> (code: GSWW)

Start:	1991
Gear:	36/47 GOV trawl
Timing:	quarter 2 (April)
Stratification:	by rectangle

Target:	commercially important species
No of hauls:	40
Continuation:	continued in 1996, not in 1997; again in 1998 as part of the mackerel / horse mackerel egg surveys
Contact:	Nils Hammer, BFA-ISH, Hamburg, Germany

<u>The Dutch Mackerel / Horse Mackerel Recruit Survey</u> (code: DMRS)

Start:	1987
Gear:	36/47 GOV trawl
Timing:	quarter 4 (November / December)
Stratification:	by rectangle
Target:	horse mackerel and mackerel
No of hauls:	45
Continuation:	not in 1995, but continued in 1996; continuation in 1997 doubtful
Contact:	Guus Eltink, RIVO-DLO, IJmuiden, Netherlands

<u>The French Bottom Trawl Survey in Eastern Channel, Division VIId</u> (code: FCG)

Start:	1988
Gear:	20/25 GOV trawl with 20 mm codend
Timing:	quarter 4 (October)
Stratification:	by subrectangle
Target:	commercially important species
No of hauls:	100
Continuation:	continued in 1996 and 1997
Contact:	Andre Carpentier, IFREMER, Boulogne-sur-Mer, France

<u>The French Bottom Trawl Survey in Bay of Biscay and Celtic Sea</u> (code: EVHOE)

Start:	1987
Gear:	36/47 GOV trawl
Timing:	annually in quarter 4 (October/ November), irregular in quarter 2 (May / June)
Stratification:	by depth
Depth strata:	15-30, 31-80, 81-120, 121-160, 161-200, 201-400, 401-600 m
Target:	commercially important species
No of hauls:	150 per quarter
Continuation:	continued in 1996 and 1997, but only in quarter 4
Contact:	Jean-Charles Poulard, IFREMER, Nantes, France

<u>The Spanish Groundfish Survey in Cantabrian Sea and off Galicia</u> (code: D/C)

Start:	1980
Gear:	Baka trawl with 20 mm codend
Timing:	quarter 4 (October)
Stratification:	by depth, random sampling scheme
Depth-strata:	30-100, 101-200, 201-500 m
Target:	commercially important species
No of hauls:	100 - 120
Continuation:	continued in 1996 and 1997
Contact:	Francisco Sanchez, IEO, Santander, Spain

<u>The Spanish Groundfish Survey in the Gulf of Cadiz</u> (code: SpGOC)

Start:	1993
Gear:	Baka trawl with 20 mm codend
Timing:	quarter 1 (March)

Stratification:	by depth, random sampling scheme
Depth-strata:	30-100, 101-200, 201-500 m
Target:	commercially important species
No of hauls:	30
Continuation:	continued in 1996 and 1997
Contact:	Francisco Sanchez, IEO, Santander, Spain

<u>The Portuguese Bottom Trawl Survey</u> (code: PYF)

Start the surveys:	1979
Gear:	Norwegian Campelen trawl with 20 mm codend
Timing:	quarter 3 (July) and quarter 4 (October)
Stratification:	by depth, fixed stations
Depth-strata:	20-100, 101-200, 201-500, 501-750 m
Target:	commercially important species, mainly hake and horse mackerel
No of hauls:	90 per quarter
Continuation:	continued in 1996 and 1997
Contact:	Fatima Cardador, IPIMAR, Lisbon, Portugal

Table 4.2 Information on the possible continuation in 1996 and 1997 of the bottom trawl surveys in Sub-areas VI, VII, VIII and Division IXa.

Survey	code	Continuation in 1996	in 1997
Scottish Groundfish Survey in Division VIa	SGF6a	yes	yes
Scottish Groundfish Survey in Division VIb	SGF6b	yes	yes
Scottish Mackerel Recruit Survey	SMR	yes *	yes *
West of Ireland Survey	WI	yes	yes
Irish Sea Recruit Survey	ISRS	yes	yes
West and South Coast of Ireland Recruit Survey	WSCRS	yes	yes
Irish Sea Gadoid Survey	ISG	yes	yes
Celtic Sea and Western Approaches Grounfish Survey	CSGF	yes	yes
Northern Ireland Groundfish Survey in Division VIIa	NIGFS	yes $	yes $
German Survey in Western Waters	GSWW	yes	no
Dutch Mackerel / Horse Mackerel Recruit Survey	DMRS	yes	???
French Bottom Trawl Survey in the Eastern Channel	FCG	yes	yes
French Survey in the Bay of Biscay and the Celtic Sea	EVHOE	yes #	yes #
Spanish Survey in the Cantabrian Sea and off Galicia	D/C	yes	yes
Spanish Groundfish Survey in the Gulf of Cadiz	SpGOC	yes	yes
Portuguese Bottom Trawl Survey	PYF	yes	yes

* will possibly be restricted to the area north of 55°N
$ March and September/October survey to be continued
# Only the October survey to be continued

Table 4.3 Use of data from existing surveys in the western and southern areas by ICES Working Groups

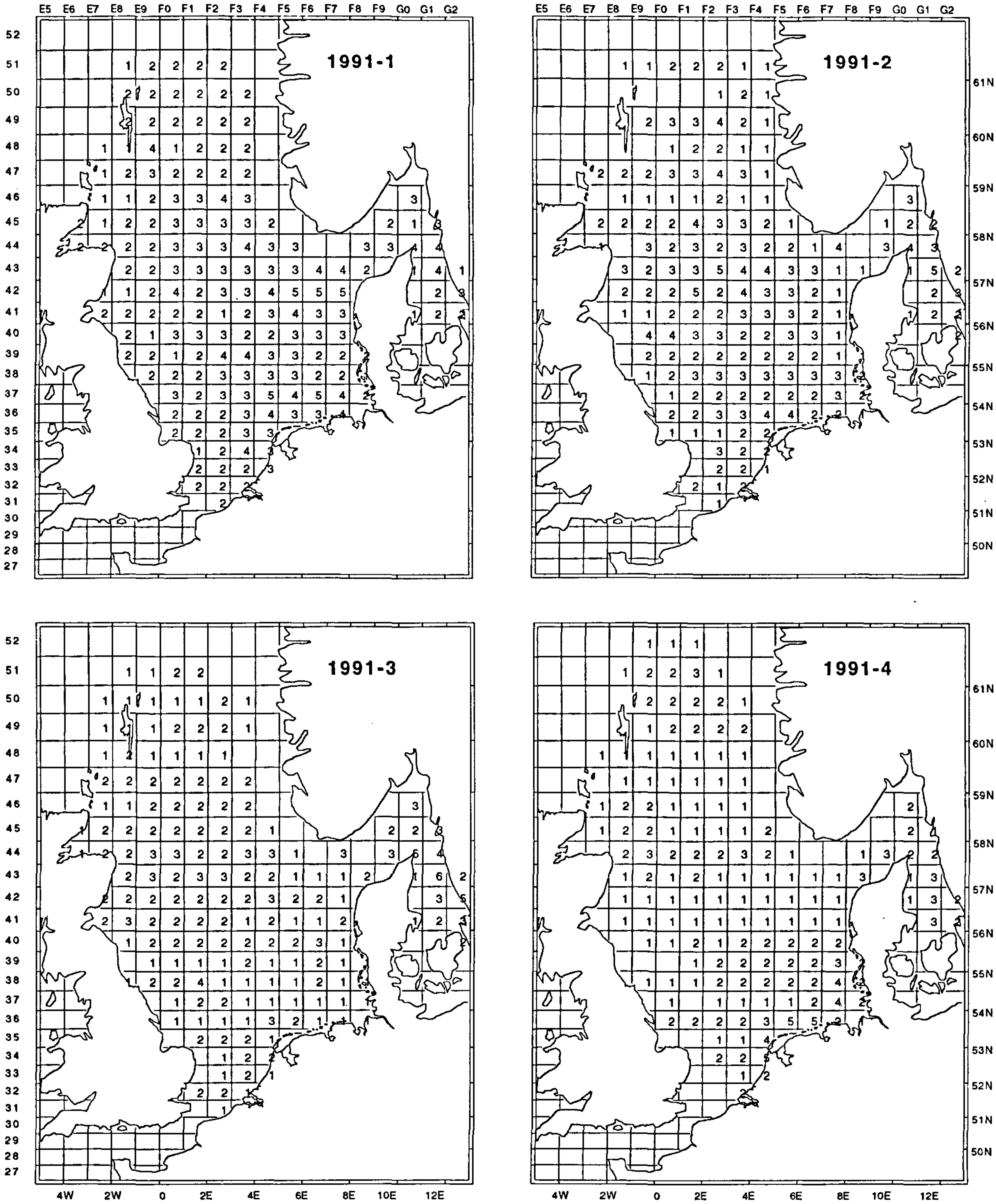
	Species	Area	Survey results used *
Northern Shelf demersal stocks (1)	Cod	VIa	SGF6a
	Haddock	VIa	SGF6a
	Whiting	VIa	SGF6a
	Megrim	VIa	
	Anglerfish	VIa	
	Cod	VIb	
	Haddock	VIb	SGF6b
	Whiting	VIb	
	Saithe	VI	
	Cod	VIIa	ISG,ISRS,NIGFS
	Whiting	VIIa	ISG,ISRS,NIGFS
	Plaice	VIIa	
	Sole	VIIa	
	Blue ling	V,VI,XIV	
	Ling	V,VI,XIV	
	Tusk	V,VI,XIV	
Southern Shelf demersal stocks (2)	Sole	VIIe	
	Plaice	VIIe	
	Cod	VIIf,g	CSGF
	Whiting	VIIf,g	CSGF
	Sole	VIIf,g	
	Plaice	VIIf,g	
	Hake	III,IV,VI,VII,VIIIa,b	CSGF, EVHOE
	Monkfish L. piscatorius	VII,VIIIa,b	CSGF
	Monkfish L. budegassa	VII,VIIIa,b	CSGF
	Megrim L. whiffiagonis	VII,VIIIa,b	CSGF
	Sole	VIIIa,b	
	Hake	VIIIc,IXa	D/C,PYF
	Monkfish L. piscatorius	VIIIc,IXa	
	Monkfish L. budegassa	VIIIc,IXa	
	Megrim L. whiffiagonis	VIIIc,IXa	D/C,PYF
	Megrim L. boscii	VIIIc,IXa	D/C,PYF
	Cod	VIIe	
	Whiting	VIIe	
	Cod	VIIb,c	
	Whiting	VIIb,c	WI
	Sole	VIIb,c	
	Plaice	VIIb,c	WI
	Cod	VIIh,k	
	Whiting	VIIh,k	
	Sole	VIIh,k	
	Plaice	VIIh,k	
Pelagic stocks (3)	Mackerel	VIa,VIIb,e-h,j,VIIIa	SGF6a,DMRS,EVHOE SMR,WI,GSWW,CSGF
	Horse Mackerel	VIIIc,IXa	PYF

(1) source : Report of the Working Group on the Assessment of Northern Shelf Demersal Stocks. Copenhagen 14-23 June 1994. C.M. 1995/Assess : 1

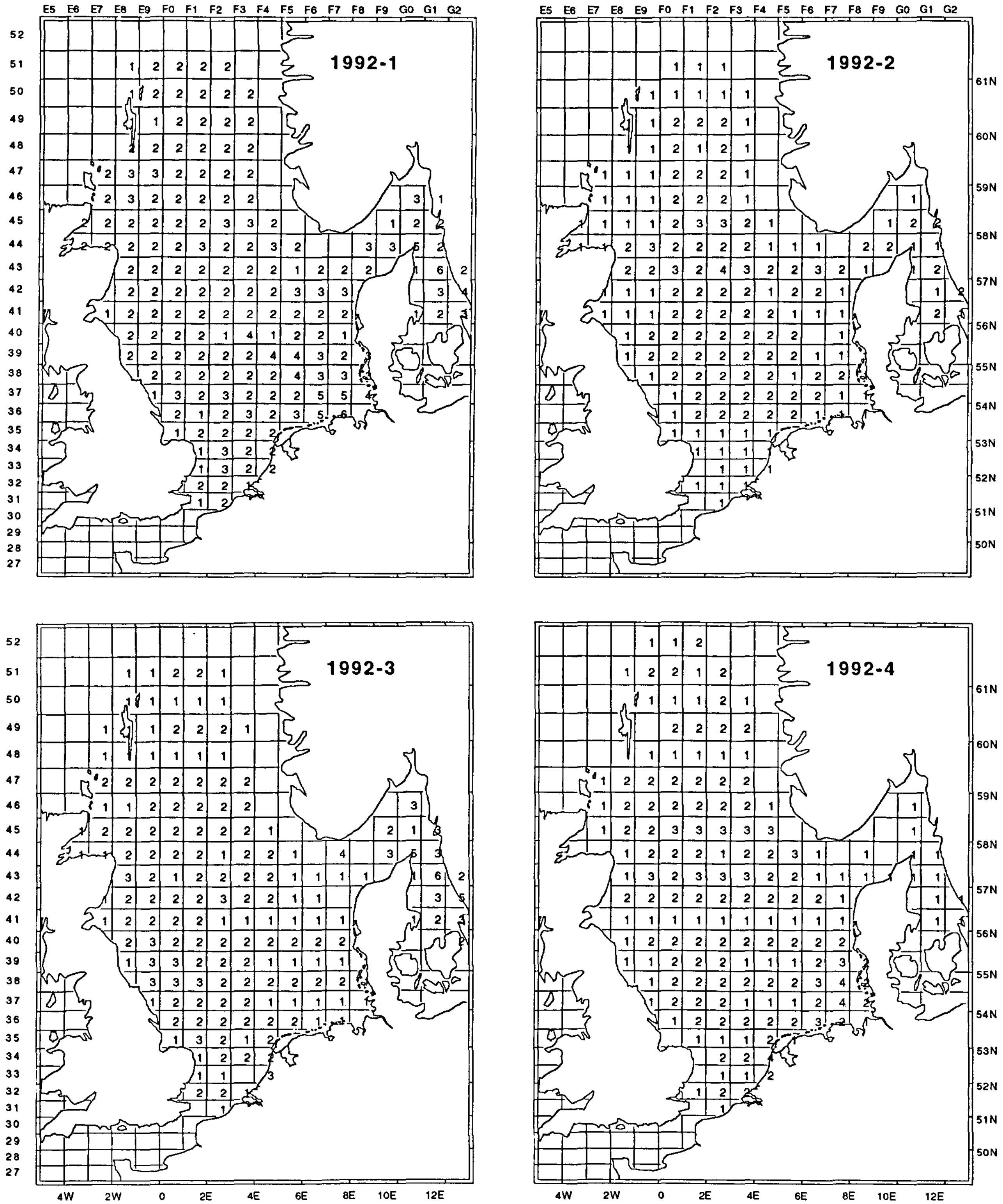
(2) source : Report of the Working Group on the Assessment of Southern Shelf Demersal Stocks. Copenhagen 6-15 september 1994. C.M. 1995/Assess : 6

(3) source : Report of the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy. Copenhagen 10 -19 October 1995. C.M. 1996/Assess : 7

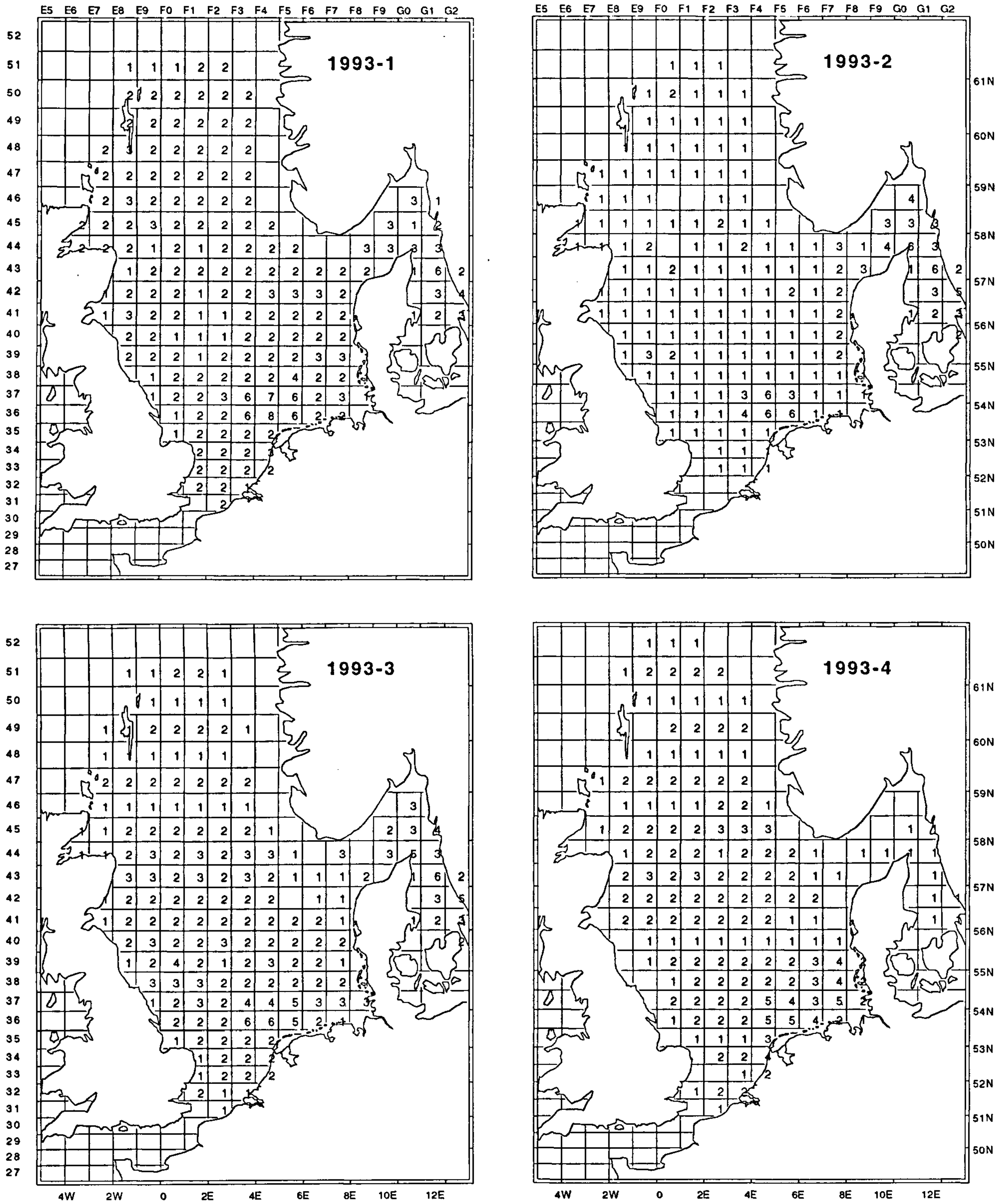
(*) Survey codes given in table 4.1



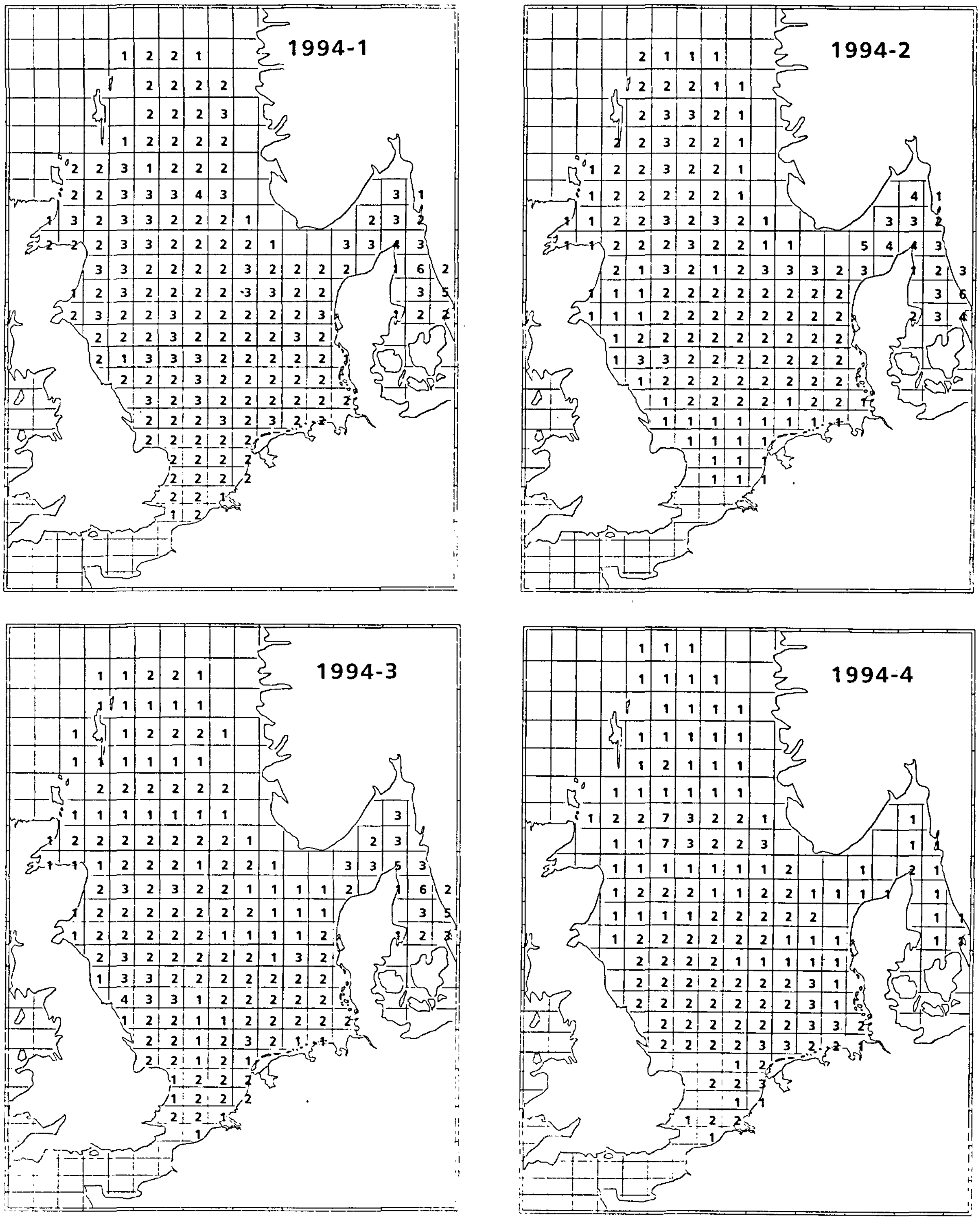
Figures 3.1 The number of valid hauls per rectangle for the IBTS surveys in 1991.



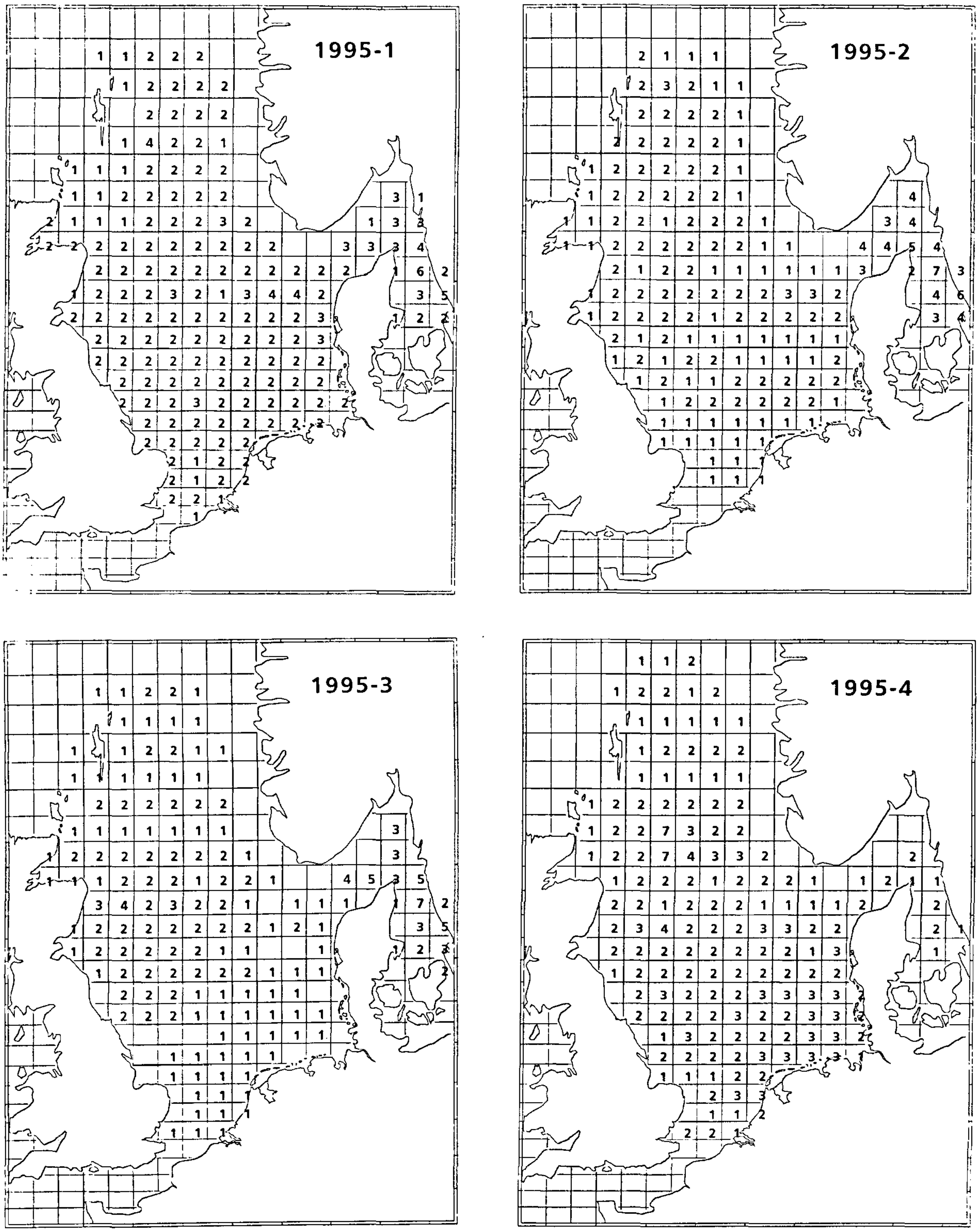
Figures 3.2 The number of valid hauls per rectangle for the IBTS surveys in 1992.



Figures 3.3 The number of valid hauls per rectangle for the IBTS surveys in 1993.



Figures 3.4 The number of valid hauls per rectangle for the IBTS surveys in 1994.



Figures 3.5 The number of valid hauls per rectangle for the IBTS surveys in 1995.

COD

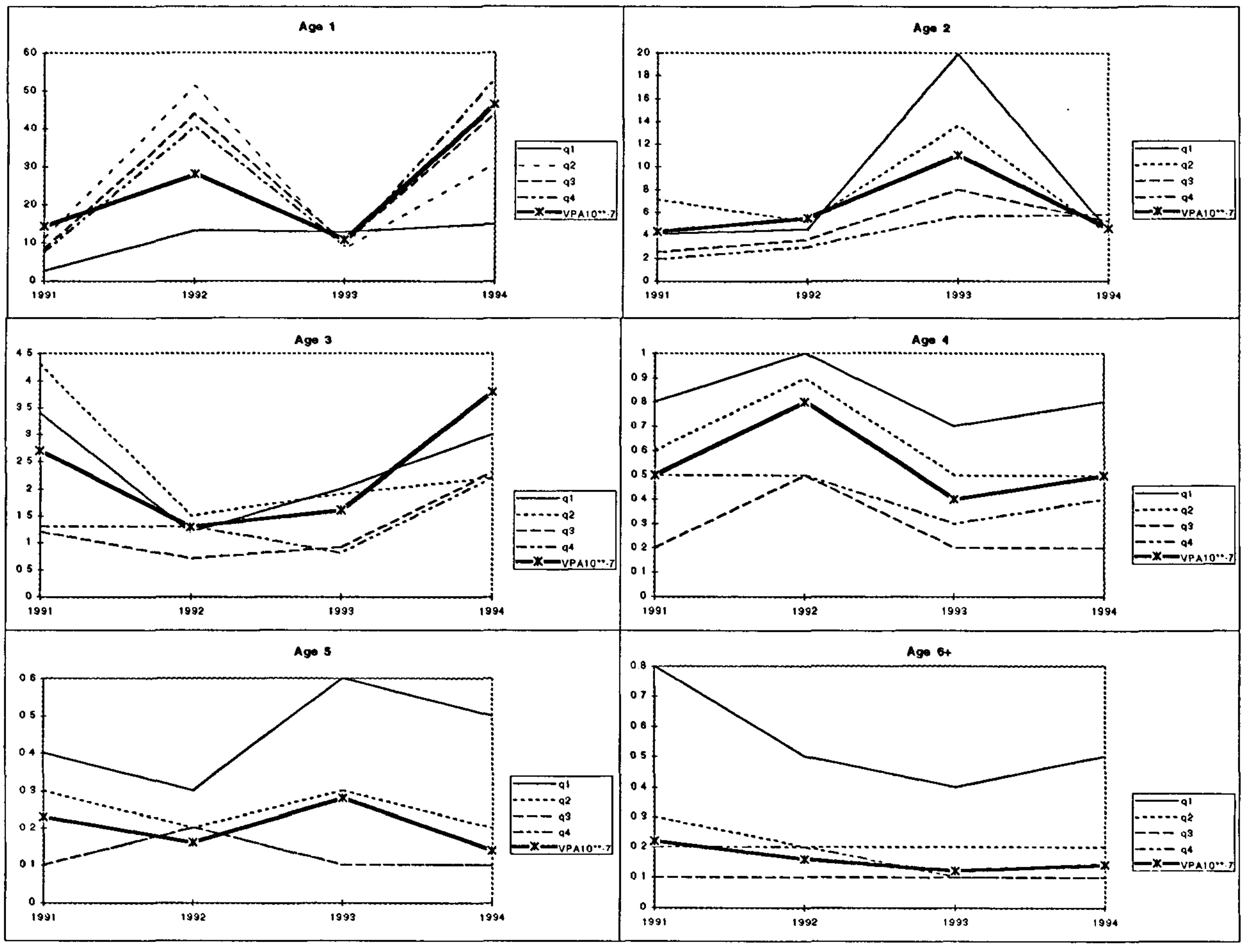


Figure 3.6 Quarterly IBTS indices for ages 1 to 6+ for cod and VPA values.

HADDOCK

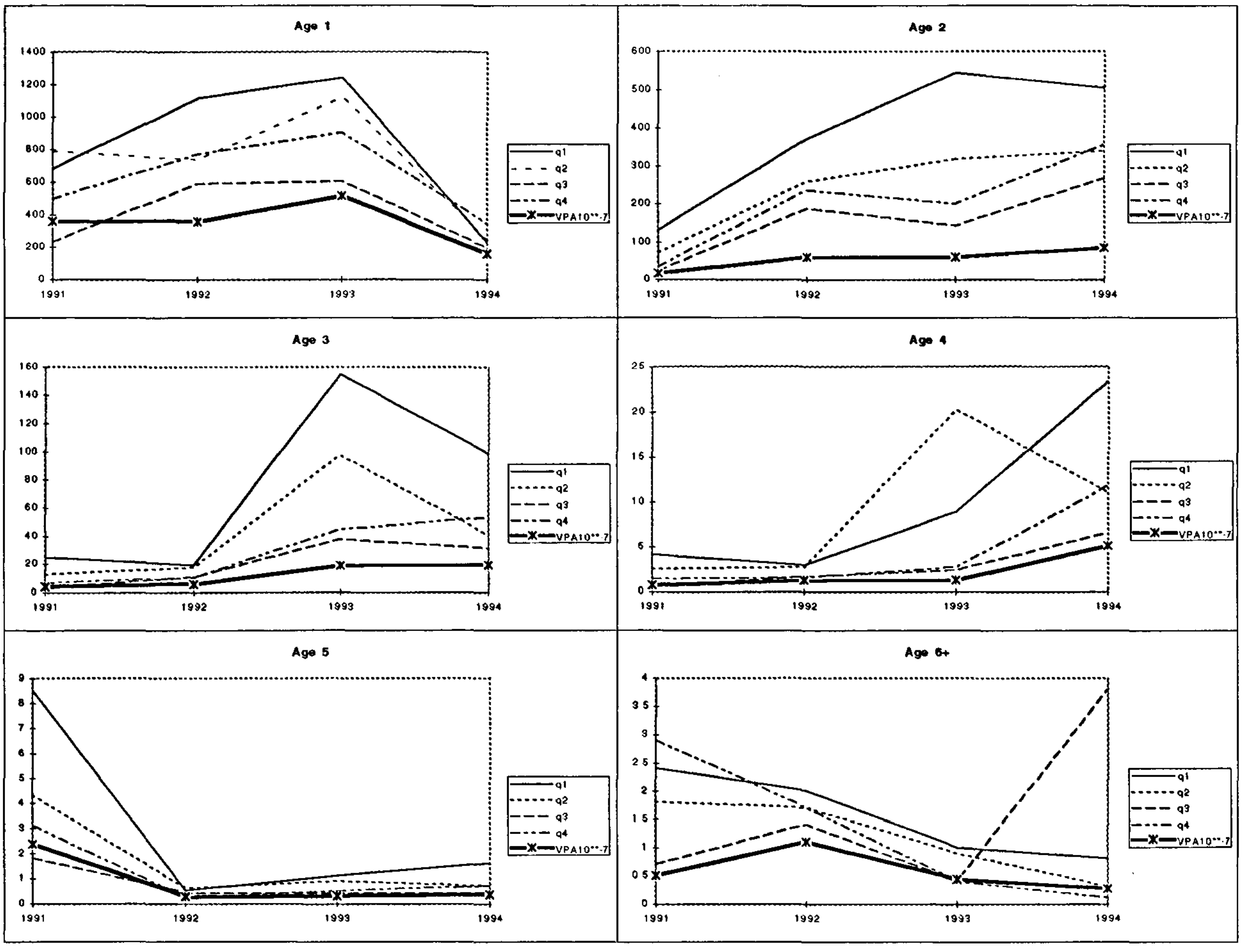


Figure 3.7 Quarterly IBTS indices for ages 1 to 6+ for haddock and VPA values.

WHITING

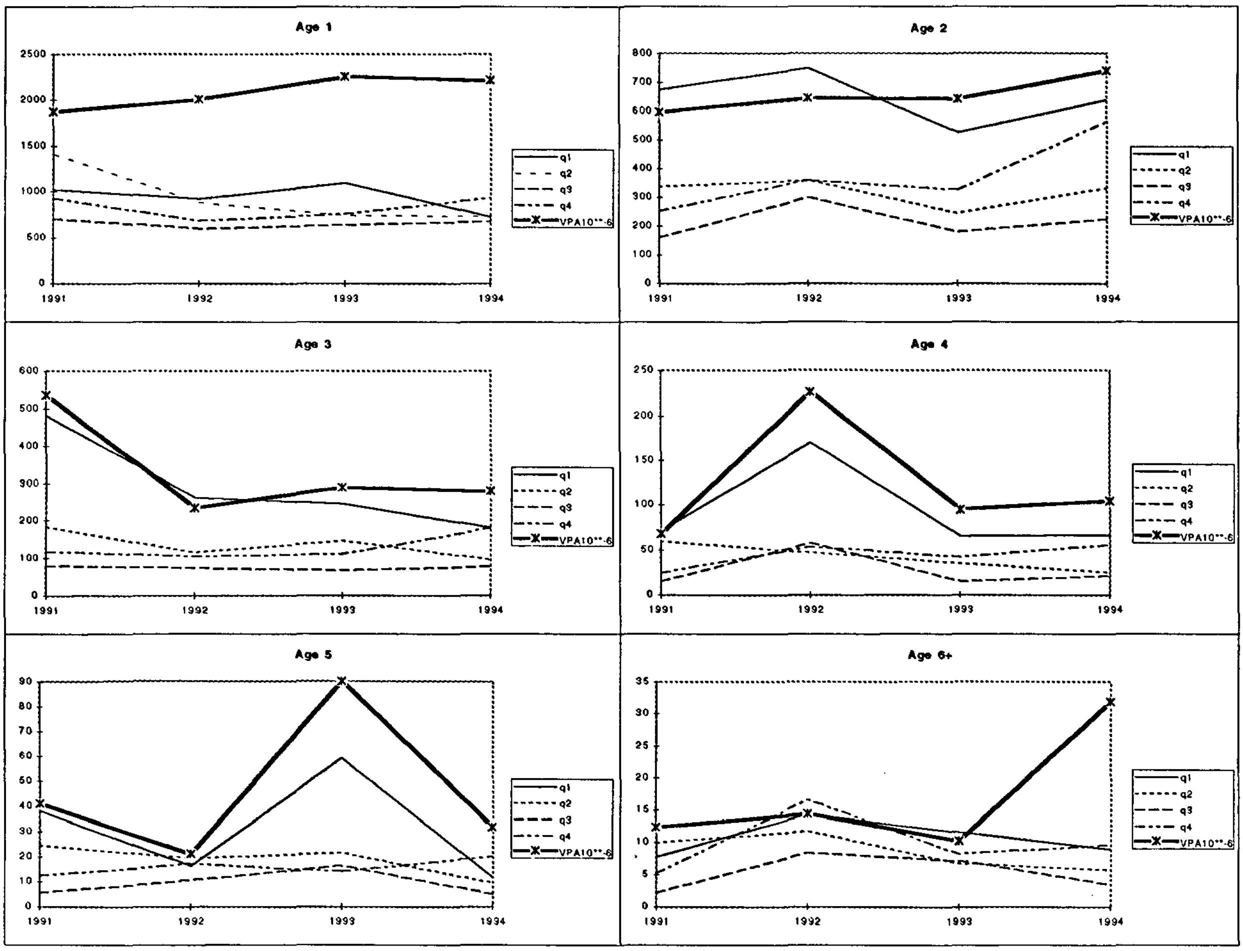


Figure 3.8 Quarterly IBTS indices for ages 1 to 6+ of whiting together with VPA values.

NORWAY POUT

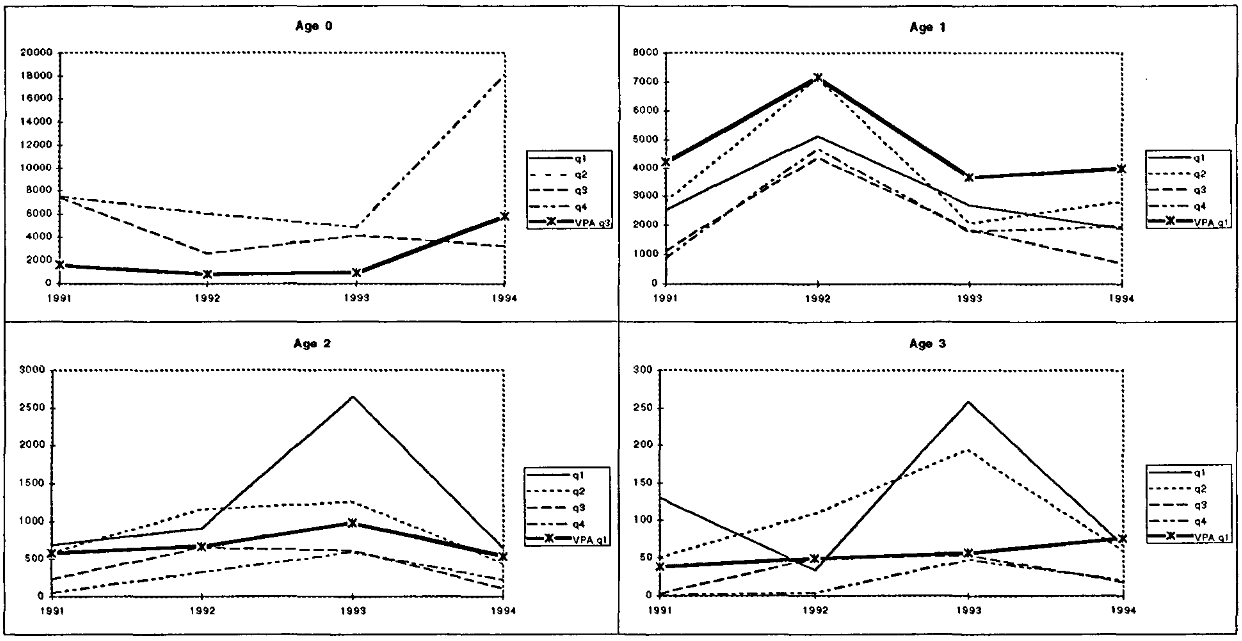


Figure 3.9 Quarterly IBTS indices for ages 0 to 3 of Norway pout together with VPA values.

HERRING

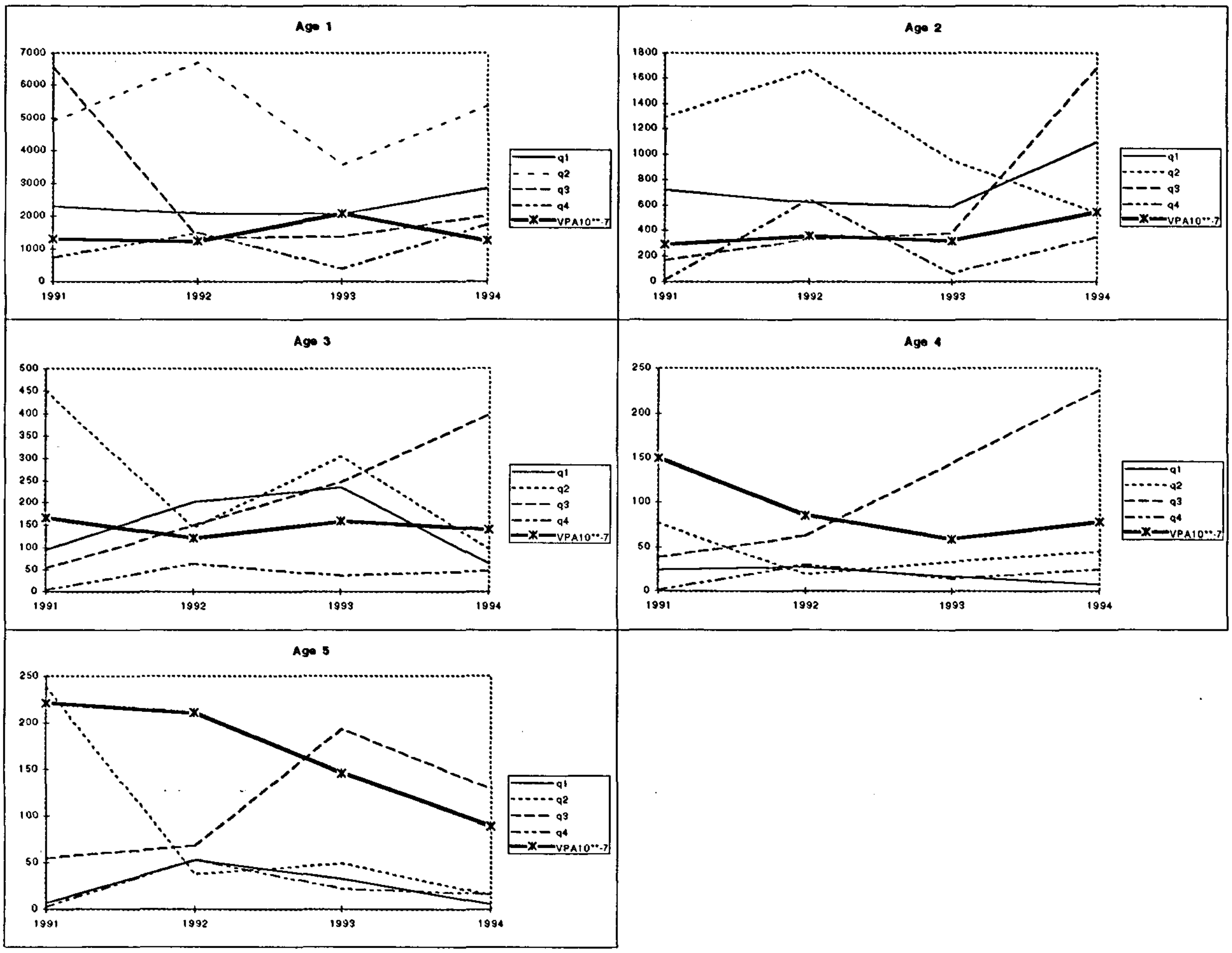


Figure 3.10 Quarterly IBTS indices for ages (rings) 1 to 5+ for herring and VPA values.

SPRAT

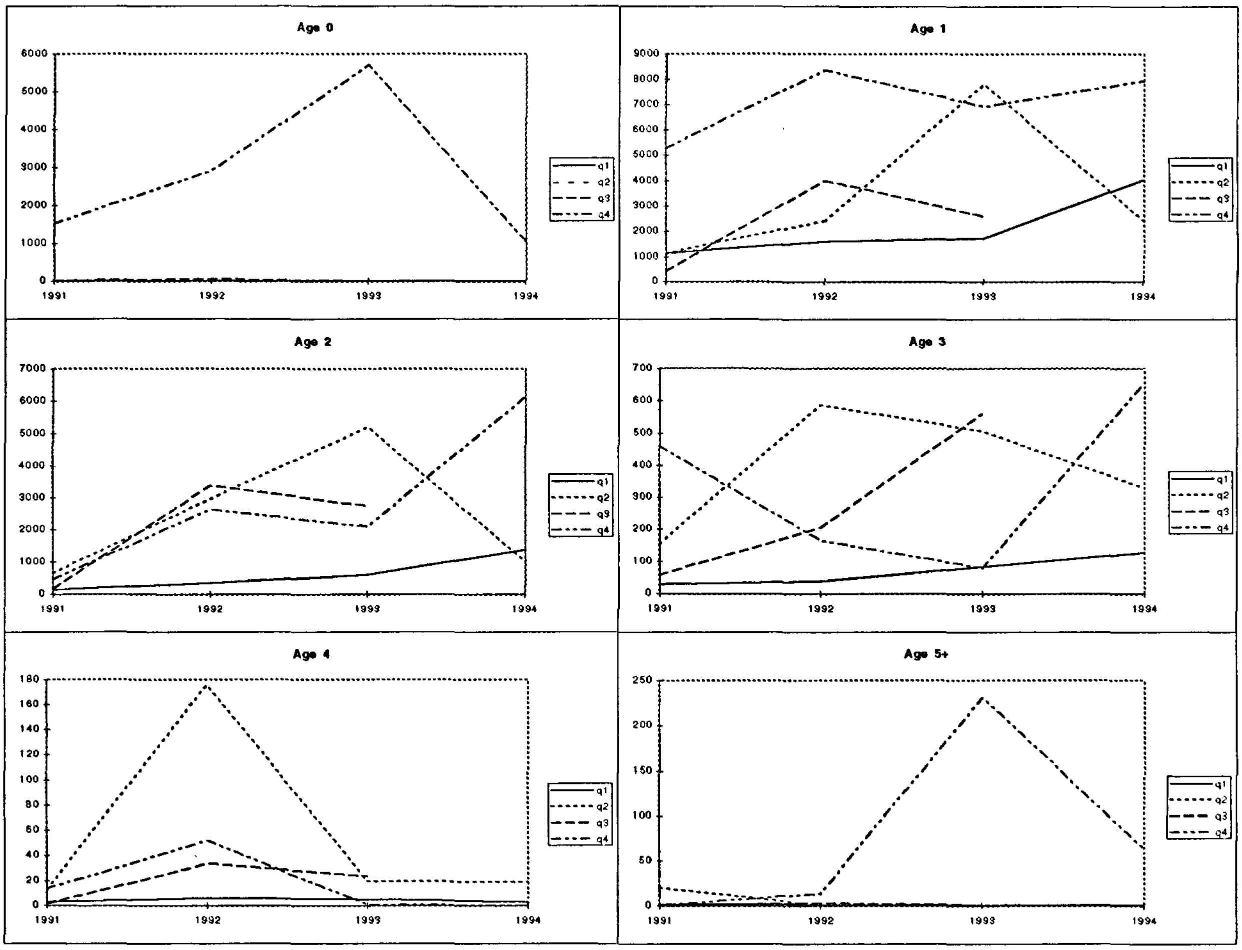


Figure 3.11 Quarterly IBTS indices for ages 0 to 5+ of sprat.

MACKEREL

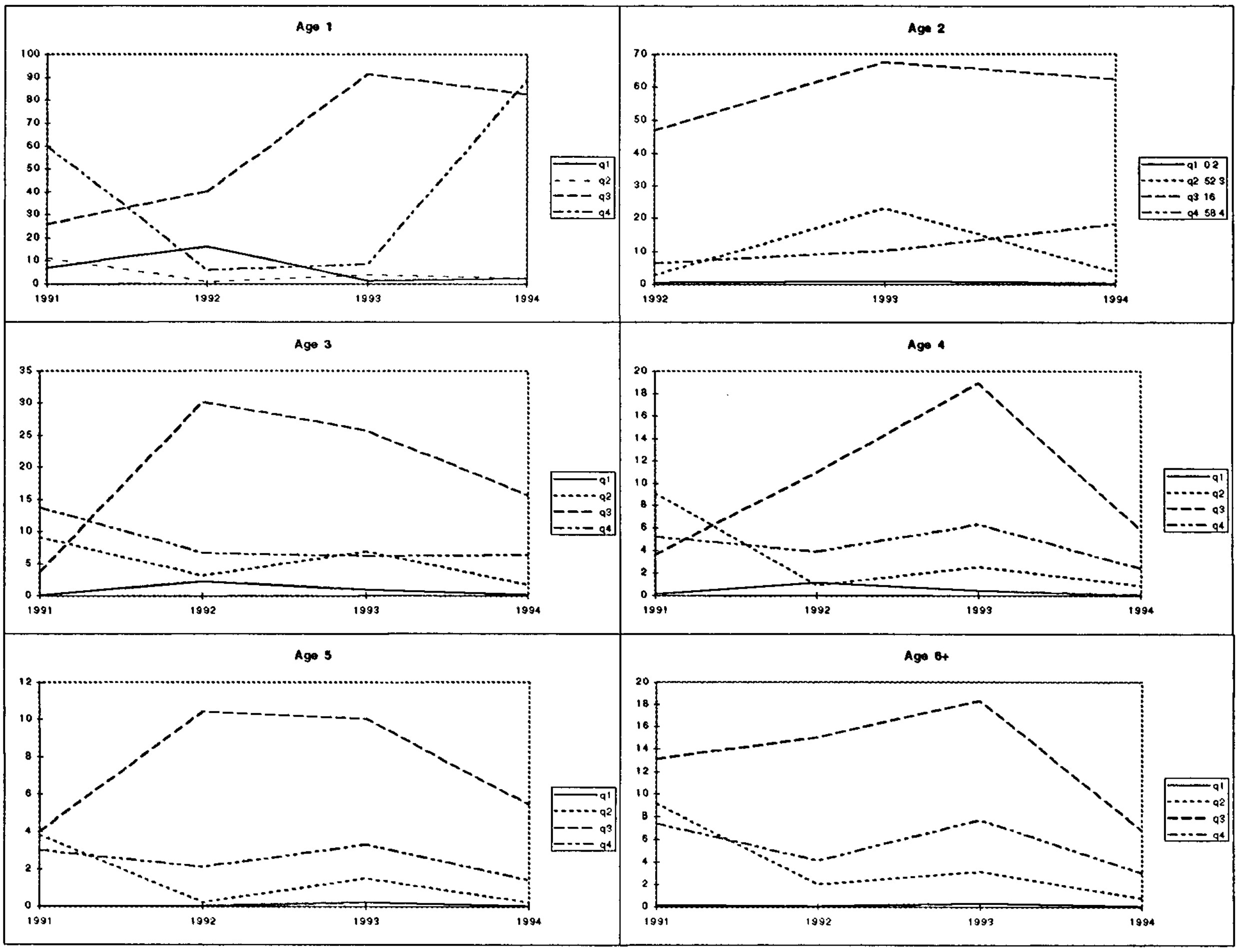


Figure 3.12 Quarterly IBTS indices for ages 1 to 6+ of mackerel.

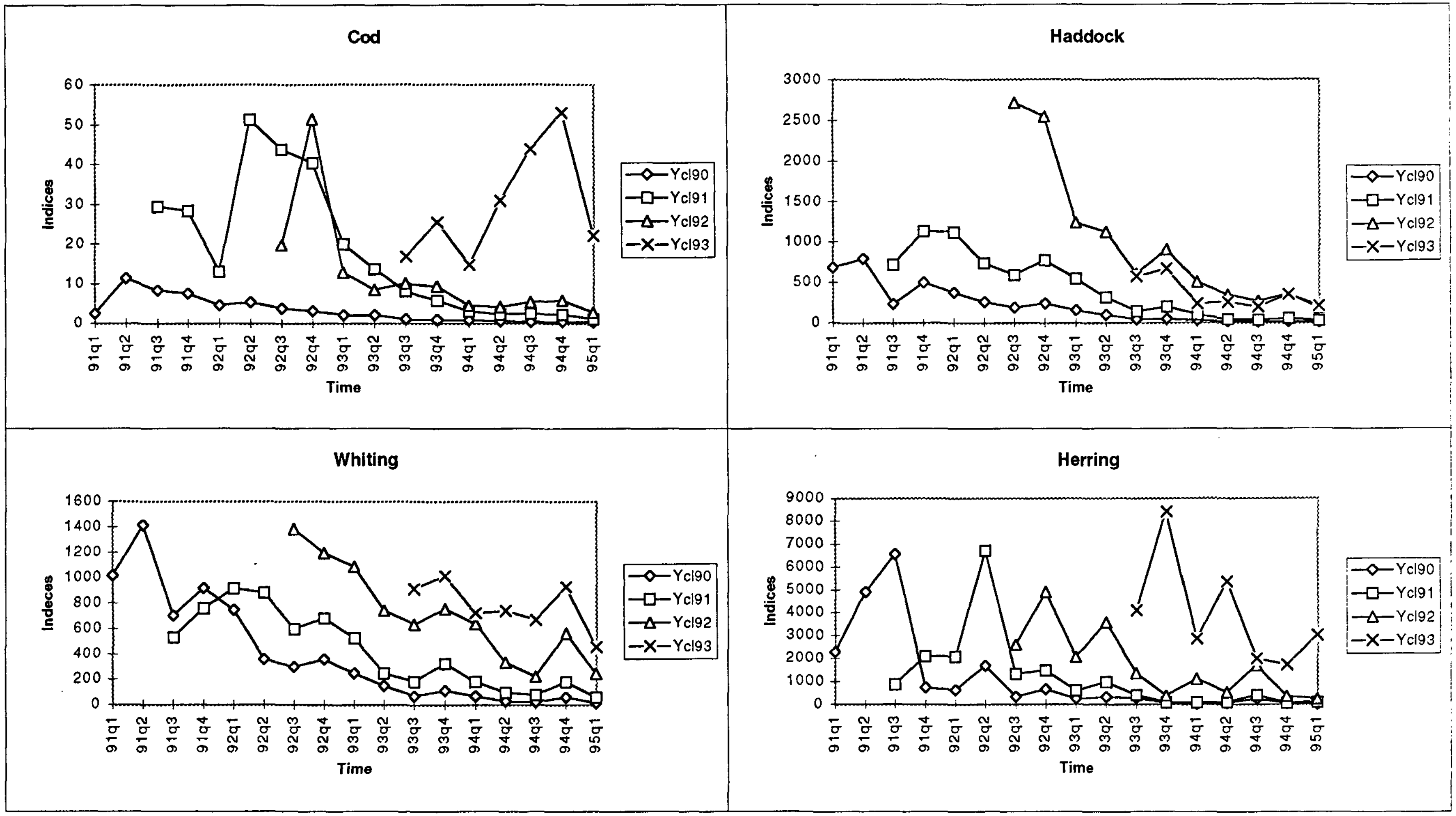


Figure 3.13 IBTS indices for year classes 1990, 1991, 1992 and 1993 of cod, haddock and whiting and year classes 1989 to 1992 of herring.

Figure 3.14 Cod y cl 91

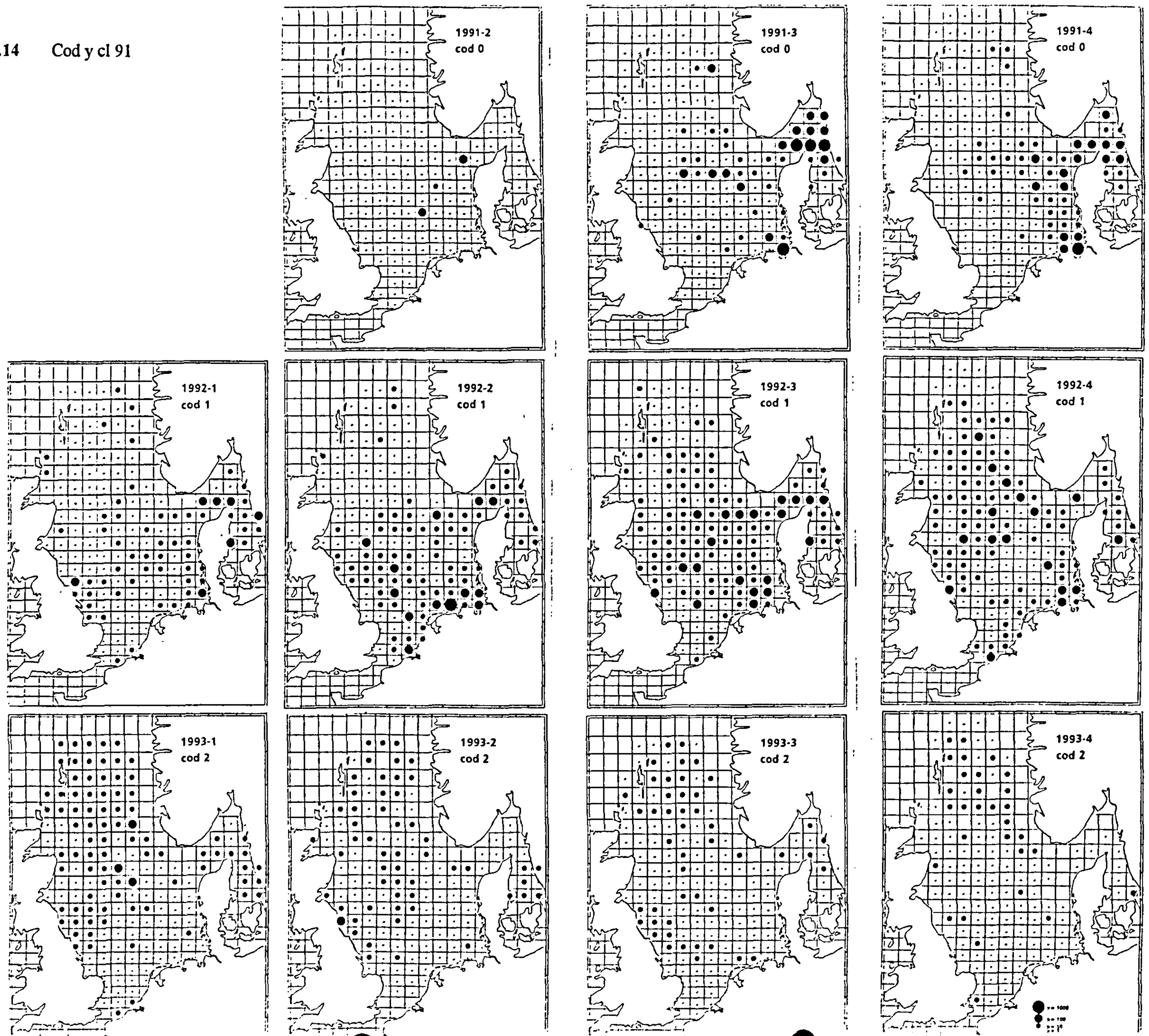


Figure 3.15 Cod y cl 91 and 94

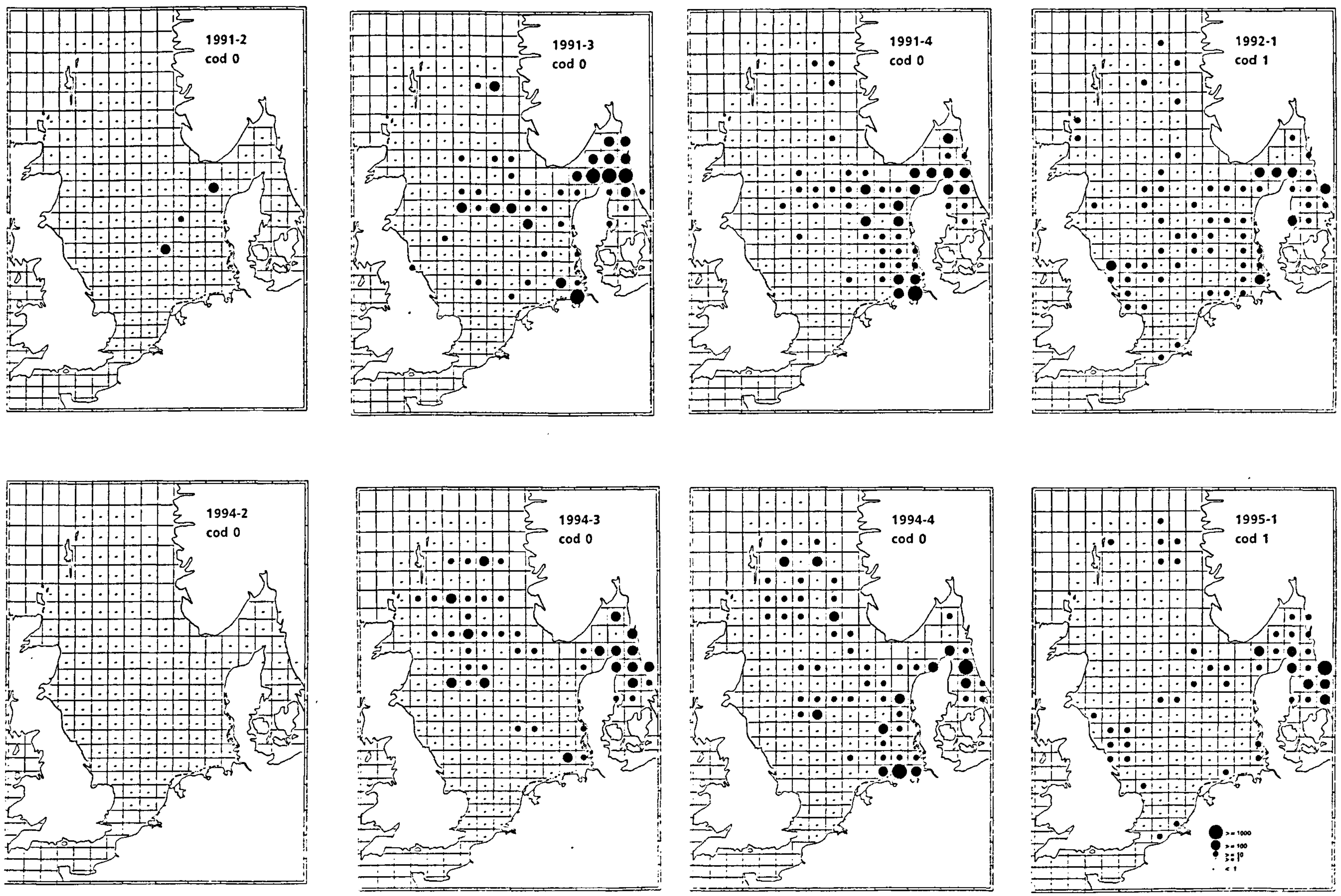
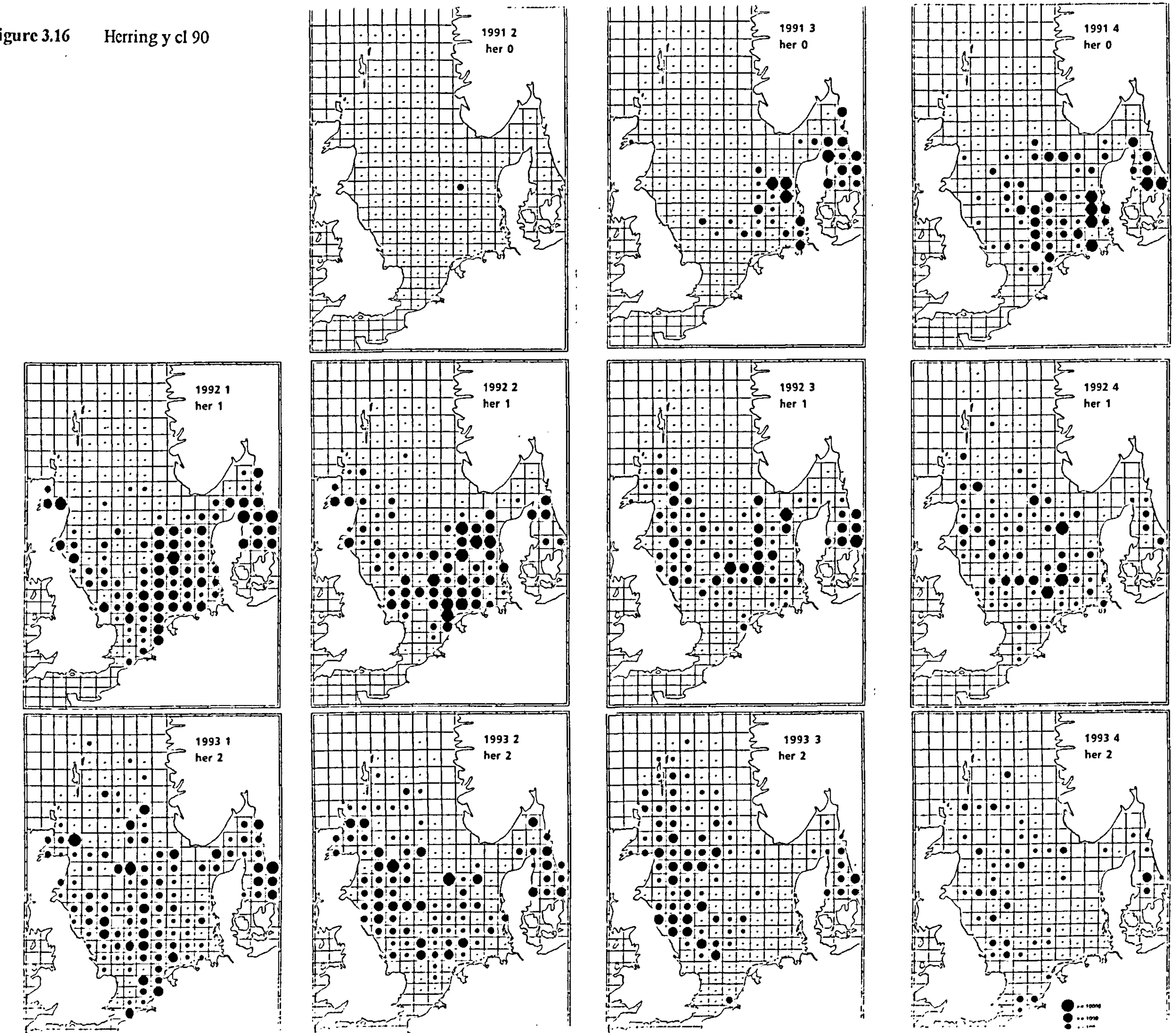


Figure 3.16 Herring y cl 90



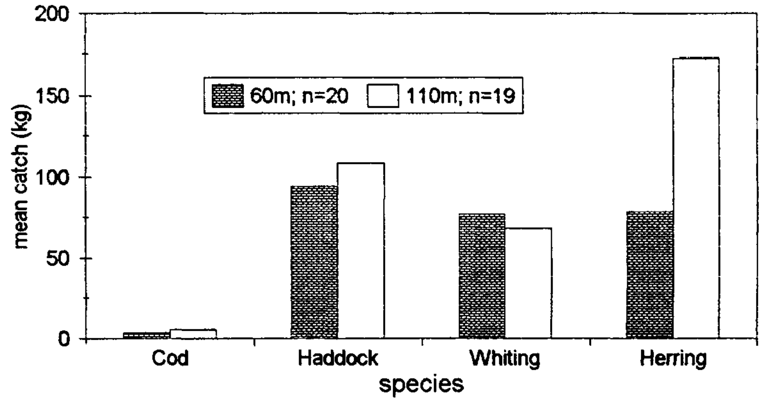


Figure 3.17a: Comparison of different sweep lengths; data of 1994

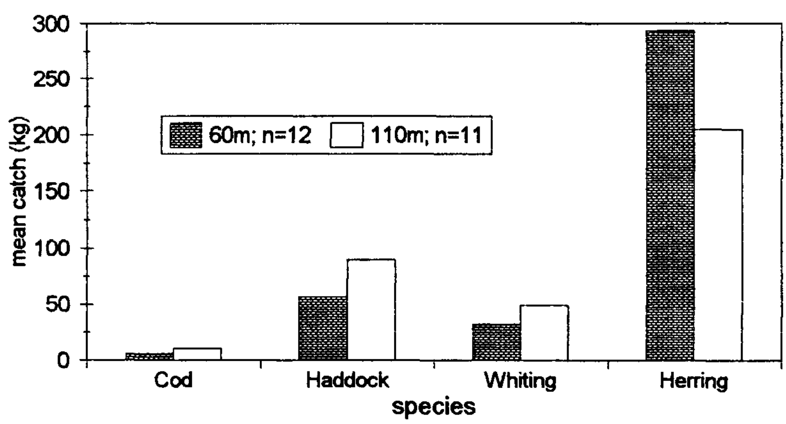


Figure 3.17b: Comparison of different sweep lengths; data of 1995

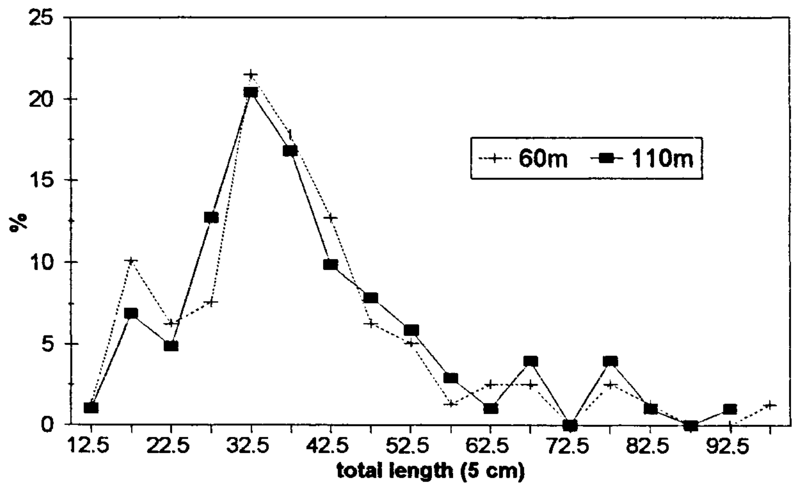


Figure 3.18: COD. Comparison of length frequency distributions, using 60m (n=79) and 110m (n=102) sweep lengths.

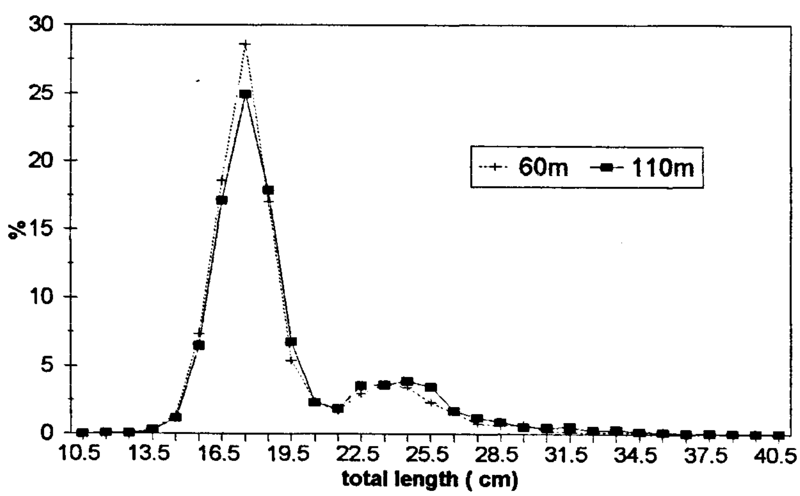


Figure 3.19: Haddock. Comparison of length frequency distributions, using 60m (n=26364) and 110m (n=27141) sweep lengths.

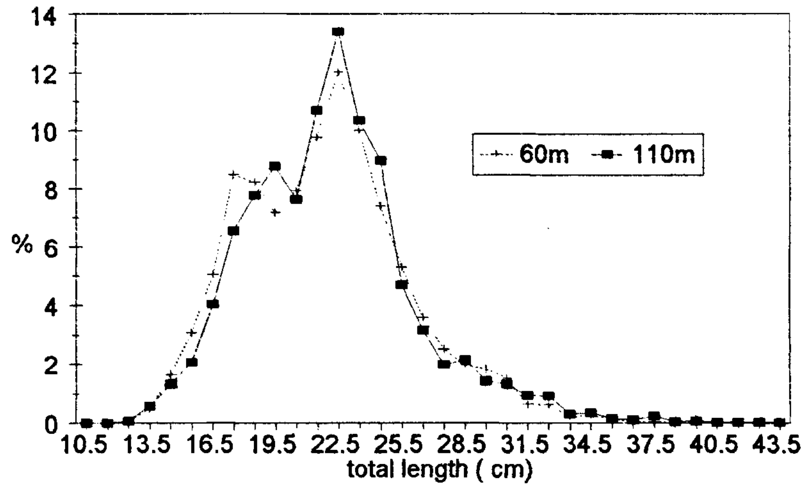


Figure 3.20: Whiting. Comparison of length frequency distributions, using 60m (n=17269) and 110m (n=14508) sweep lengths.

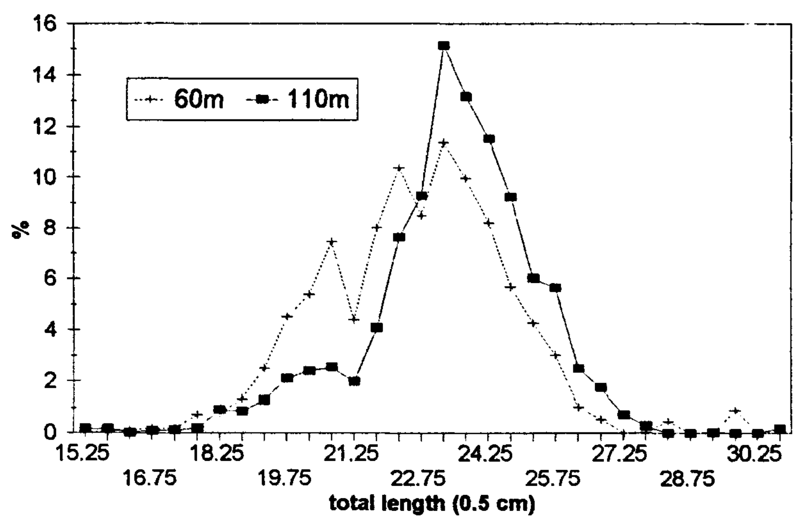


Figure 3.21: Herring. Comparison of length frequency distributions, using 60m (n=14945) and 110m (n=29385) sweep lengths.

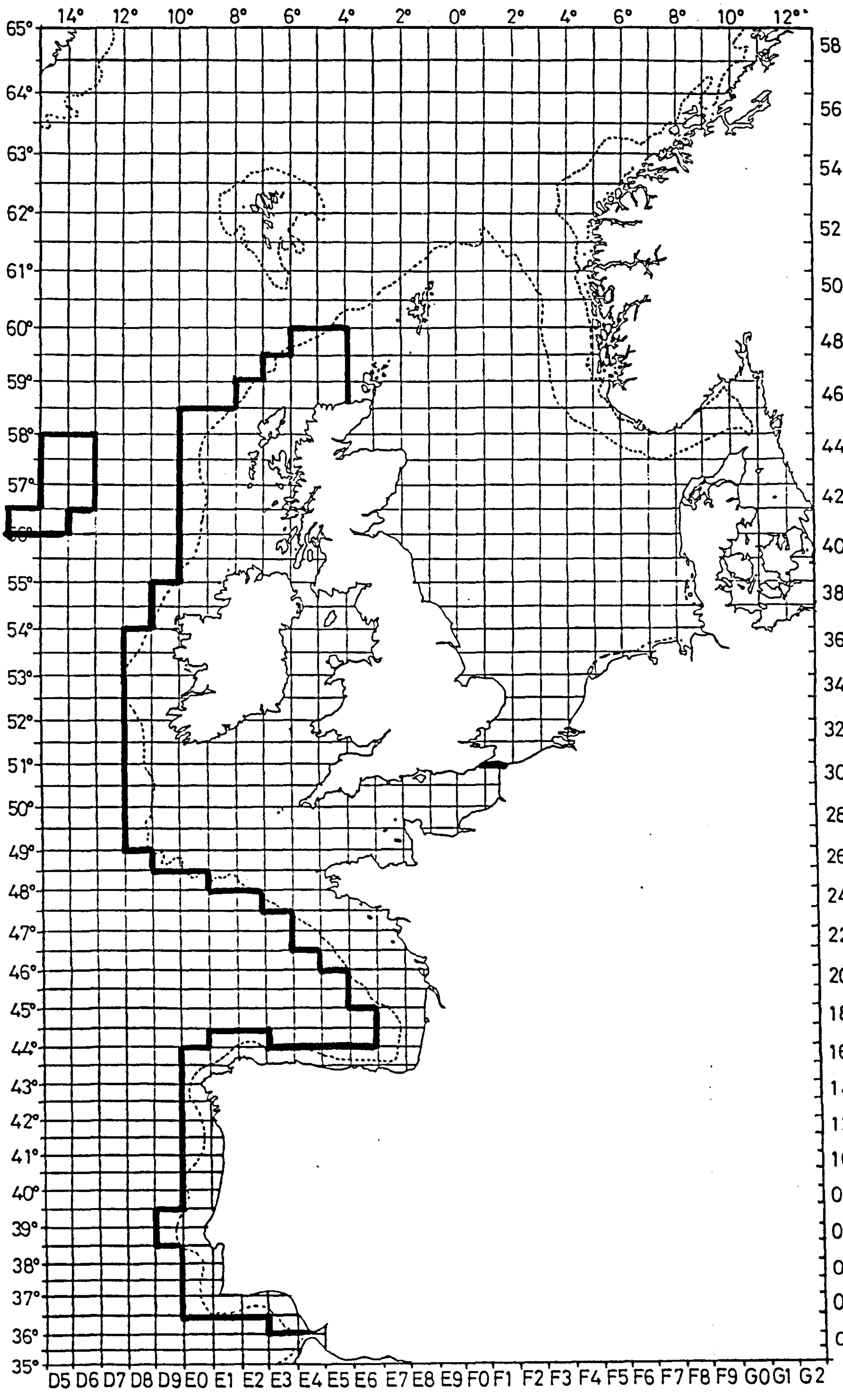
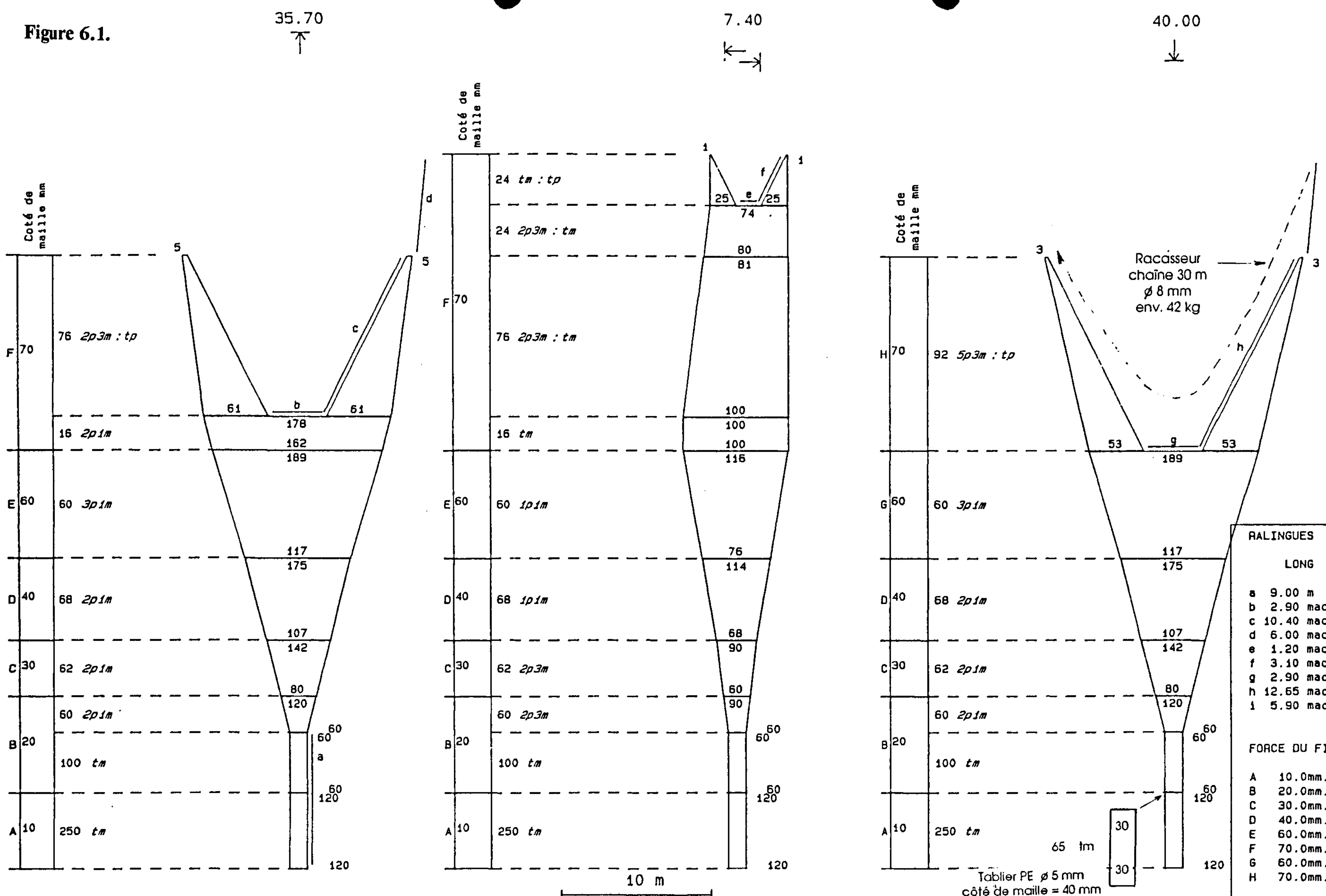


Figure 4.1 Approximate area coverage by bottom trawl surveys in the 4th quarter of 1995 in the western and southern areas.

Figure 6.1.



IFREMER - SETE Service Technologie des Pêches Copyright du logiciel: CENTRE NATIONAL DE LA MER / IFREMER	Ref : GOC73 DATE : 27/10/93

CHALUT 35.70m. / 40.00m.

TYPE 2 faces avec côtés
Especes : divers fond plateau et talus
Origine : IFREMER Sète

1 BATEAU
500 ch. a 1000 ch.
Traction : 4.50 tonnes point fixe
Surface fil : 54.78 m2

RALINGUES

	LONG	MATERIAU	DIAM
a	9.00 m	PA	12.00
b	2.90	macier inox	10.00
c	10.40	macier inox	10.00
d	6.00	macier inox	10.00
e	1.20	macier inox	10.00
f	3.10	macier inox	10.00
g	2.90	macier garn	12.00
h	12.65	macier garn	12.00
i	5.90	macier garn	12.00

FORCE DU FIL PAR ZONE

A	10.0mm.	1100m/Kg	PA
B	20.0mm.	600m/Kg	PA
C	30.0mm.	600m/Kg	PA
D	40.0mm.	600m/Kg	PA
E	60.0mm.	400m/Kg	PA
F	70.0mm.	400m/Kg	PA
G	60.0mm.	280m/Kg	PA
H	70.0mm.	280m/Kg	PA

MAILLAGES EN COTE DE MAILLE
Les mailles de couture sont à ajouter aux largeurs du plan
PROGRAMME MEDITS: ES-FR-GR-IT
Chalut d'échantillonnage
27/10/93