Resource Management Committee

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REPORT OF THE

INTERNATIONAL BOTTOM TRAWL SURVEY WORKING GROUP

Lisbon, Portugal
7–10 April 1999

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

Palægade 2–4 DK–1261 Copenhagen K Denmark

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1 TERMS OF REFERENCE AND PARTICIPATION

The following resolution was passed at the ICES Annual Science Conference at Cascais, Portugal in September 1998. The International Bottom Trawl Survey Working Group [IBTSWG] (Chair: Mr A. Newton,UK) will meet for four days in Lisbon, Portugal in April 1999 to :

a) consider further coordination and standardisation of quarter 4 bottom trawl surveys in Sub-areas VI, VII and VIII and Division IXa;
b) propose a depth and area/latitude stratified station grid;
c) describe specific modifications of the IBTS exchange format, to include data from western and southern surveys;
d) modify the Manual for the IBTS to include specifications for the western and southern surveys;
e) evaluate the progress made in establishing a common database as specified at the last meeting of IBTSWG;
f) consider the implications of the results of the Study Group on the Evaluation of the Quarterly IBTS Surveys for the North Sea area;
g) consider the standard index calculations and the implication of changes in assessment units for the species-specific standard areas used.

IBTSWG will report to the Resource Management and Living Resources Committees at the 1999 Annual Science Conference and to ACFM before its May 1999 meeting.
The meeting was attended by:

Trevor Boon	UK(England)
Lisa Borges	Portugal
Fatima Cardador	Portugal
Paul Connolly	Ireland
Siegfried Ehrich	Germany
Jean-Charles Mahe	France
Andrew Newton (Chair)	UK(Scotland)
Dave Reid	UK(Scotland)
Francisco Sanchez	Spain
Odd Smedstad	Norway
Henrik Sparholt	ICES Secretariat
Yves Verin	France
Kai Wieland	Denmark

Henk Heessen (Netherlands) and Johan Modin (Sweden) were unable to participate due to unforeseen circumstances.

2 INTRODUCTION

The International Bottom Trawl Working Group (IBTSWG) has its origins in the North Sea, the Skagerrak and Kattegat where co-ordinated surveys have occurred since 1966. Initially these surveys only took place during the first quarter of the year, but between 1991 and 1997 co-ordinated surveys took place in all four quarters of the year. Pressure on ship time caused the number of surveys to be reduced and currently co-ordinated surveys in the North Sea are only undertaken in the first and third quarters.

The IBTSWG assumed responsibility for co-ordinating western and southern division surveys in 1994. Initially progress was slow, but following the meeting in Santander in March 1997 major improvements were made in co-ordination and one of the main TORs of the current meeting is to fully integrate these surveys into ICES surveys. This objective was achieved by building on the success of the SESTIS project (an EU funded project involving France, Portugal and Spain) and by utilising the forthcoming joint projects with France, Ireland and Scotland. An important aspect of co-ordinated surveys is comparative fishing between nations and the meeting reviewed the experience gained by some of the participants in recent experiments.

Whilst a considerable period of time was spend on the 'new areas' the origins of the Working Group were not forgotten and progress and standardisation within the North Sea was also reviewed. Close attention was paid to the species specific standard areas and to the calculations of the relevant indices with the result that ICES will be asked to provide new indices as described in this document, together with existing indices, to assessment groups.

3 NORTH SEA SURVEYS

3.1 Co-ordinators' Overview

3.1.1 Quarter 1

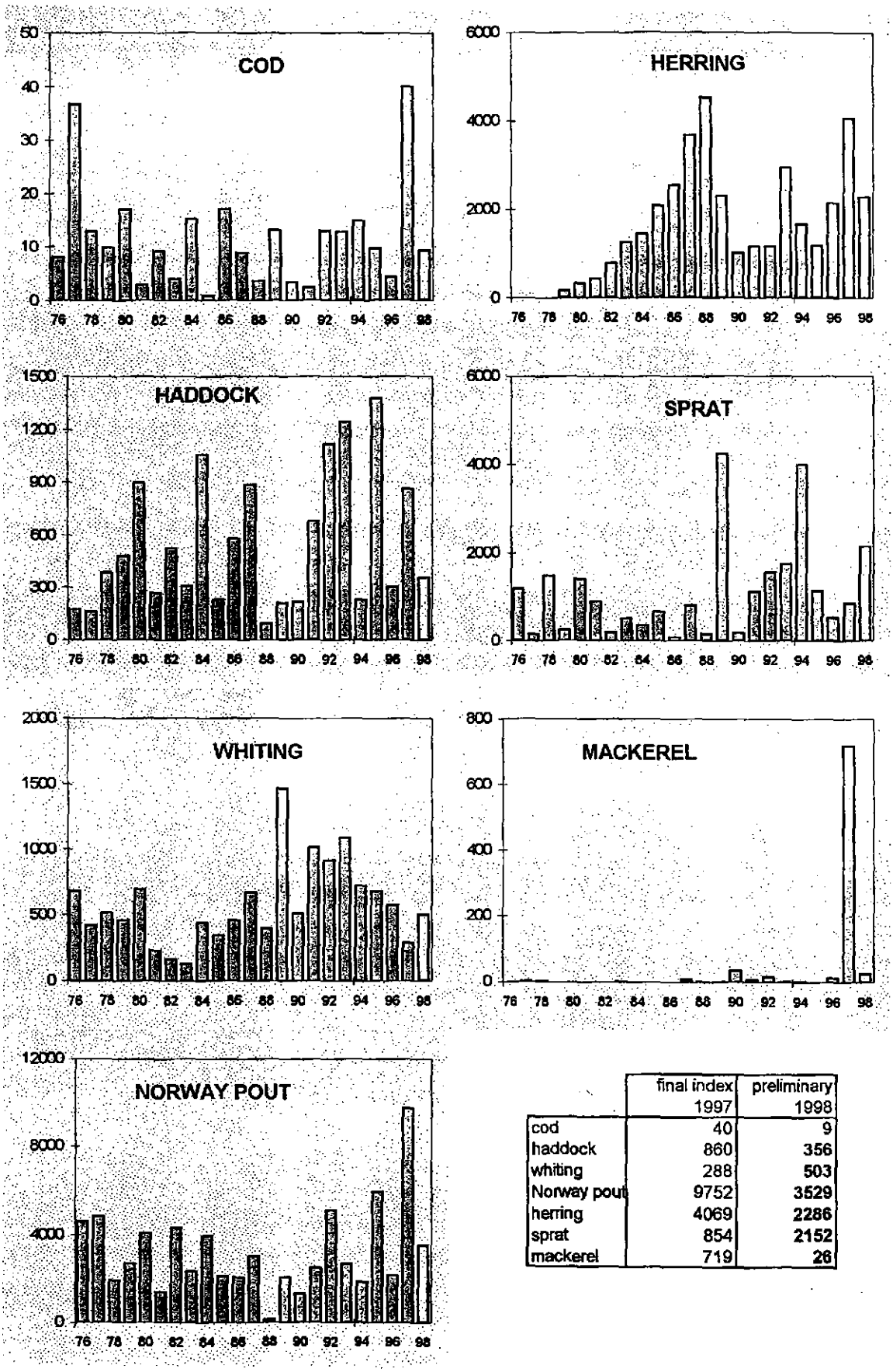
Seven countries participated in the 1999 quarter 1 IBTS survey (see table). For the first time all participants fished with the GOV-trawl during daytime and with the MIK-trawl during the night. Although the weather conditions were rather poor from time to time, the overall coverage was good: all rectangles have been fished at least once with the GOV, and in the MIK coverage only 3 gaps may be found.

While at sea, the preliminary catch data were exchanged between vessels. This information is restricted to the catch in number per hour of the youngest year classes of 7 species, and the number of MIK hauls per rectangle. From these data it appears that for sprat and whiting. The indices are higher than for 1998. The catches of herring were poor, and confirm the low catches of herring larvae in 1998. For cod, haddock, Norway pout, mackerel and herring, this years index was lower than for 1998.

The catches of herring larvae in the MIK hauls were rather good.

Country	Vessel	Period	GOV	MIK
			No of hauls	No. of hauls
Denmark	Dana 2	29-01/11-02	35	64
France	Thalassa 2	30-01/21-02	63	41
Germany	Walther Herwig 3	29-01/28-02	71	97
Netherlands	Tridens 2	25-01/26-02	53	71
Norway	Michael Sars	09-01/11-02	43	56
Scotland	Scotia 3	25-01/14-02	53	98
Sweden	Argos	25-01/12-02	34	61
Total			352	488

Figure 3.1.1 (overleaf) provides a summary of the final individual species indices since 1976 together with a preliminary value for the 1998 year class.



	final index 1997	preliminary 1998
cod	40	9
haddock	860	356
whiting	288	503
Norway pout	9752	3529
herring	4069	2286
sprat	854	2152
mackerel	719	26

Figure 3.1.1 North Sea IBTS indices since 1976 and preliminary 1998 year class indices.

3.1.2 Quarter 3

For the six years period 1991-96 there were co-ordinated quarterly international bottom trawl surveys in the North Sea, Skagerrak and Kattegat. Due to various national constraints such a high level of coverage has proved impossible to maintain and effort has now become focused on quarters 1 and 3 only. The effort ascribed to quarter 3, as cruise days is given in Table 3.1.2. This also includes proposals for 1999. It can be seen that the number of hauls has fluctuated between a low of 248 in 1995 and a high of 353 in 1992. However, there has still been at least one haul made, in almost all the ICES rectangles, within the prescribed depth range, in the North Sea, Skagerrak and Kattegat, in each year since 1991.

Two national surveys, the Scottish Groundfish Survey and the English Groundfish Survey, have, since 1991, been incorporated in the quarter 3 International Survey. Because of their longer time series (SGFS since 1982, EGFS since 1977) these two surveys have been used in the assessment of North Sea gadoids in preference to the combined International Survey. However, beginning in 1998, Scotland changed to a new research vessel, Scotia III, and also took the opportunity to change their survey fishing gear from an Aberdeen trawl to a GOV trawl, the recommended standard gear. Without applying conversion factors, this has effectively broken the SGFS indices time series. There is also a possibility in the next few years that England will change research vessels. Both the English and Scottish institutes have in the past provided current age based survey data to the North Sea Assessment Working Group even though their surveys finish only a few weeks before the WG meetings. The logistics of providing age based data from the combined international quarter 3 survey are somewhat more complex, but it was decided to establish a schedule to achieve this aim and to bring it into operation for the 1999 survey. Therefore institutes participating in the quarter 3 survey are requested to provide ICES with haul and length data immediately after their cruise ends and gadoid age data as soon as they are available. It is understood that the provision of age data so quickly is difficult for some participants but, if England and Scotland are able to achieve this, as they have done in the past, then there should be sufficient material to construct age/length keys for at least the 7 North Sea roundfish areas and thus to construct age based recruit indices.

Table 3.1.2 Number of valid hauls and days at sea per country for quarter 3 surveys 1991 – 1998 and number of days proposed for 1999.

	1991		1992		1993		1994		1995		1996		1997		1998		1999
	Hauls	Days	Hauls	Days	Hauls	Days	Hauls	Days	Hauls	Days	Hauls	Days	Hauls	Days	Hauls	Days	Days
Denmark															51	14	13
France			61	17	70	19	55	19			56	32					
Germany			48	12							33	8	32	8	28	8	8
Netherlands	73	19	32	11	65	17	42	10	34	9	17	5	18	8			
Norway																	28
Sweden	52	15	53	15	53	15	53	15	53	15	53	15	46	15	48	15	15
UK(England)	87	27	72	31	71	27	73	23	74	30	79	27	74	26	74	28	32
UK(Scotland)	90	20	87	20	87	20	89	20	87	20	85	20	88	20	77	18	21
Total	302	81	353	106	346	98	312	87	248	74	323	107	258	77	278	83	117

3.2 Study Group on the Evaluation of the Quarterly Surveys for the North Sea area

This Study Group met in August 1998 with the remit to evaluate quarterly IBTS surveys in the North Sea. The report of the Study Group discusses 5 main items:

1. The usefulness of the IBTS survey indices.
2. The ability of the quarterly surveys to describe spatial distribution and seasonal variability.
3. IBTS and ecosystem studies.
4. Correction factors for catches made with gears other than GOV trawl.
5. Reduction in survey effort - concentration of effort in quarters 1 and 3.

Under the first item the Study Group recommends the IBTS Working Group to reconsider the standard areas, and this is discussed in chapter 3.2.2. Further, "in light of the recent and continuing methodological developments the Study Group feels that the IBTS Working Group should continue the search for ways of analysing IBTS data which are sensitive to reductions of stocks which display density-dependent habitat utilisation". The Working Group found this issue too complicated to take up in a four days meeting with a long Terms of Reference, but the Group encourages scientists in the different laboratories to take up the problem. The usefulness of the IBTS indices are also discussed in chapter 3.2.1.

Both within- and between-year changes in distribution could be seen. Regarding the predator prey overlap the time-series were too short for any firm conclusion. The Study Group did not have any recommendations to the Working Group in this connection.

The Study Group "felt that there was an opportunity for increasing the value of the IBTS by routinely collecting species abundance data from other biota, such as epi-benthos or seabirds, providing that this had little impact of the survey's ability to adequately survey the groundfish assemblage". In 1999 monitoring epibenthos with a small beamtrawl will be started up in the third quarter IBTS. This project have EU-funds for two years.

In the North Sea correction factors are established for the old English Groundfish Survey, but work has to be done to establish correction factors for the old Scottish Groundfish Survey. The problem of correction factors for catches made with gears other than the GOV trawl is further discussed in chapters 4.4, 5.4 and 5.5.

Because of short time-series the Study Group could not give a firm conclusion on the effects of reducing the effort from four to two quarters, but from 1998 there have been only two quarterly surveys in the North Sea.

3.2.1 Comparison of Quarterly Indices

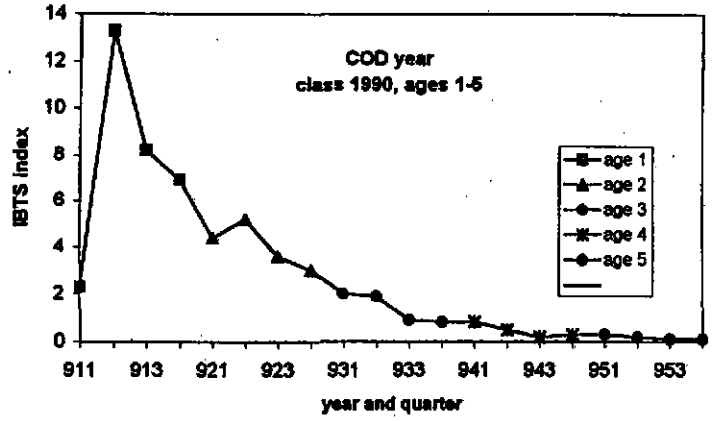
To give an impression on the consistency of the quarterly IBTS indices, the catch curves of the 4 species cod, whiting, haddock and herring for the year-classes 1990 to 1993 are shown in Figures. 3.2.1. a-d.

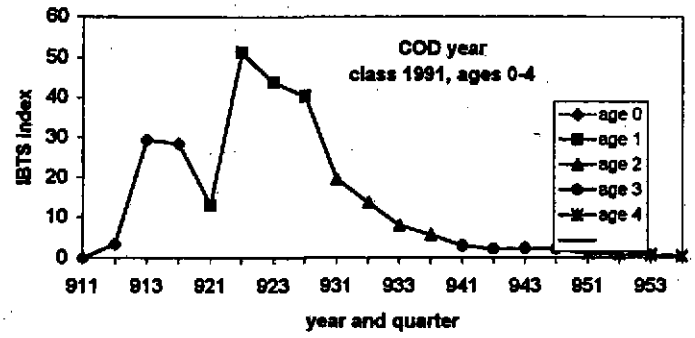
Due to several reasons the quarterly indices are very inconsistent. For cod age 1 it depends on the fact that the **species specific IBTS standard area** does not covers the total distribution area of the stock. Some near-shore rectangles of the German Bight and the rectangles in the eastern Skagerrak are excluded, which are important nursery areas in some years. The inclusion of the 4 rectangles adjacent to the Wadden Sea in the German Bight can result in a 2-3 fold increase of the index (Wieland, 1998). For cod age 2 and whiting age 1 and 2 Wieland only found small differences between IBTS indices based on standard areas and the extended areas.

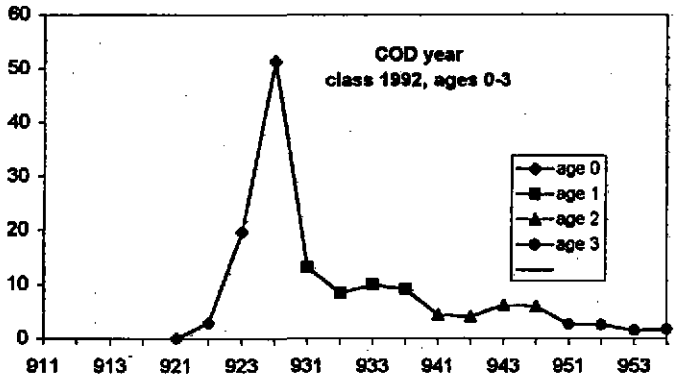
During the first quarter the proportion of **night hauls** is the highest and can reach 20% of the hauls used for the calculation of the indices for the gadoids. The light conditions influence the catches of 1 and 2 years old cod and whiting in the way that the night catches are substantially lower than daylight catches (cod age 1: only 60%; Wieland 1998). For the calculation of the herring index this problem does not occur as only daylight hauls are used.

The relatively low index for haddock and whiting in quarter 3 partly depends on the inclusion of the original Scottish catches. During this period Scotland has used the **Aberdeen-trawl**, which has a lower catchability than the GOV-trawl (Knijn et al. 1993). Since 1998 the GOV has become the standard gear deployed by all nations in the third quarter survey.

The inconsistency of the herring indices depends on the very **patchy distribution**. Very high values in only one or two rectangles, based on only one haul and therefore not smoothed by additional hauls in that rectangle, dominate the index. The inconsistency of the indices makes it necessary to improve the quality of the indices, as already stated by the Quarterly IBTS Working Group.







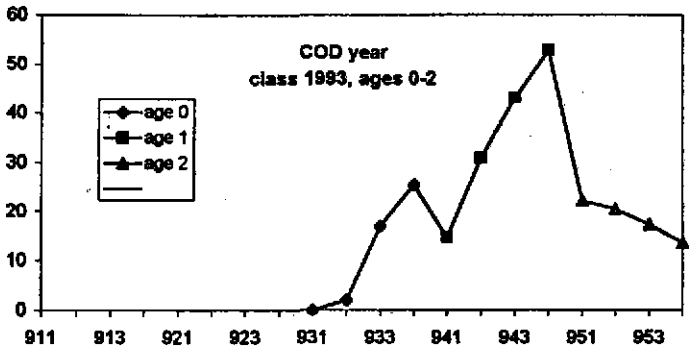


Figure 3.2.1.a: Cod. Catch curves for the year classes 1990–1993.

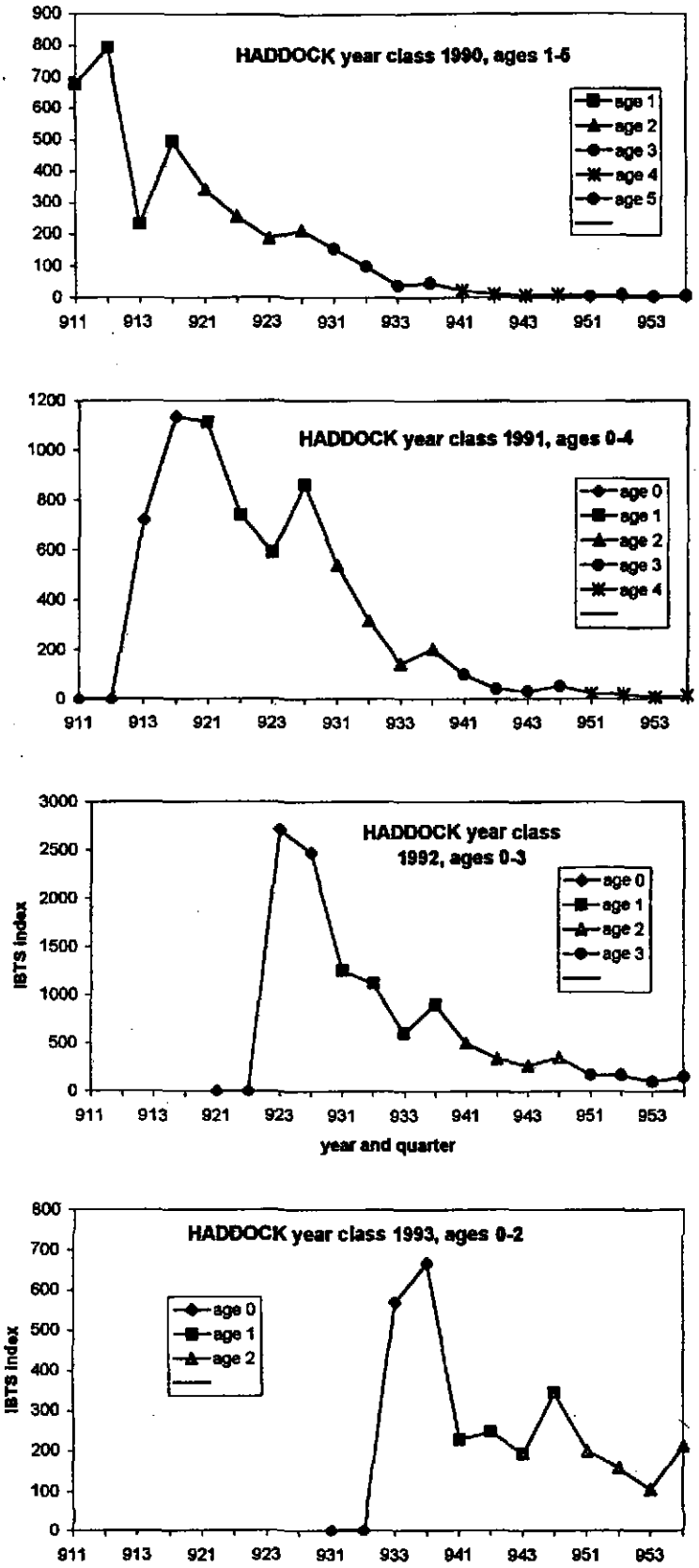


Figure 3.2.1.b: Haddock. Catch curves for the year classes 1990–1993.

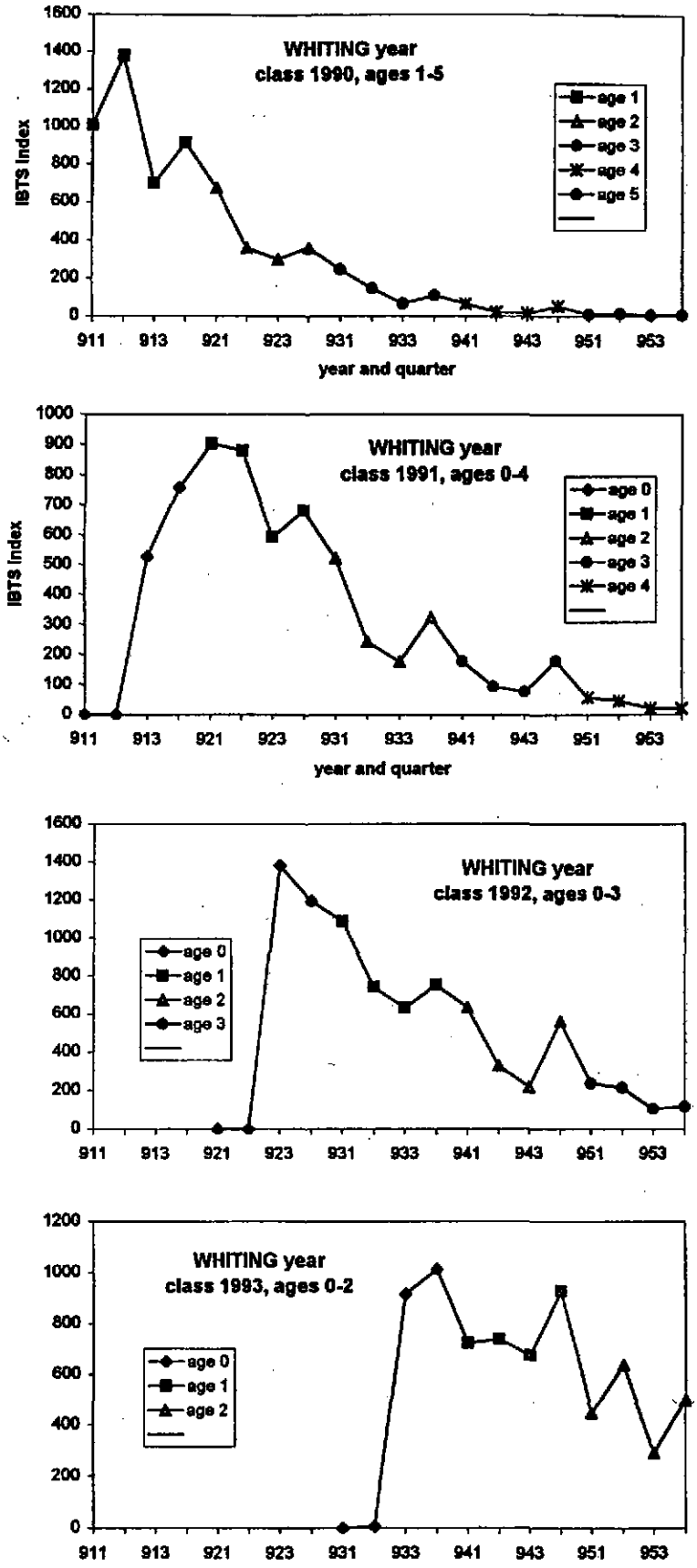
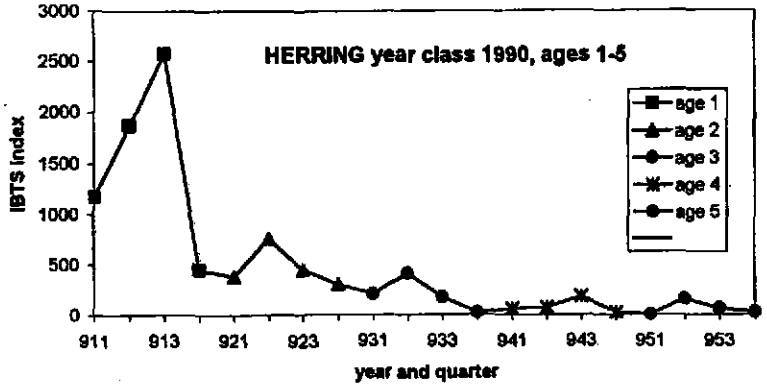
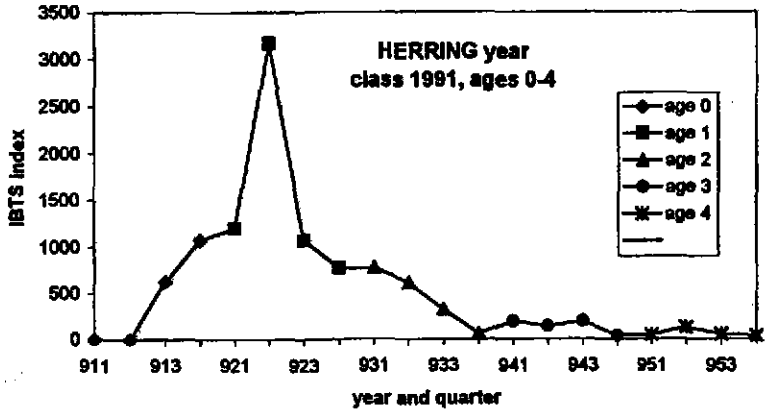
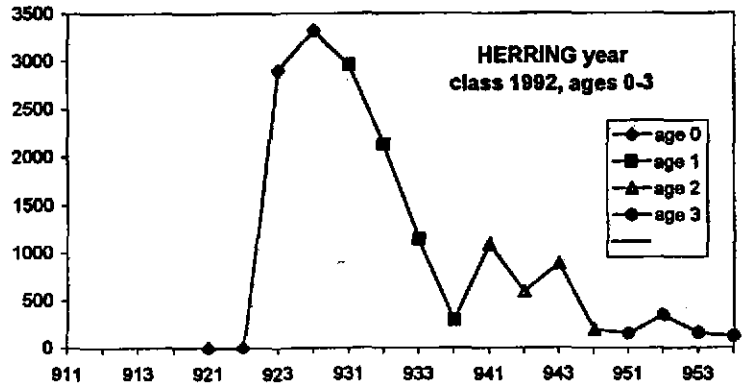


Figure 3.2.1.c: Whiting. Catch curves for the year classes 1990–1993.







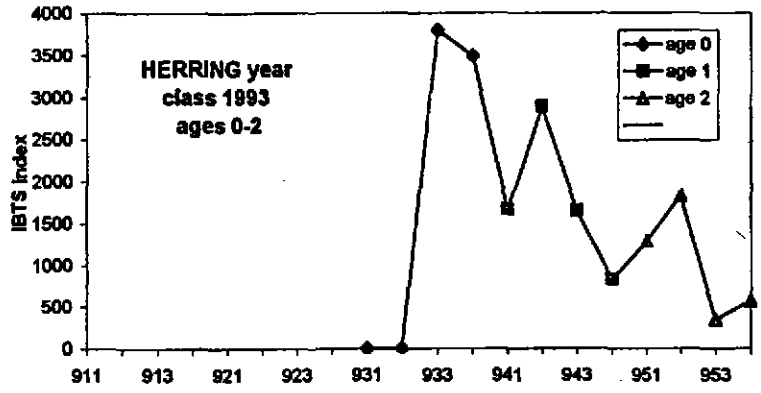


Figure 3.2.1.d Catch curves for the year classes 1989–1992. Please note that the year classes given in the above figures are wrong by one year.

3.2.2 IBTS species-specific standard areas

Cod, haddock, whiting and Norway pout

The IBTS standard areas used for the calculation of abundance indices were established in order to in corporate all the statistical rectangles regularly fished excluding regions which are of limited or no significance for a given species (ICES CM 1981/H:1). The areas for cod, haddock, whiting and Norway pout are species-specific and cover the main distribution of these species in the North Sea. For cod, three rectangles from the western Skagerrak (44F8, 44F9 and 43F8; Fig. 3.2.2.1) are included. The areas for haddock, whiting and Norway pout covers an additional rectangle (43F9) in the eastern Skagerrak which, however, has never been fished in the first quarter survey (ICES CM 1998/D:4).

The standard area for cod was identical to that used for whiting until 1980, but since then five rectangles from which four rectangles are located in the coastal region of the German Bight have been excluded because they introduced an increased variability of the survey index for the 1-group and further a decreased correspondence with VPA estimates for the years 1969 to 1979 (ICES CM 1983/G:62). The IBTS was extended in the 1980's to the Skagerrak and Kattegat (Heessen *et al.* 1997) where at times high abundances of in particular age 1 and 2 cod can be found (ICES CM 1998/D:4, Wieland 1998). The existing standard areas have, however, not been changed accordingly, and separate indices were given for age 1 and 2 cod in the Skagerrak and the Kattegat based on a length splitting (e.g. ICES CM 1999/D:8).

The Working Group on the assessment of demersal stocks in the North Sea and Skagerrak, which is one of the major user of IBTS results, applies the following stock entities since 1996 (ICES CM 1998/Assess:7):

- Cod: eastern Channel (Div. VIId), North Sea (Sub-area IV) and Skagerrak
- Whiting: eastern Channel and North Sea
- Haddock and Norway pout: North Sea (Sub-area IV) and Skagerrak/Kattegat (Div. IIIA).

The recent change of the assessment units, the extension of the IBTS survey area and the high importance of the Skagerrak/Kattegat as nursery areas in some cases provided the background for considering a re-definition of the IBTS species-specific standard areas as recommended by the Study Group on the Evaluation of the quarterly IBTS surveys (ICES CM 1998/D:4). Results for cod, haddock, whiting and Norway pout were presented in Working Document 3.

New species-specific areas were chosen such, as they resemble the actual assessment units for a given species, as far as covered by the IBTS. For haddock and Norway pout regions which are of limited or no significance were excluded. The area limits were set according to the definitions of the ICES roundfish areas in the North Sea (Fig. 3.2.2.1), and were as follows:

- Cod: roundfish areas 1-8 (Figure 3.2.2.2)
- Haddock: roundfish areas 1-4 & 7-9 (Figure 3.2.2.3)
- Whiting: roundfish areas 1-7 (Figure 3.2.2.4)
- Norway pout: roundfish areas 1-4 & 7NE-9 (Figure 3.2.2.5).

Mean catches (in n/hr) by statistical rectangle were retrieved from the ICES IBTS Database. The 1st quarter data covered the period 1982 to 1998, and abundance indices were calculated for the 1- and the 2-group according to the normal IBTS procedure, i.e. taking the arithmetic mean for all rectangles within the areas specified above. These indices were compared with the standard ones as listed in ICES (CM 1999/D:8) and most recent assessment results taken from ICES (CM 1999/ACFM:8). These assessment results were not independent from the IBTS as the 1st quarter IBTS standard indices were used among data from other fleets for tuning. Additional comparisons were made with assessment data, in which the 1st quarter were excluded from tuning.

The numbers of rectangles for which IBTS data were available are listed in Table 3.2.2.1 by species and roundfish area. Area coverage was equal for all species in the North Sea (roundfish areas 1-7). According the reported data the Skagerrak (roundfish area 8) was not well covered in the 1980's. Data for the Kattegat (roundfish area 9) are completely missing for the years prior to 1991, and in the later years data for haddock and Norway pout were missing in 2 and 3 cases, respectively. The missing data would, of course, effect the standard indices as they include the western Skagerrak, but this effect might become important if catch rates in the Skagerrak/Kattegat deviate substantially from the North Sea average when an area extension towards the entire Skagerrak and the Kattegat is considered.

Abundance indices for age 1 and 2 cod, haddock, whiting and Norway pout are shown in Figures 3.2.2.6–3.2.2.9. The new indices were consistently higher for age 1 and 2 cod, which indicates the high importance of the coastal region of

the German Bight (e.g. 1991) and the Skagerrak (e.g. 1992 and 1995) (Wieland 1998). The similarity of the two indices for both age groups of haddock in the period entire time series and in particular for the years 1991 and 1993–1997 may suggest that catch rates in the Skagerrak/Kattegat do not differ from the North Sea average. The new indices for whiting and Norway pout also did not differ very much from the standard ones.

The agreement between IBTS abundance indices and assessment results was not substantially effected by the change of the species-specific areas (Table 3.2.2.2a) with one exception. For age 1 cod a much better correspondence was found for the new index which includes the Skagerrak. The exclusion of the 1st quarter IBTS in the VPA tuning resulted only in slight changes of the assessment results for the last years of the time series (Figure 3.2.2.10) and did not effect the level of agreement between the IBTS indices and the assessment for haddock and whiting (Table 3.2.2.2b). Similarly, an inclusion of the southern North Sea for haddock and Norway pout, which contributes almost zero catches (ICES CM 1998/D:4), did not change the correlation with assessment results (Table 3.2.2.2a).

Sprat

The standard area for sprat in the North Sea is problematic as it covers only about half of the distribution area of the sprat stock. The Herring Assessment Working Group for the Area South of 62^{0}N realised this already some years ago (ICES CM 1995/Assess:13) and made their own index calculations. In order to make the indices as consistent and comparable across stocks as reasonable, the present WG considers that for the North Sea sprat stock the index should be calculated as an area weighted mean over means by rectangles for the entire North Sea. For the Skagerrak/Kattegat stock it should be calculated in the same way, but for the rectangles in that area.

Other species

No analysis with changed areas was carried out for other IBTS target species, i.e. herring, mackerel and saithe.

Conclusions

The Working Group agreed that it is worthwhile to change the IBTS species-specific areas such as they correspond more closely to the actual assessment units despite of the problems discussed above. The IBTS database should be updated in order to attempt for including as much of the missing data as possible from the Skagerrak and the Kattegat. ICES should provide new abundance indices, which can be used by the Working Group on the Assessment of Demersal Stocks in the North Sea alternatively to the standard indices, using the data from all fished rectangles with the area limits as follows:

North Sea (roundfish areas 1-7):	Whiting, sprat
North Sea and Skagerrak (roundfish areas 1-8):	Cod
North Sea, Kattegat and Skagerrak (roundfish areas 1-9):	Haddock, Norway pout
Skagerrak and Kattegat (roundfish areas 8-9):	Sprat

Table 3.2.2.1: Area coverage in the 1st quarter IBTS 1982-1998 for cod, haddock, whiting and norway pout.

	Number of rectangles by roundfish area for which data were available																		
	1	2	3	4	5	6	7	8				9				total			
Year	all species	all species	all species	all species	all species	all species	all species	cod	had	whi	nor	cod	had	whi	nor	cod	had	whi	nor
1982	18	17	21	11	10	27	13					0	0	0	0	118	118	117	118
1983	41	25	21	12	10	34	13					0	0	0	0	156	156	156	156
1984	41	25	20	12	10	36	13					0	0	0	0	157	157	157	157
1985	41	25	21	12	10	35	13	9	9	9	9	0	0	0	0	166	166	166	166
1986	41	25	20	11	10	36	13	9				0	0	0	0	165	156	156	156
1987	41	25	20	11	10	34	13	10	10	10		0	0	0	0	164	164	164	154
1988	41	25	20	11	10	33	13					0	0	0	0	153	153	153	153
1989	37	25	19	11	10	35	13					0	0	0	0	150	150	150	150
1990	37	25	20	11	9	33	13					0	0	0	0	148	148	149	148
1991	41	25	20	11	10	34	13	9	9	9	9	8	8	8	8	171	171	171	171
1992	40	25	19	12	11	34	13	10		10		8	0	8	0	172	154	172	154
1993	41	25	20	12	10	34	13	10	10	10	10	8	8	8	8	173	173	173	173
1994	34	25	20	11	11	34	13	10	10	10	10	8	8	8	8	166	166	166	166
1995	36	25	20	12	10	34	13	10	10	10	10	8	8	8	8	168	168	168	168
1996	39	25	20	12	10	33	13	9	9	9	9	8	8	8	8	169	169	169	169
1997	40	25	20	12	11	33	13	10	10	10	10	8	8	8	8	172	172	172	172
1998	41	25	20	12	11	34	13	9	9	9	9	8	0	8	8	173	165	173	173

missing data that effect the indices based on the existing standard areas or the inclusion of the entire Skagerak

missing data that effect the indices based on the inclusion of the Kattegat for haddock and norway pout

Table 3.2.2a Correlation (r^2) between 1st quarter IBTS indices based on different areas with ICES assessment (IBTS standard area indices: ICES CM 1999/D:8, Assessment data: ICES CM 1999/ACFM:8).

	Cod (1982–1998)		Haddock (1982–1998		Whiting (1982–1998		Norway pout (1983–1998	
Index	Age 1	Age 2	Age 1	Age 2	Age 1	Age 2	Age 1	Age 2
IBTS standard areas	0.23	0.62	0.71	0.91	0.16	0.44	0.49	0.40
IBTS roundfish areas 1–7					0.15	0.45		
1–8	0.44	0.63						
1–4 & 7–9			0.67	0.93				
1–4 & 7E–9							0.46	0.43
1–9			0.66	0.92			0.46	0.43

Table 3.2.2b Correlation (r^2) between 1st quarter IBTS indices based on different areas with assessment when 1st quarter IBTS is executed from tuning for haddock and whiting (Assessment provided by Phil Kunzlik, Marine Laboratory Aberdeen).

	Haddock (1982–1998)		Whiting (1982–1998)	
Index	Age 1	Age 2	Age 1	Age 2
IBTS standard areas	0.7	0.88	0.16	0.44
IBTS roundfish areas 1–7			0.16	0.46
1–4 & 7–9	0.67	0.89		

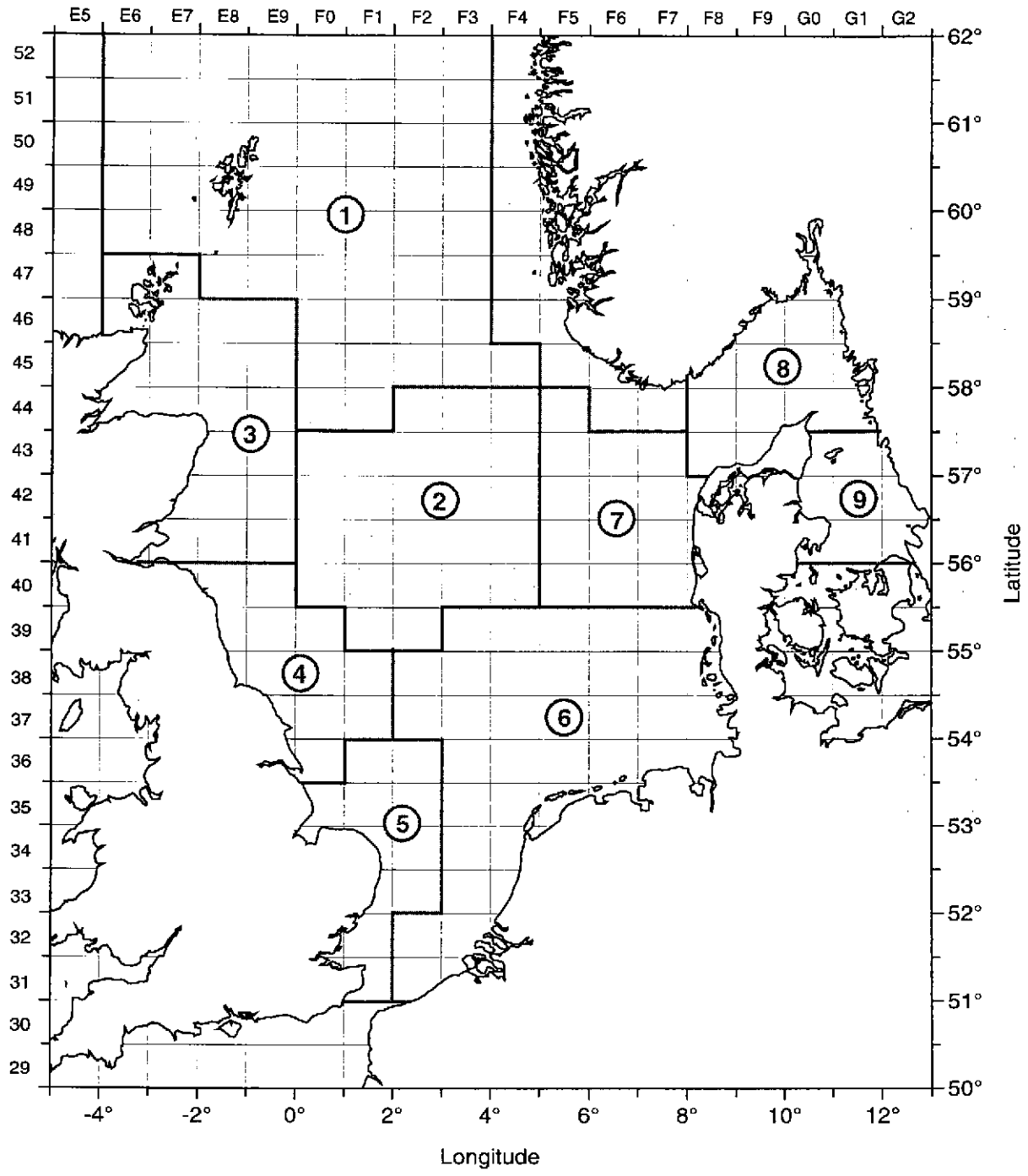


Figure 3.2.2.1: ICES statistical rectangles and roundfish sampling areas in the North Sea.

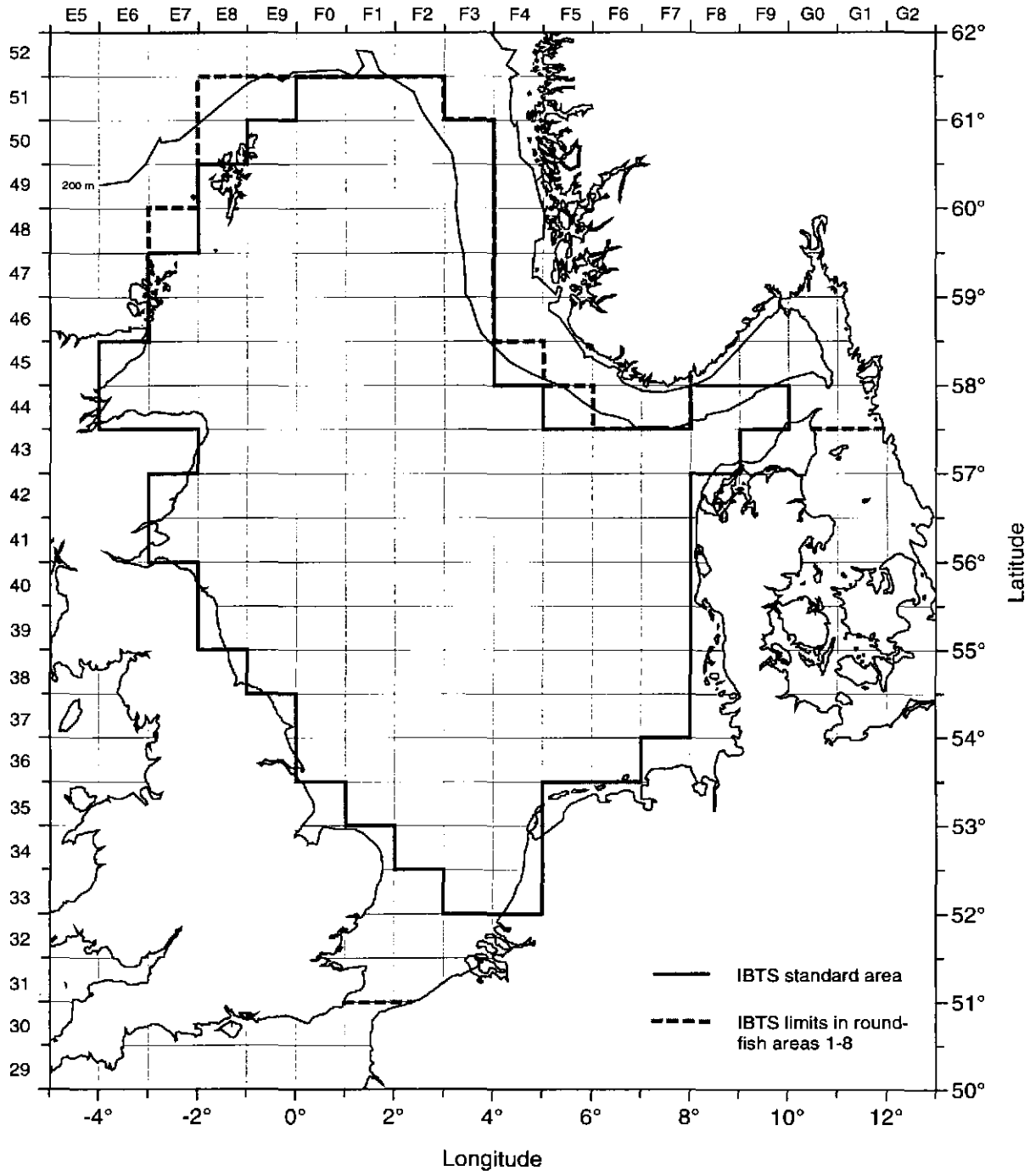


Figure 3.2.2.2: IBTS area for cod.

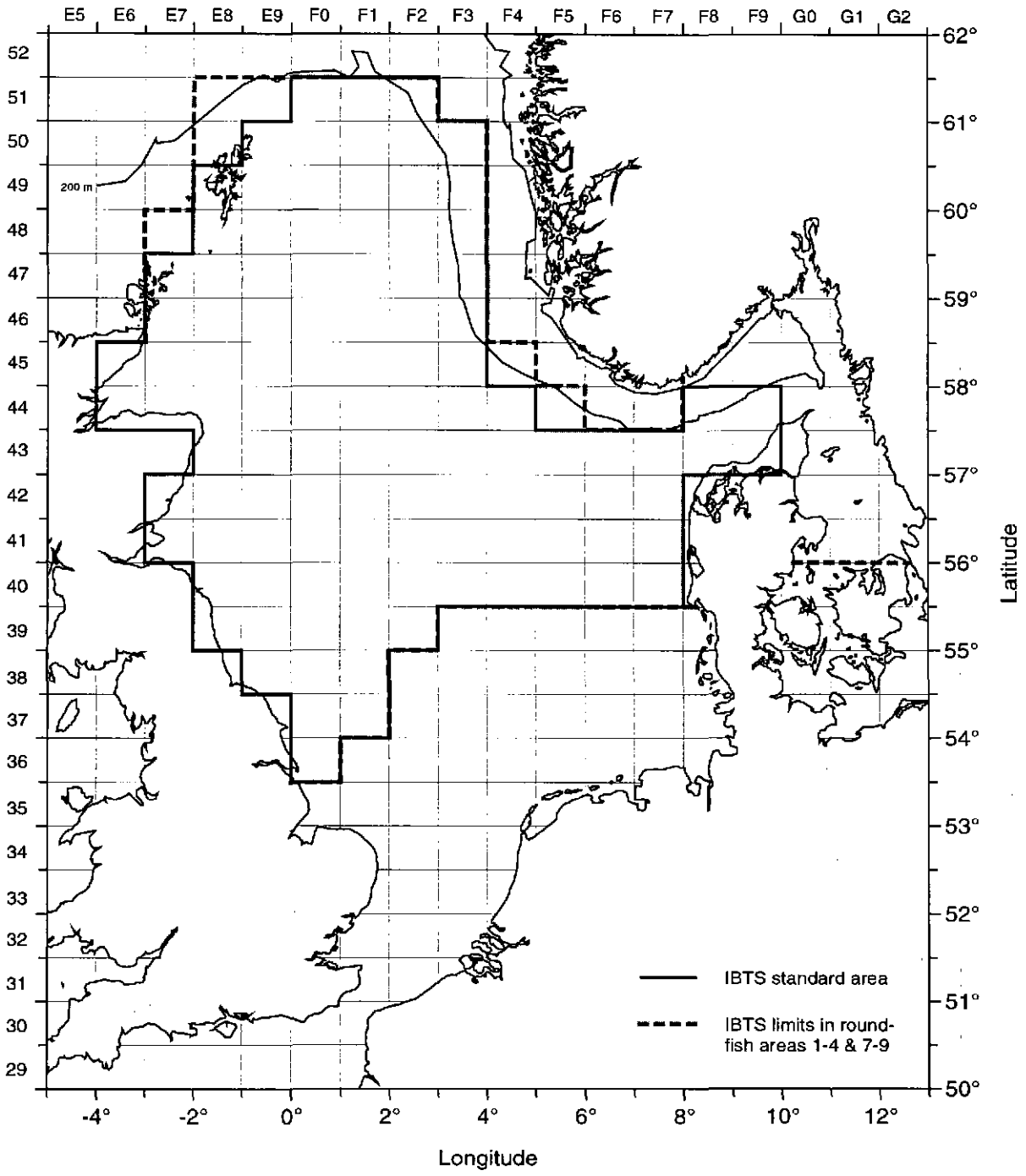


Figure 3.2.2.3: IBTS area for haddock.

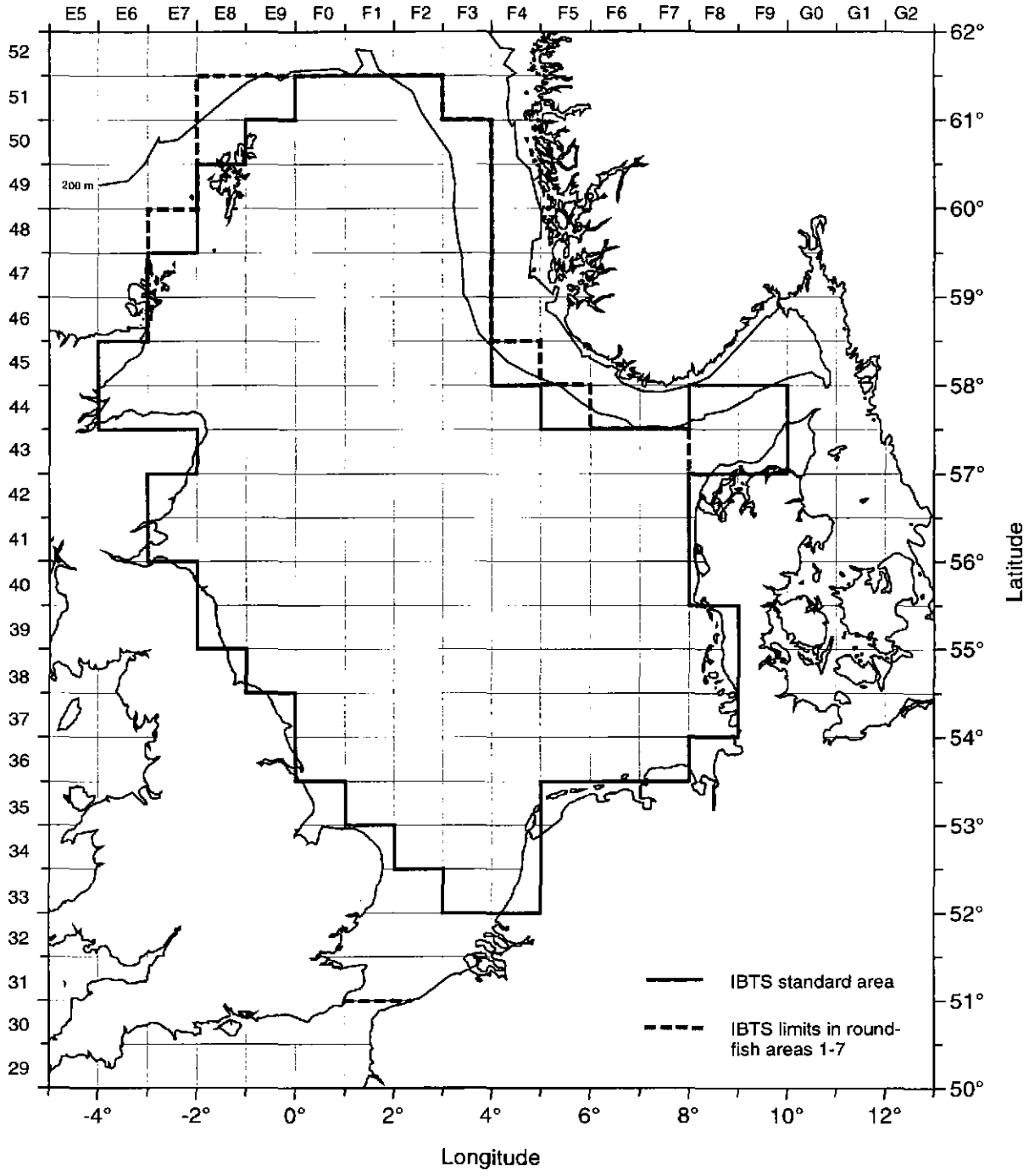


Figure 3.2.2.4: IBTS area for whiting.

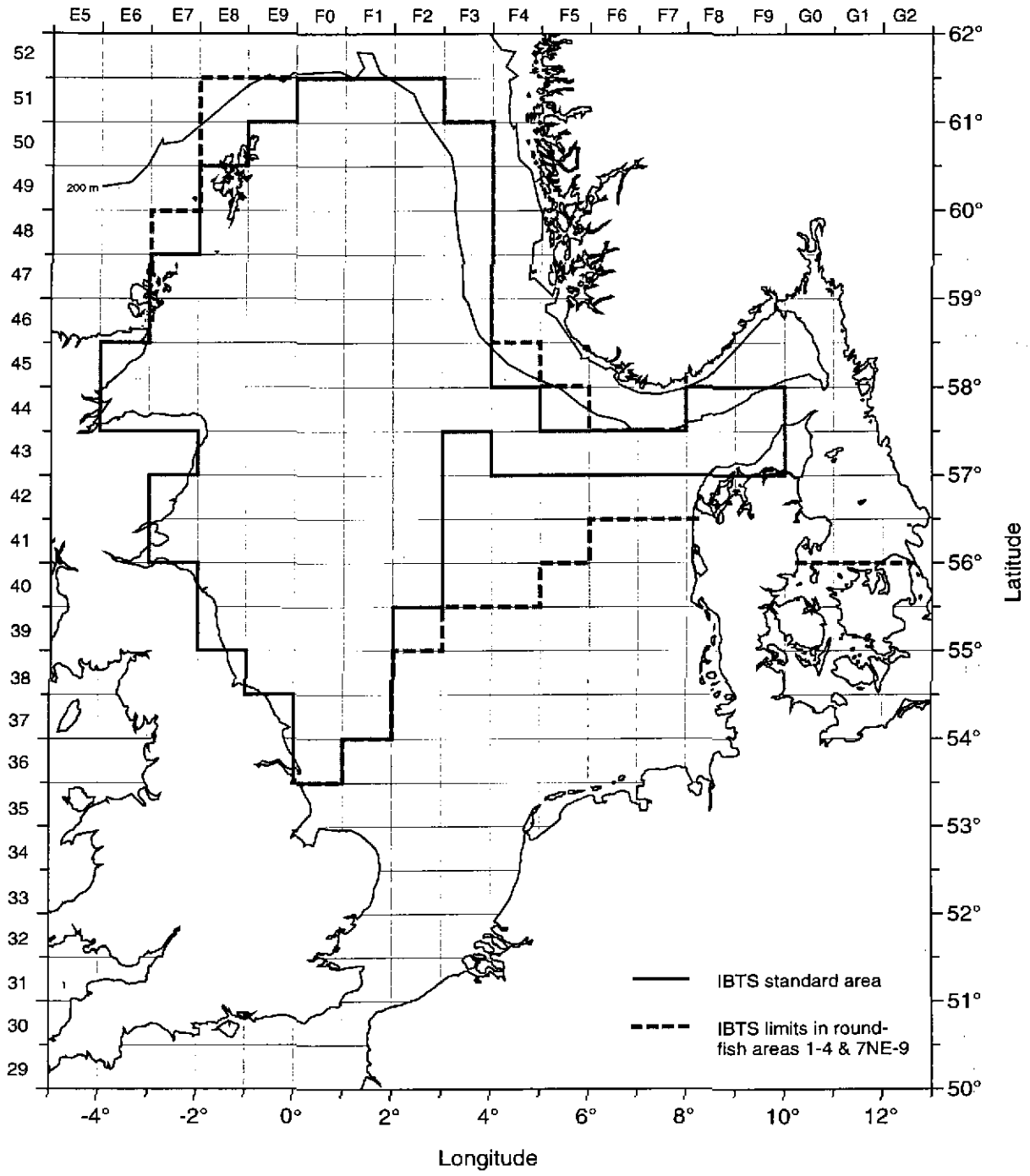


Figure 3.2.2.5: IBTS area for norway pout.

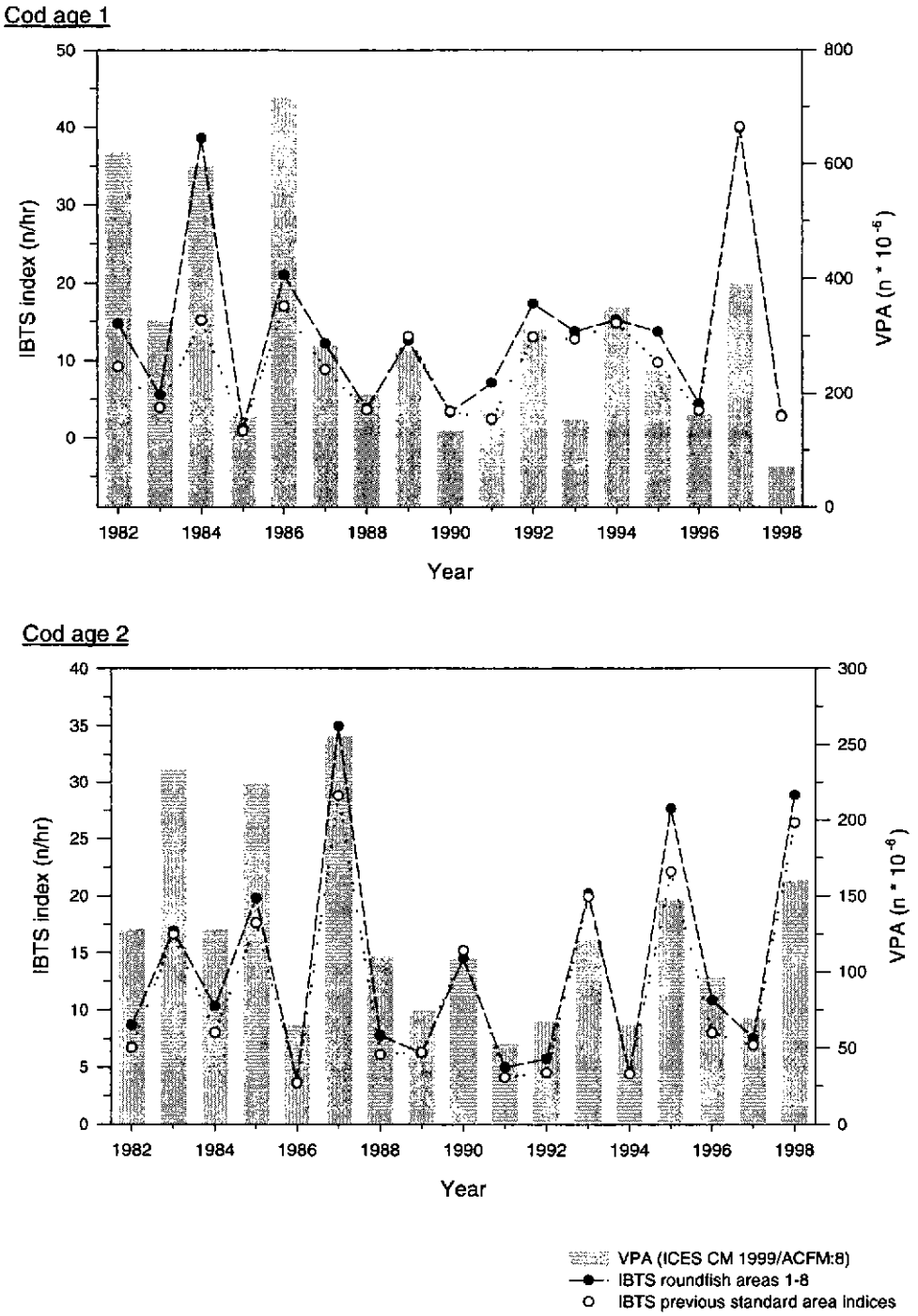


Figure 3.2.2.6: IBTS indices for cod age 1 and 2 compared with assessment.

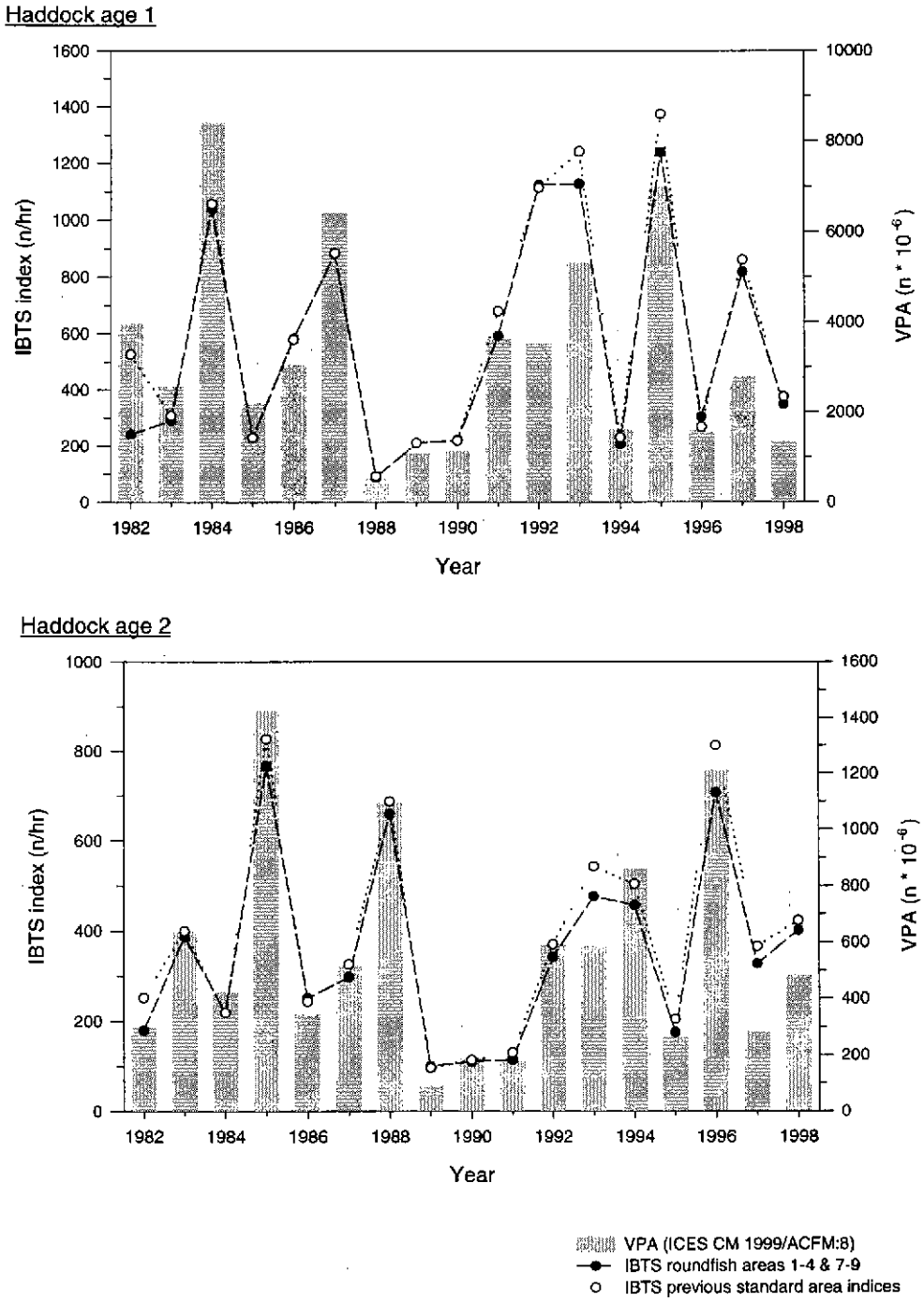


Figure 3.2.2.7: IBTS indices for haddock age 1 and 2 compared with assessment

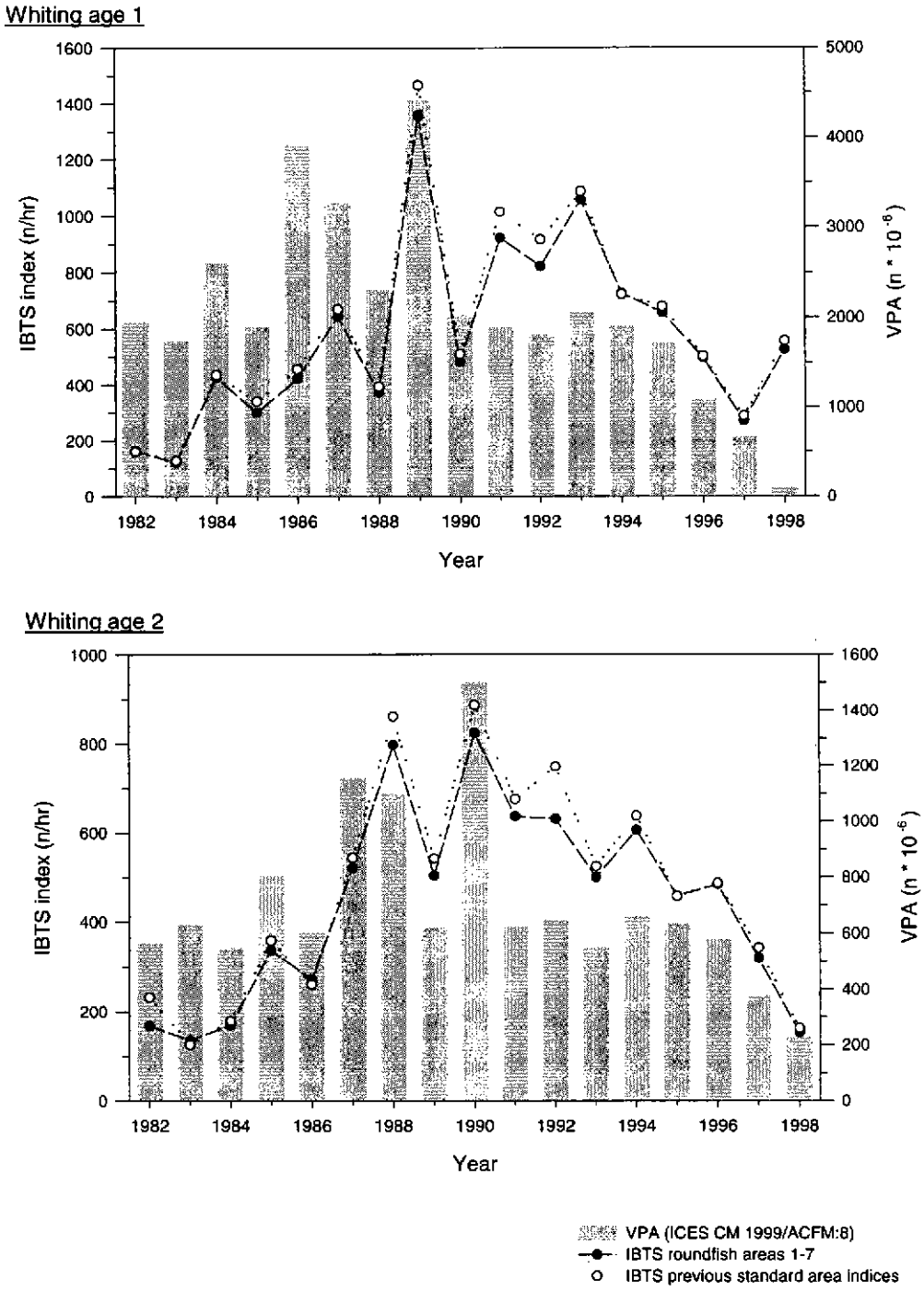


Figure 3.2.2.8: IBTS indices for whiting age 1 and 2 compared with assessment.

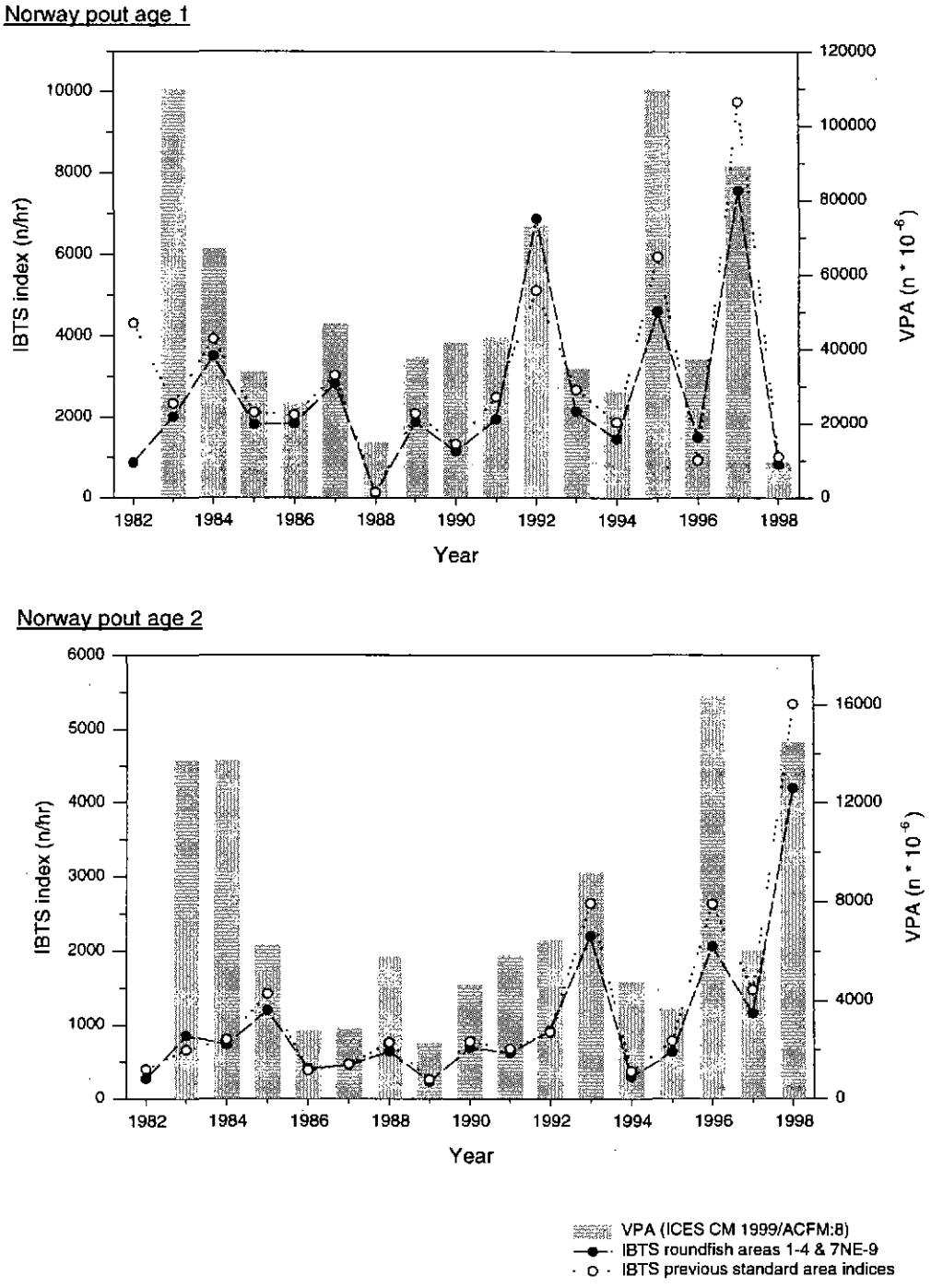


Figure 3.2.2.9: IBTS indices for Norway pout age 1 and 2 compared with assessment.

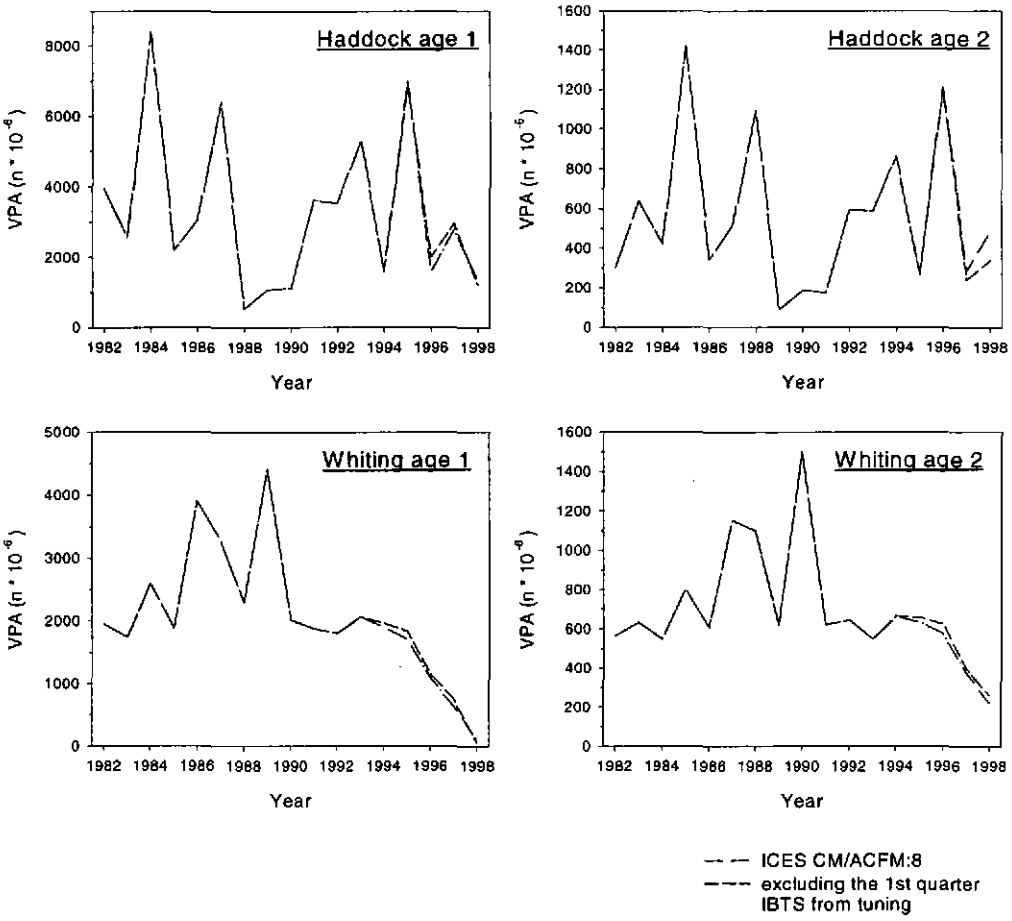


Figure 3.2.2.10: Comparison of assessment results with and without the 1st quarter IBTS used for tuning.

3.3 Downs herring 1-ringer index

The Herring Assessment Working Group for the Area South of 62^{0}N (HAWG) has requested that the 1-ringer herring IBTS 1st quarter index be split into an index for the Downs herring and an index for the rest of the spawning components in the North Sea autumn spawning herring stock. The HAWG has suggested that herring smaller than 13 cm in the 1st quarter of the year can all be assumed to belong to the Downs herring component and herring larger than that belong to the other spawning components.

In order to analyse this assumption total length distributions of herring, calculated as the average no/hr by length for all valid daylight hauls, were produced for the first quarter survey data for 1991-1999 and for the other quarters for 1991-1995 (Figure 3.3.1-6). It can be seen that for most of the years the length distribution in the 1st quarter does not support the assumption that 13 cm would be an appropriate splitting value, as 13 cm in general rather represents a peak in the length distribution than a 'low' between two peaks. The only exception to this is in the 1998 data, where 13 cm seems to be a reasonable split between what appears to be two normal distributions in the length data.

Munk and Christensen (1990) observed on the basis of 1st quarter IBTS data of 1981-1989 that there always is a minimum in the length distribution around 12 cm. This seems, however, not to be the case for the period considered here (1991-1999) although 12 cm seems as a better splitting value than 13 cm.

The data from the 2nd, 3rd and 4th quarters do not indicate a clear separation of the Down's component from the other components in any of the quarters.

The reason for the lack of a clear signal in the length distribution of the Down's spawning component herring might be due to Baltic 1-ring herring present in Div. IIIa in February, with similar length as the Down's herring. It has also been shown (Munk and Christensen 1990) that the Yorkshire component herring has a mean length in most years around 13 cm. It thus seems that Down's herring can only be distinguished from other herring by the way of length considerations, if this is done on a sub-area basis and maybe even on a year to year basis as well. Further analysis would be useful in order to obtain a procedure that is optimal in relation to the need by HAWG. Time did not allow for such analysis during the present meeting and it is recommended that this should be done intersessionally and in co-operation with the HAWG. The work should be done in due time before the HAWG meets in March year 2000, in order to allow the IBTS database indices to be corrected accordingly.

Basic data files with catch in no/hr by length and haul for 1982-1999 (1st quarter data) and 1991-1996 (2nd, 3rd and 4th quarter data) were made available to the present Group and can be obtained from the ICES Secretariat for those interested in pursuing the issue.

The ICES Secretariat is requested to make these files available to the HAWG when they meet in year 2000 as well the data for the first quarter of year 2000 in the same format.

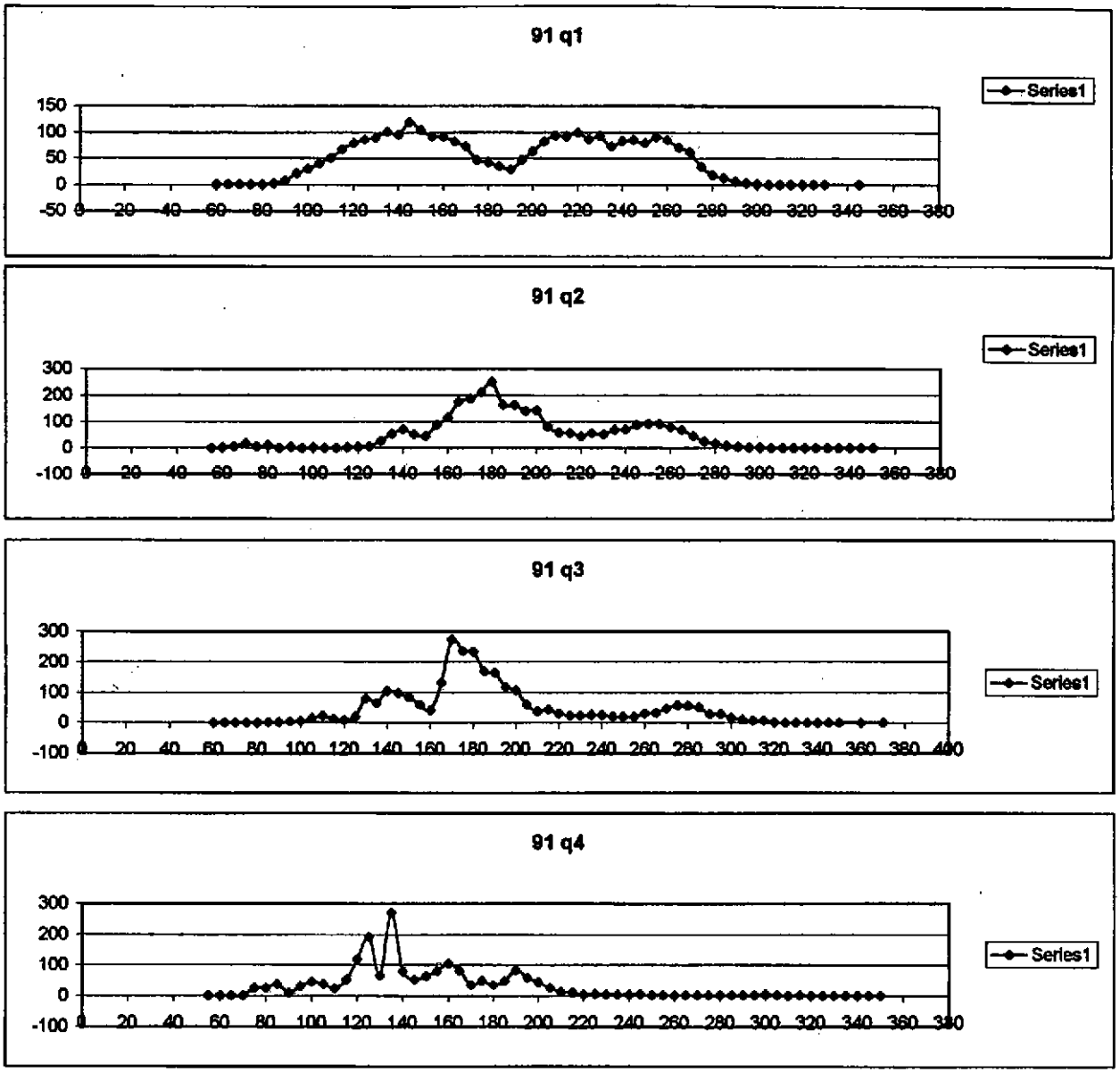


Figure 3.3.1. Herring. Total length distribution in the IBTS surveys in 1991 in average No./hr. by length (in mm).

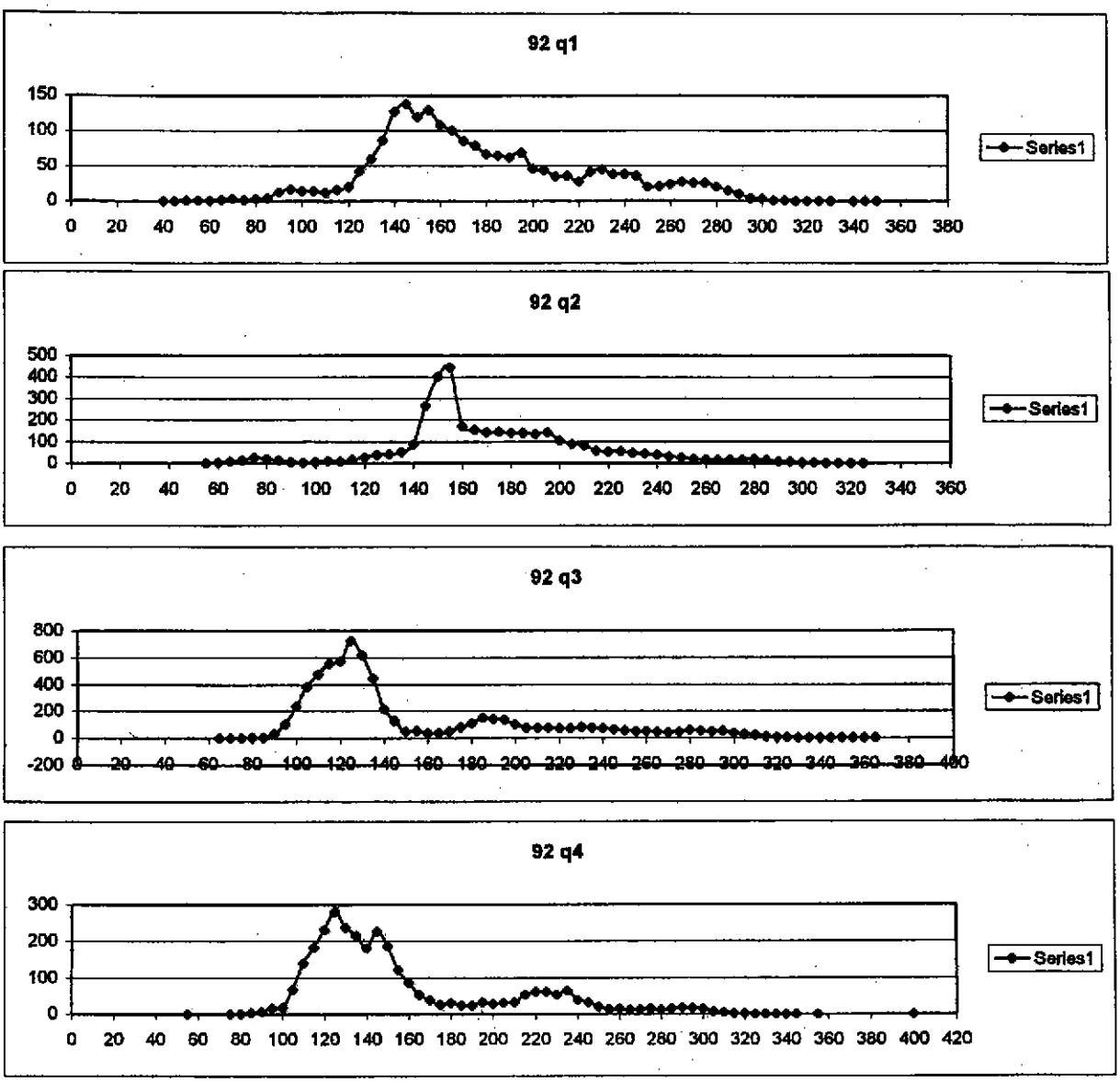


Figure 3.3.2. Herring. Total length distribution in the IBTS surveys in 1992 in average No./hr. by length (in mm).

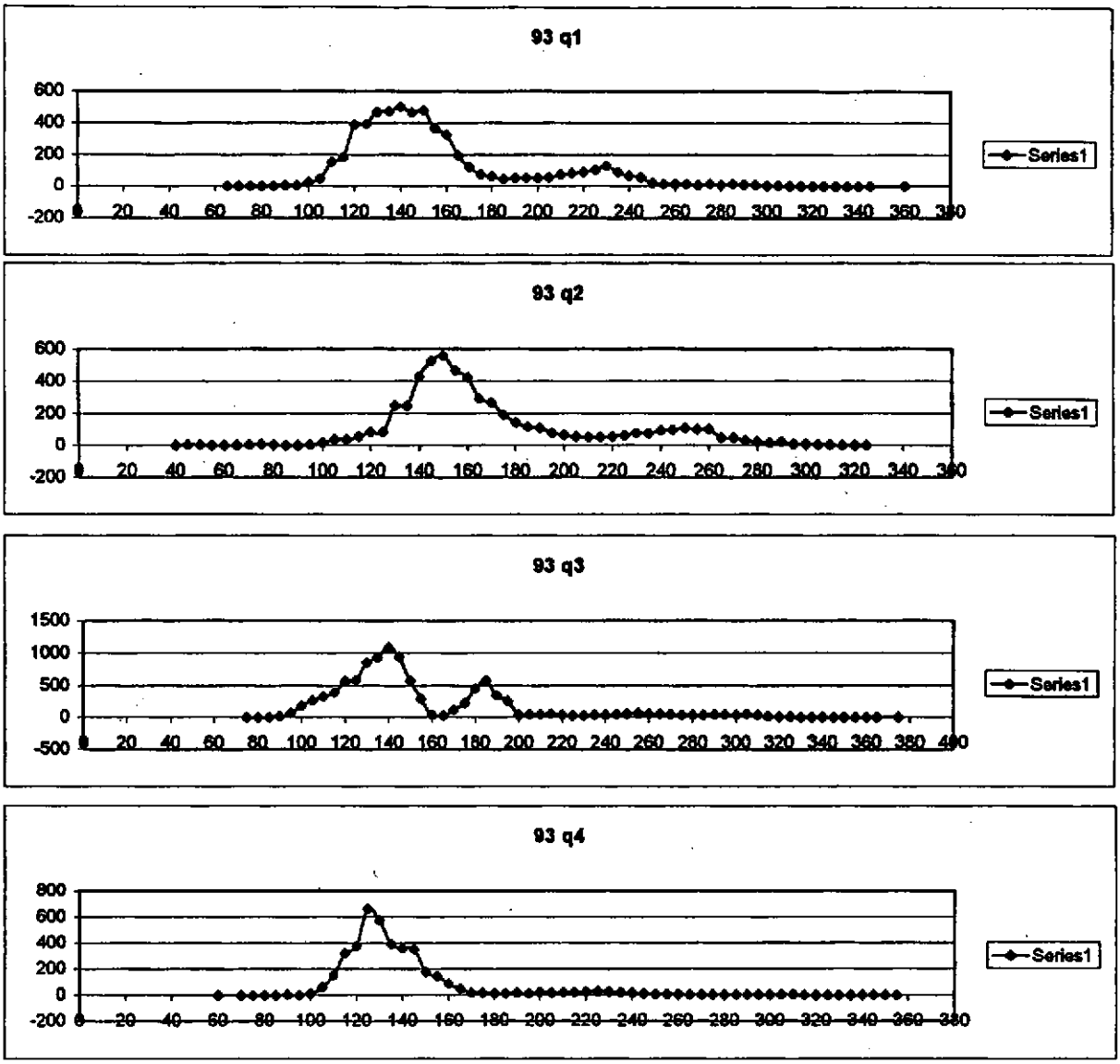


Figure 3.3.3. Herring. Total length distribution in the IBTS surveys in 1993 in average No./hr. by length (in mm).

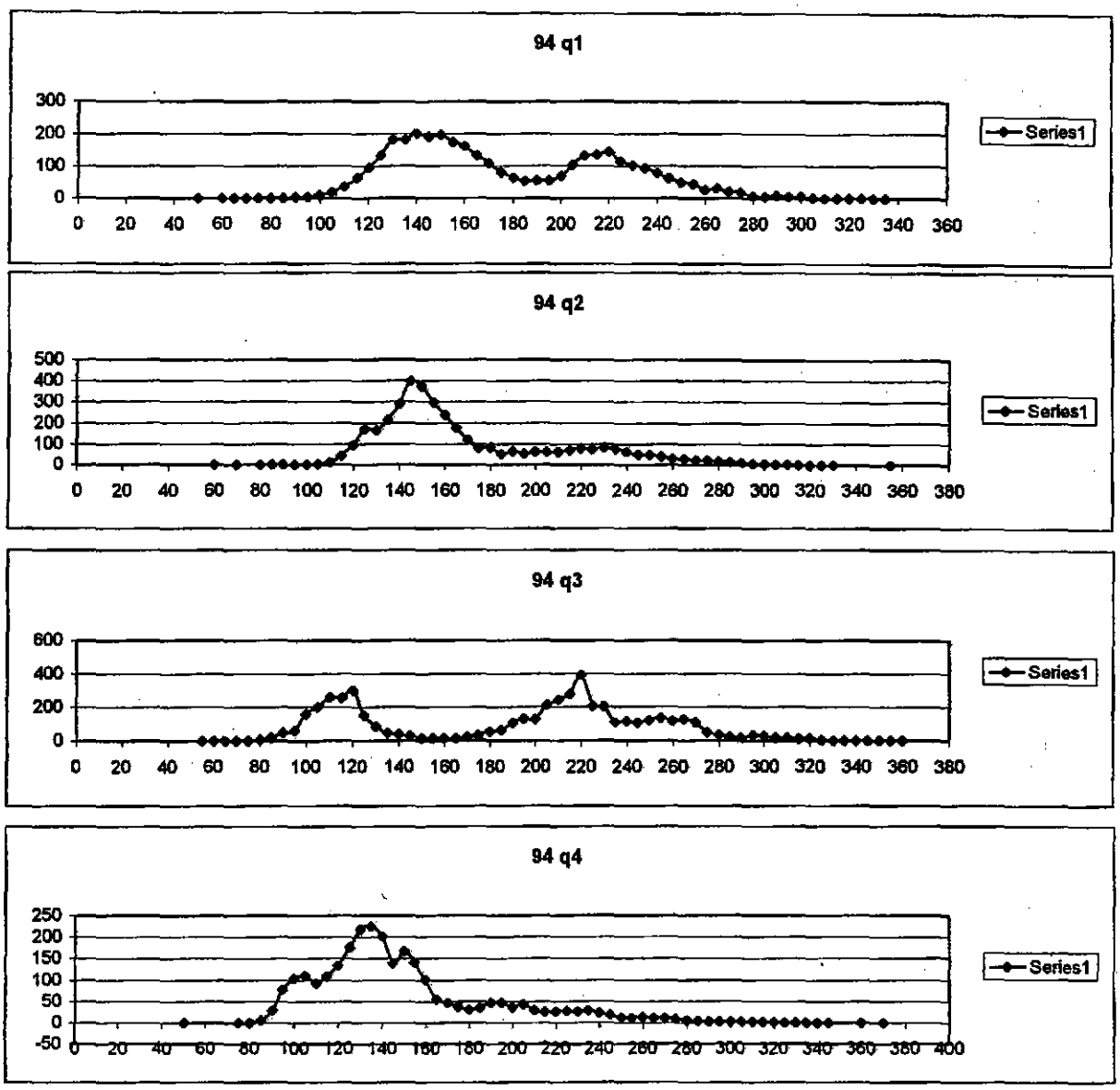


Figure 3.3.4. Herring. Total length distribution in the IBTS surveys in 1994 in average No./hr. by length (in mm).

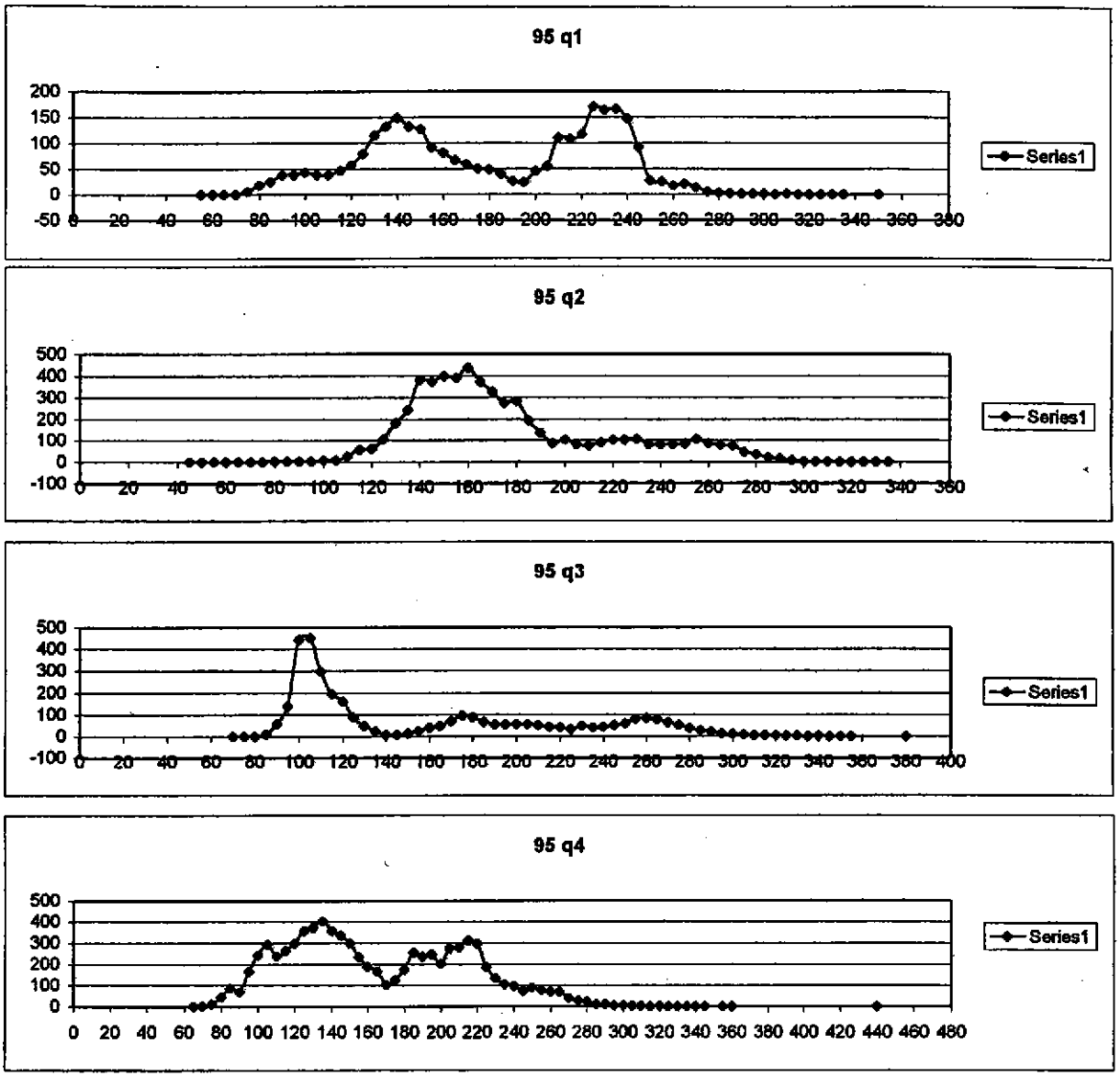


Figure 3.3.5. Herring. Total length distribution in the IBTS surveys in 1995 in average No./hr. by length (in mm).

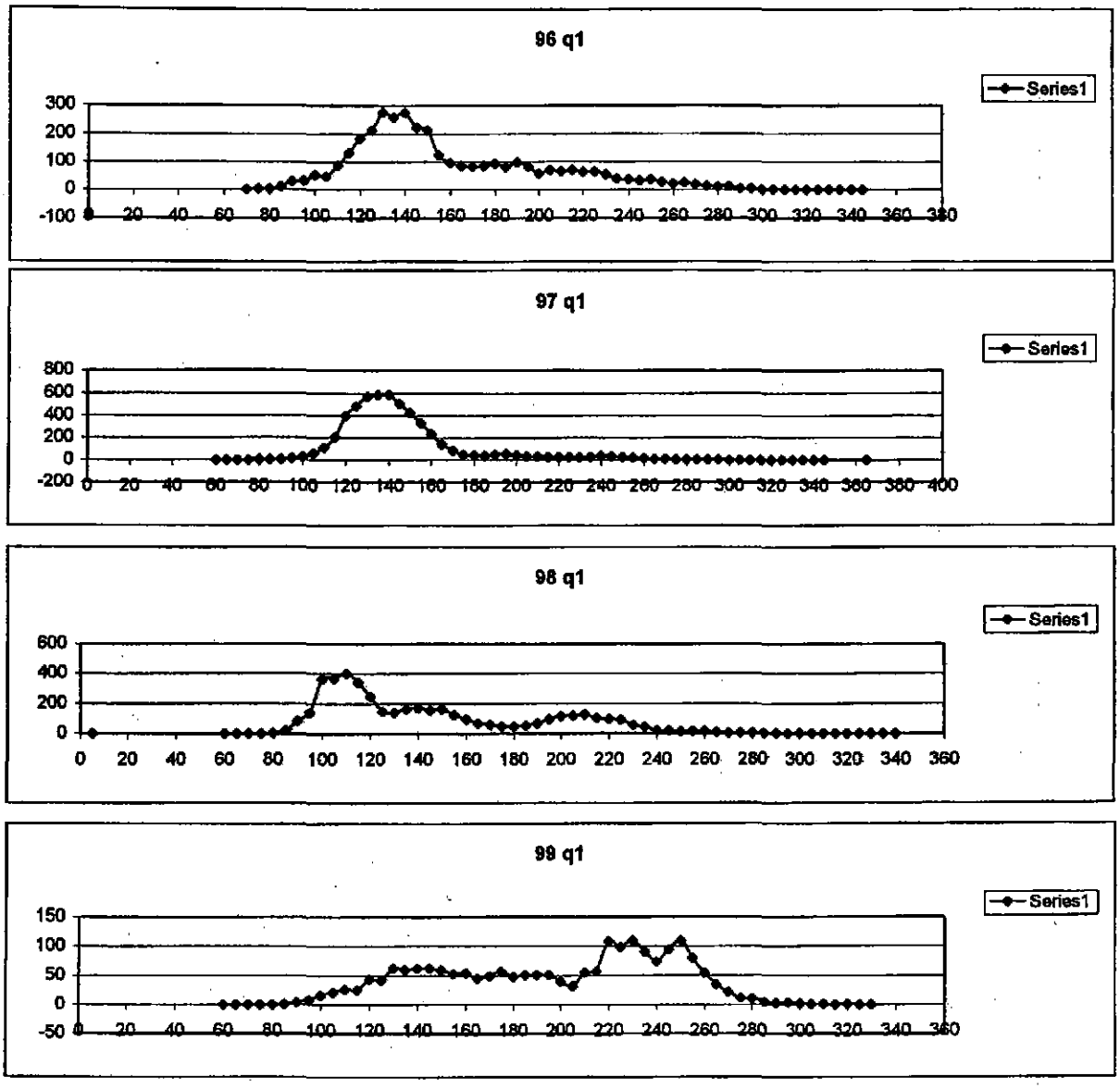


Figure 3.3.6. Herring. Total length distribution in the IBTS surveys in 1996–1999 in average No./hr. by length (in mm).

3.4 North Sea Manual

Section 6.5 provides further details of the rational behind revising the North Sea manual but during the current meeting two items were raised that require attention before the next co-ordinated survey.

3.4.1 Sprat Collection

The HAWG reviewed the otolith sampling regime of sprat otoliths during the IBTS surveys. In their opinion in the ALKs available to them it would appear that the 9.0 – 11.0 length groups appeared to be in transition and as this potentially covered the 1 – 3 age groups there could be a problem in defining the strength of the appropriate year classes. The HAWG did not specific any particular sampling regime but in further discussions between the IBTSWG and the sprat co-ordinator it was decided to recommend that future surveys should sample sprats as follows:

8.0 – 11.0 cms	16 otoliths per 0.5 cm
>11.0 cms	12 otoliths per 0.5 cm

However, it should be noted that all participants expressed concern that the increase in otolith collection would naturally lead to an increase in time required for age determination. None of the participants could guarantee that their national institute would be able to respond to this additional request.

3.4.2 Day/Night Fishing in Quarter 1

Traditionally fishing has been allowed to take place in either daylight or darkness except for some squares which were designated as 'herring' squares and in these locations hauls were only to be made in daylight. For many years the herring index has been constructed so that only information from daylight hauls was used. This was not the case for the demersal indices where data from all tows regardless of the light factor have been used. The manual expresses a strong opinion that, if possible, trawling should only occur during daylight hours, however, it is strongly recommended that only daylight fishing should occur in the old standard herring area (Fig 6.4 in manual).

Section 3.2.1 highlights the strong influence that light may have on the catchability of 1 and 2 year old cod and whiting and that section also indicates that night hauls can constitute 20% of the hauls used in the gadoid indices. Thus the participants now strongly recommend that all hauls in quarter 1 surveys should be conducted in the daylight period as defined on pages 2 and 3 of the manual.

3.5 Comparative Fishing between *Scotia II* and *Scotia III*

Scotia II was in service with the Marine Laboratory since 1971 and became the standard survey vessel for Scotland on IBTS surveys in the early 1980s. She was a purpose built, diesel-electric stern trawler with an overall length of 68.58 metres, a maximum draught of 4.94 metres and a net tonnage of 376 tonnes.

Scotia III was launched in October 1997 and came into service with the IBTS surveys starting with the quarter 3 survey in 1998. Again the vessel is a purpose built, diesel-electric stern trawler with an overall length of 68.60 metres. The new ship has a maximum draught of 5.6 metres and can deliver a 30 tonne pull at the maximum towing speed of 5.5 knots.

With the advent of the new research vessel it was decided to take the opportunity to adopt the standard towing time of 30 minutes for every haul. Until quarter 3 1998 Scotland had always fished for 60 minutes. The change in vessels and towing time necessitated an experiment in comparative fishing and some ship time was provided in April 1998.

The trials started on fishing grounds to the east of the Orkney Islands and both vessels were fitted with the standard IBTS gear, namely the GOV trawl, fitted with ground gear B. Both vessels towed on parallel tows although for operational and safety reasons *Scotia II* always fished slightly ahead of *Scotia III*. The gear parameters were monitored using Scanmar systems and effective fishing time was measured from the moment that the monitoring equipment indicated that the gear had been successfully deployed on the seabed. *Scotia II* towed for 60 minutes and *Scotia III* towed for the new standard time of 30 minutes. All catches were treated as per standard IBTS instructions with gadoids being measured to the 1 cm below and herring to the 0.5 cm below. In total 29 paired hauls were made and 25 of the pairs were deemed as being suitable for analysis.

An analysis of the data was performed by Alain Zuur and Rob Fryer of the Marine Laboratory and they submitted a paper on their preliminary analysis (Working Document 5). Zuur and Fryer developed a model for numbers at length for

a single paired tow that is analogous to that used for analysing selectivity trials with paired tows (Millar & Fryer,1999). The authors found considerable between-tow variation in relative catch rates and therefore they decided to combine information over tows. It was assumed that all things being equal it would be expected that *Scotia II* would catch twice the amount of *Scotia III*. Thus Zuur and Fryer estimated the average relative catch rate and use bootstrap confidence intervals to compare it to a relative catch rate of 2.

For haddock the conversion factor between the two vessels is 2 for all lengths. The same conversion factor was determined for herring. Again for whiting the conversion factor was determined as 2, but there was weak evidence that this may not be the appropriate factor for all lengths of this species. Further analysis of the data is being undertaken.

3.6 Report on EU contract on Historical IBTS data

The original IBTS surveys started in 1965 but it was only in 1983 that it was agreed that all participating countries would supply data on a regular basis to ICES. For the earlier years several countries were unable to provide computerised data due to a shortage of manpower and/or budget. The main aim of this contract was to computerise all data gathered during the period 1965 – 1983 but not entered into the ICES data base. The result of this contract was to provide a full set of data collected during the IBTS quarter 1 surveys carried out since 1965; this provides data for a time series analyse over the period 1965 to present, more than three decades of surveys.

Table 3.6.1 shows the number of hauls for which data have been made available by this study contract.

Table 3.6.1

Year	England	Germany	Netherlands	Norway	Scotland	Sweden
1965	-	-	31	-	-	-
1966	-	68	27	-	-	-
1967	27	55	27	-	15	-
1968	18	65	23	-	31	-
1969	25	45	43	-	15	-
1970	30	45	+	-	16	-
1971	16	55	+	22	40	-
1972	25	38	+	25	44	35
1973	25	46	+	-	54	16
1974	26	53	+	13	+	18
1975	41	79	+	44	+	27
1976	36	61	+	56	+	32
1977	59	67	+	50	+	20
1978	59	65	+	54	+	26
1979	46	61	+	4	+	28
1980	55	69	+	53	+	32
1981	+	70	+	53	+	32
1982	+	64	+	46	+	23
Total	488	1006	151	465	215	289

- No survey made + Data already in ICES database

Below are listed some brief comments on the data from the various institutes.

Netherlands

Surveys from the years 1965 to 1969 were computerised at RIVO-DLO. Length frequencies for the standard species were complete for all years, but for the non-target species the first years seem incomplete. The records of age data for the years concerned were limited to herring.

UK England

Fourteen quarter 1 English surveys, amounting to 452 valid hauls were outstanding for the years 1967 to 1980 (inclusive). All available data for these surveys were keyed into the CEFAS surveys database and despatched to ICES in exchange format files. Some minor problems were encountered whilst keying the data, particularly concerning by-catch species in early years. As an example, for some surveys, small catches of a species were recorded as number of fish while larger catches were recorded as so many baskets or buckets. In those cases conversion rates were determined to provide numbers of fish. The variations in data recording quality and the subsequent effects on recording and validity codes in the exchange files uncovered some 'bugs' in the exchange file creation routine, but these were successfully overcome. Finally, it is believed that sprat age data were originally collected during some of these surveys, but none were found in a usable format.

UK Scotland

The Marine Laboratory, Aberdeen undertook to computerise Scottish survey data for the IBTS cruises for 1967 – 1973 (inclusive). The first step was to locate the original survey data, perform quality control audits on these data and then use a range of software packages to enter the cruise data into the Laboratory's computer data bank. All data have been verified and all necessary information processed and transmitted to ICES.

Norway

Most of the raw data were found, but for some of the older years age readings of sprat are still missing and therefore not punched. All available data for 1971 – 1982 are re-punched, checked and sent to ICES. Because of the abnormal long haul duration in some of the former years, it proved difficult to adapt the routine database programs to handle these data; this caused a delay in submitting the finalised Norwegian data.

Sweden

The tasks of the Institute of Marine Research included checking and entering IBTS data for the years 1969, 1970 and 1972–1982.

Altogether 297 valid research hauls from 1972 to 1982 have been identified, punched in IBTS format and forwarded to the ICES Secretariat. Input data were checked by an ICES provided checking program. Haul data before 1972 were lost during a transit of the institute to a renovated building and could not be entered into the database. The entered data include both haul details and species parameters. Biological measurements consist of length frequencies for all species caught and individual measurements for the catches of herring and sprat. The herring data specify lengths, ages, gender, maturity and vertebrae counts. Non-clupeid species were neither aged nor measured individually before 1980. Some essential gear parameters e.g. door spread, were not recorded during the earliest survey periods.

Germany

BFA-ISH submitted IBTS data on 1194 hauls from 20 cruises from the period 1966 – 1982 together with checklist from each cruise with detailed information. The surveys were carried out by 4 different fishery research vessels.

The age readings of herring are nearly complete over the whole time series, whereas no otoliths of cod, haddock and whiting were taken during the first cruises until 1972. Only since 1980 have the age readings for these four species been complete.

In addition to the hauls of the cruises which were scheduled under this contract, the results for another 206 hauls were provided. These are hauls from 3 surveys carried out by the German FRV 'Poseidon' in the first quarter of 1977 to 1979. This vessel used the same gear as FRV's 'Anton Dohrn I and II', which participated in the official IBTS programme in those years. No additional costs were necessary for the input of these data, since the input has been done within the scope of the EU contract 'IMPACT II'.

ICES Overview

Lena Larsen of the ICES Secretariat has made a very useful overview of all the historical data now in the ICES database. This overview gives essential information for those who wish to use the data sets and who are not familiar

with the surveys. Thanks to the overviews it was established that Russian data for three years are still missing; RIVO have undertaken to input the missing data as soon as possible.

3.7 Review of GOV design

It had been noted some time after release that the specification for the standard rigging of the GOV groundrope given in the Manual for the International Bottom Trawl Surveys (revision V), had deviated from that given in all previous versions of the manual. The distribution of the specified additional weight appeared to have changed and the total weight of the groundrope (in air) was now given as 834kg, some 127kg heavier than specified in the report of the GOV model testing (Wileman 1984). It was established that these discrepancies were caused by the use of 13mm long link chain as the groundrope core in place of the 18mm diameter wire rope previously specified. Whilst the use of chain may be permitted, it should not increase the total weight of the groundrope beyond 707kg and the distribution of the additional 210kg (included in the 707kg) should continue to be 70kg spread over the bosom, 35kg spread over each quarter section and 35kg spread over each forward wing end section.

There was some discussion on the continued use of 50m and 100m sweeps for quarter 1 surveys. The manual requires the use of 50m sweeps (60m to include backstrops) in depths less than 70m and 100m sweeps (110m to include backstrops) in depths of 70m and over. Some research vessel crews experience difficulties in making these sweep changes. With a large data set now available from surveys made in quarters 2, 3 and 4, where only 50m sweeps (60m) are used in all depths, it was suggested that an analysis may be made to determine whether the continued use of 100m sweeps (110m) in quarter 1 is still necessary.

3.8 Hydrographical data

Several users of the hydrographical data in connection with IBTS data have experienced problems with connecting hydrographical stations to IBTS stations. It was decided some years ago that hydrographical data should not be part of the IBTS exchange format and thus not be part of the IBTS database. The hydrographical data should instead be reported directly to the ICES hydrographical database. Although the IBTS exchange format should include hydrographical station numbers this disconnection of the two sets of data have resulted in problems combining hydrographical data to trawl haul data. Often the hydrographical station number are not reported in the IBTS data send to ICES, often if the stations numbers are reported the stations numbers do not correspond to the station numbers reported to the ICES hydrographical database, for instance because the hydrographical departments in the national institutes have their own numbering system. Procedures for checking and correcting this will be quite resource demanding. However, the main point is that the hydrographical data are reported to the database. The ICES Secretariat has developed an extraction program that can match hydrographical data to haul time and position data, based on distance in space and time between haul and hydrographical stations. Taking into account that hydrographical data sampled at the IBTS only represent the situation at the end or the beginning of a haul (and because only haul shooting time is recorded it is not known whether it is the beginning or the end), that often no hydrographical measurements are taken if there is a hydrographical station nearby, and that the hydrographical data needs careful quality control by experts in hydrography in the Secretariat, it is regarded as an important advantage that the hydrographical data are reported to the ICES hydrographical database. The ICES Secretariat is requested to make extraction of hydrographical data that match haul data available on a regular basis.

3.9 Clear Tows

It was agreed in 1992 that the exchange, between institutes, of positional information on damage free fishing hauls made within the North Sea, Skagerrak and Kattegat would be useful. An exchange format was devised and CEFAS elected to co-ordinate the exchange. This worked well for some time but then response progressively declined. A call for a revival was made at the 1997 IBTS WG meeting but response was again poor. It was agreed at this meeting that this information is extremely useful, as would be the position of hauls where damage did occur. It was suggested that the clear tow exchange format be extended to include a field indicating whether the haul was valid (V) or invalid (I). It is recommended that institutes provide haul positional information for the North Sea, Skagerrak and Kattegat, to Trevor Boon at CEFAS, according to the format indicated in the manual and including an additional field indicating validity, for the years 1997, 1998 and 1999, immediately after this meeting ends and thereafter by 30 November for that year. The combined information will be returned in the first instance as quickly as possible for use by participants in the 1999 quarter 3 survey and thereafter by early January for the benefit of quarter 1 participants.

4 WESTERN DIVISION SURVEYS

4.1 Co-ordinators Overview

The IBTS has routinely co-ordinated surveys in the North Sea, the Skagerrak and the Kattegat. In 1994, the remit of the IBTS was extended to include the work of the Study Group on the co-ordination of Bottom Trawl Surveys in Sub Area VI, VII, VIII and Division IXa. Following the 1997 IBTSWG meeting contacts were established with the laboratories involved in quarter 4 surveys and the first steps were taken to co-ordinate and standardise these surveys.

There are nine surveys carried out in the Western Division area.

The Scottish Groundfish survey in Division VIa (SGF6a, Quarter 1)
The Scottish Groundfish survey in Division VIb (SGF6b, Quarter 3)
The Scottish Mackerel Recruit survey (SMR, Quarter 4)
The Celtic Sea and Western Approaches Groundfish Survey (CSGF) (UK E&W; Quarter 1)
The Northern Ireland Groundfish Survey (NIGFS) (UK Northern Ireland; Quarter 3-4)
The Irish West Coast Groundfish Survey (WCGS) (Ireland; Quarter 4)
The Irish Sea – Celtic Sea Groundfish Survey (ISCSGS) (Ireland; Quarter 4)
The French Bottom Trawl Survey (Biscay and Celtic Sea) (EVHOE) (France; Quarter 4)
The French Bottom Trawl Survey in the Eastern Channel (FCG) (France; Quarter

A brief resume of each survey is given in Appendix III and tow positions for some surveys are plotted in Figures 4.1.1-4.1.2. The gears used by these surveys are given in Table 4.1.1. A fuller description of each survey appears in sections 4.2 and 5.2.

Table 4.1.1 - Sampling materials used in the groundfish surveys of the Western and Southern areas.

Country/Institute **Parameters of gears used**	Ireland MIFRC	UK/Scotland MLA	UK/England CEFAS	France IFREMER	Spain IEO	Portugal IPIMAR
Research vessel	Celtic Voyager	Scotia	*Cirolana*	*Thalassa*	*Cornide de Saavedra*	*Noruega*
Type	Stern trawler					
GRT	340	N/A	1731	3022	1133	495
Kw	N/A	N/A	N/A	2200	1650	1100
Overall length (m)	32	68.6	74	73.7	67	47.5
Gear Type	GOV 28.9/37.1	GOV 36/47	PHHT	GOV 36/47	BAKA	NCT
Depth range (m)	15-200	20-200	40-600	30-400	30-700	30-750
Trawling speed (Knots)	3.5	4	4	4	3	3.5
Doors weight (kg)	500	1100	1440	1350	650	650
Doors surface (m^2)	2.99	4.5	4.5	4.5	3.58	3.75
Sweep length (m)	60	60	18.28	50 100	200	No
Diameter of Lower Bridle (mm)	20	20	20	22	No	?
Diameter of Upper Bridle (mm)	12	14	16	12	No	?
Diameter of Middle Bridle (mm)	12	14	No	12	No	?
Exocet Kite	Yes	Yes	No	No	No	No
Floats in Headline	18 ?	20	20	18	25	80
Floats in Winglines	32 ?	20 + 20	32+32	24 + 24	15 + 15	
Mean vertical opening (m)	6	4.6	4.4	4 4.1	2.0	4.8
Mean doors spread (m)	48	82	81.7	76.9 112.7	107.1	44.3
Mean horizontal opening (m)	N/A	19.6	N/A	18.7 20.5	18.9	15.6
Groundrope	Rubber disks	Bobbins	Rubber bobbins +Rubber disks + chain	Rubber disks and chains/Rubber and metal disks	Synthetic wrappled wire core	Bobbins

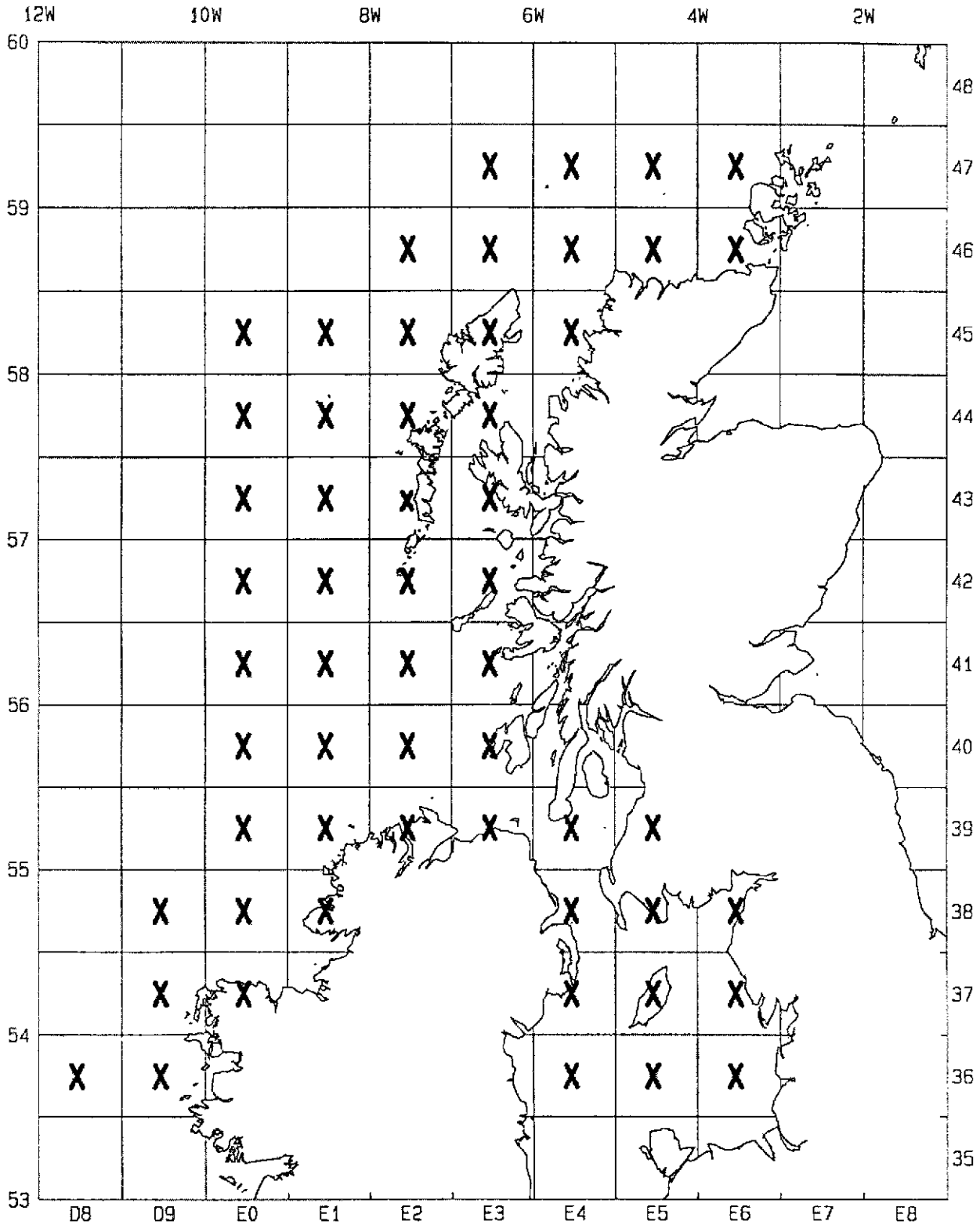


Figure 4.1.1 Scottish Survey Area — Quarters 1 and 4.

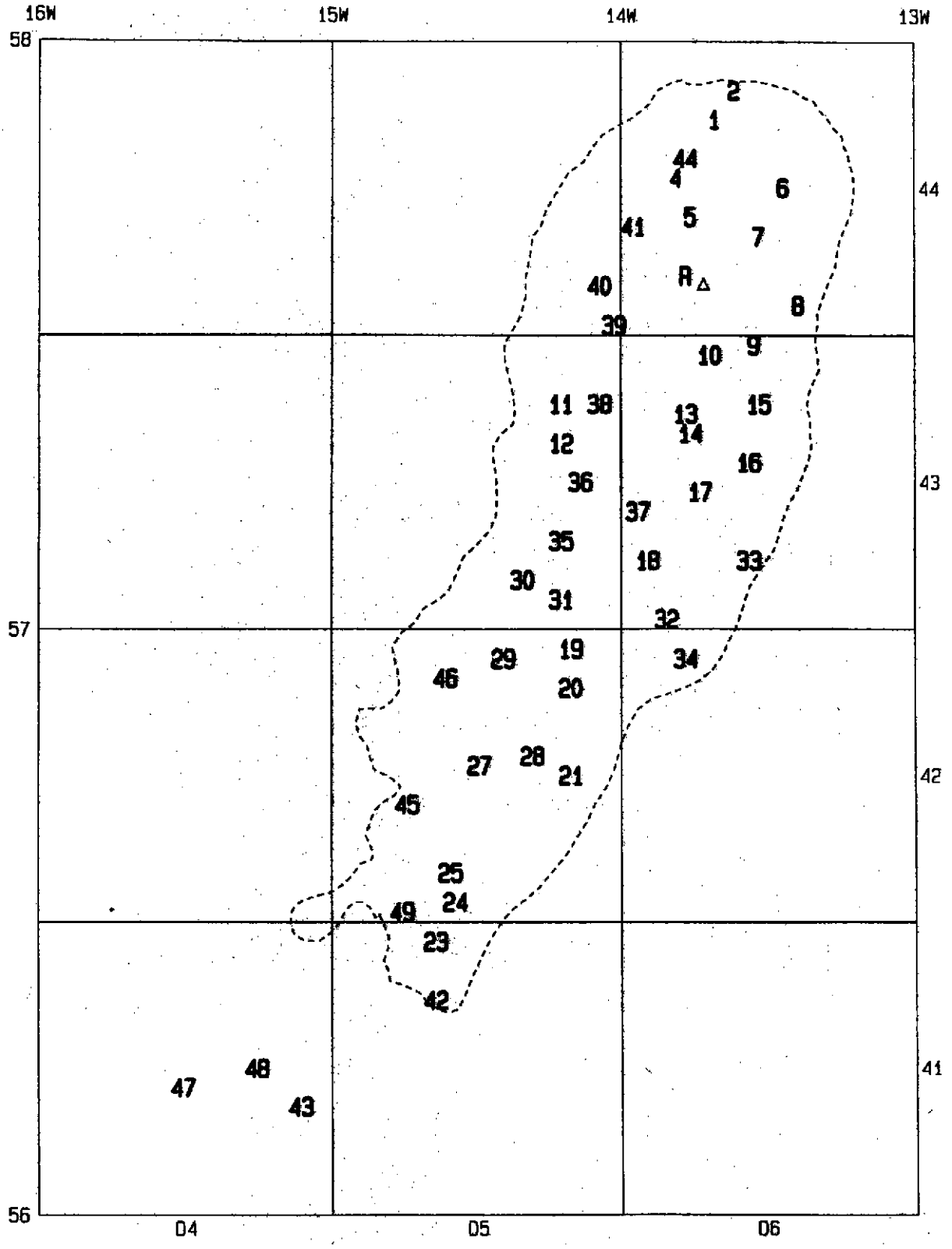


Figure 4.1.2 Scottish Survey Area — Rockall Plateau.

4.2 National Surveys

UK Scottish Surveys

Quarter 1 Groundfish survey in Division VIa started in 1981 and was originally targeted towards the fishing grounds on the continental shelf to the west of Scotland; in 1996 the survey area was extended to include the northern Irish Sea. The gear deployed is the 36/47 GOV trawl fitted with heavy ground gear 'C' and a 20 mm internal liner. The survey is currently stratified by ICES rectangle with the basic aim of undertaking at least one 30 minute tow in all accessible rectangles in the designated area. The vessel undertaking this survey changed to *Scotia III* in March 1999.

The target species are cod, haddock, whiting, saithe and herring and age frequencies are constructed for these species. All other fish species encountered are also sampled for at least length frequencies. Indices of abundance at age are calculated for all the target species and these data are used at the Northern Shelf Assessment Working Group and also made available for the Herring Assessment Working Group.

The Quarter 3 Rockall survey began in 1985 and occurred annually until 1997. However, in 1998 it was decided to make the survey a bi-annual event; in 1998 a new survey of deep water stocks occurred and in future the Rockall survey and a deep water survey will occur in alternate years. The next Rockall survey will be September 1999.

The Mackerel Quarter 4 survey began in 1985 and extended in the area west of the British Isles between 56° and 61° N and bounded by the 200m contour and the coast. It has generally not included the area of the Minch and the north channel of the Irish Sea. The survey is carried out using a 36/47 GOV trawl fitted with heavy ground gear 'C' and a 20mm internal liner. In 1998 the new research vessel *Scotia III* was used and the duration of the hauls was decreased from 60 minutes to 30 minutes. Up until 1995 the target species for this survey was mackerel but the Mackerel Assessment Working Group detected a discrepancy between the survey index and the VPA derived recruitment index. This led to a withdrawal of the survey index from the assessment. Given this situation the whole survey was re-designed to follow more closely the demersal quarter 1 survey. The mackerel survey now ends in the region of the northern part of Donegal Bay and also extends into the northern Irish Sea.

The target species have now been extended to include cod, haddock, whiting, saithe and herring as well as the original target of mackerel. The demersal time series is still too short to be of use to the Northern Shelf Assessment Working Group.

UK (E&W) Surveys

During the late 1970's the Western mackerel stock fishery was expanding and concern for over-exploitation increasing. The Celtic Sea and Western Approaches Groundfish Survey was started, in 1981, with the aim of investigating the distribution, biology and pre-recruit abundance of this mackerel stock. These objectives were almost immediately extended to all species which could be adequately sampled with a bottom trawl. While mackerel were the primary target the survey covered all or part of the western continental shelf from the northern North Sea to the north coast of Spain. Later, as the objectives changed, the area shrunk in stages to its present boundaries: 47° 30' N to 52° 30' N and 3° W to 12° W. This has been the standard area since 1987. In the early years a March/April and December survey was carried out each year but since 1989 only the spring (quarter 1) survey has been conducted.

The current objectives of this survey are:

- To determine the abundance and distribution of fish within the survey area
- To determine the abundance and distribution of the pre-recruits of the commercial species with a view to deriving recruitment indices
- To monitor changes in the stocks of commercial fish species independently of commercial fisheries data, and to monitor stock changes for species not currently of commercial importance
- To collect data for the determination of biological parameters for the more important species
- To supplement the shore based sampling programme

The trawl used for this survey is a modified Portuguese High-headline trawl with 350 mm rubber bobbins, a bunt tickler chain and a 20 mm codend liner. Standard hauls are of 60 minutes duration. The average dimensions when the gear is fishing are 4.4 m of headline height and 82 m of door spread. The trawl is fished at fixed station positions and these positions are allocated by area (division lines at 48° 45'N and 50°15'N) and depth strata (40-89, 90-114, 115-139, 140-179, 180-299 and 300-600 m). Station log data, weight and length data for all species and additional biological data for selected species are collected and stored in the survey data base.

UK (NI) Surveys

A description of these surveys can be obtained from Dr M Armstrong, DANI, Belfast.

French Surveys

The French Groundfish Survey in the Eastern Channel (DivisionVIId((FCG) started in 1988. The survey is carried out each year in October to study the distribution of commercial species and to obtain abundance indices by age group for the most important species.

The gear used is a 20/25 GOV trawl towed by a 25m vessel. The mesh size in the codend is 20 mm. This gear/vessel combination was chosen to allow trawling in shallow water, especially along the French coast. In this area important nurseries of whiting, plaice and dab are found. Each ICES rectangle is divided into 8 sub rectangles, each 15' x 15' in size. Approximately 90 trawl stations are planned, one per sub rectangle. Haul duration is 30 minutes.

The French Groundfish Survey in the Celtic Sea (Divisions VIIf,g,h,j) (EVHOE) was conducted in September-November 1990, May-June 1991 and September-October 1992. It was an extension of the survey carried out in the Bay of Biscay since 1987 and aimed at covering the grounds of the Celtic Sea deeper than 100 metres. The sampling design was systematic, stations were located at intersection points of a grid of lines 25 nautical miles apart, both in latitude and in longitude. As from 1997 new objectives were assigned to this survey:

- To determine the distribution and relative abundance of all fish species and selected species of shellfish within the survey area, particularly hose of commercial importance
- To determine the distribution and abundance of pre-recruits of the main commercial species to derive recruitment indices
- To monitor changes in the populations of commercially important species independent of commercial fisheries data and to monitor changes in species which are not currently of commercial importance
- To collect data for the determination of biological parameters

The surveys are now carried out annually in October-November with the new *Thalassa*, a stern trawler of 74 m and an engine power of 2200 KW. The survey area mainly covers Divisions VIIg,h,j. The survey area is stratified according to latitude and depth. Three geographical areas are identified in the Celtic Sea and 5 depth zones are used (31-80, 81-120, 121-160, 161-200 and 201-400 m). The 10 strata are divided into units of 25 square nautical miles and a stratified random sampling scheme has been adopted since 1997. The number of hauls per stratum is, to some extent, proportional to the surface of the stratum. The survey is designed to take 85 hauls.

Haul positions have been extracted from a database of clear tows from French surveys in the Bay of Biscay and from French, English and Dutch surveys in the Celtic Sea.

A 36/47 GOV trawl is used with a 20 mm mesh codend liner, and a groundrope with 10-20 rubber discs. Plane oval trawl doors of 1300 Kg are used. Gear geometry is monitored using Scanmar equipment. Haul duration is 30 minutes and towing speed is 4 knots. Fishing is mainly restricted to daylight hours. No Exocet kite is used.

Catch weights and catch numbers are recorded for all species, all finfish and a selection of shellfish are measured. Salinity and temperature by depth are recorded at the end of each fishing station.

Irish Bottom Trawl Surveys

The Marine Institute conduct two bottom trawl surveys in western waters as part of the fish stocks monitoring programme. The main objectives of the survey programme is to provide indices of abundance to the ICES Northern Shelf and Southern Shelf Working Group, to map the distribution of fish species in the waters around Ireland and to identify nursery areas for commercial species.

The West Coast Groundfish Survey (WCGS) commenced in 1990 and 78 fixed positions are fished in quarter 4 from the Stanton Bank (Rectangles 41E2, 41E1) to the Fastnet Rock area (Rectangles 30D9, 30E0). The survey extends over ICES Divisions VIa, VIIb, and VIIj (27 ICES rectangles) and is carried out each year on the same chartered commercial fishing vessel. The gear used is a commercial rockhopper trawl fitted with 20mm cod end liner. The tow duration is 1 hour. The survey is divided into two parts. Part A (34 hauls) commenced in 1991 and covers an area from the Stanton Bank to Galway Bay. The survey as extended in 1994 to include 44 tows in the area from Galway Bay to the Fastnet Rock area. The target species are cod, whiting, haddock, hake, megrim, plaice, herring and scad.

The Irish Sea Celtic Sea Groundfish Survey (ISCSGS) commenced in 1997 and 75 fixed stations are fished in Divisions VIa and VIIg. The survey is carried out on the RV Celtic Voyager (32m). The tow duration is half an hour and the gear used in a GOV trawl (28.9/37.1). The target species are cod, whiting, haddock, hake, megrim, plaice, herring and scad.

4.3 Possible improvements to sampling and survey design in Scottish bottom trawl surveys in area VIa and VII

The following section is a description of a range of possible improvements and enhancements to the Scottish west coast IBTS surveys. As such, they are only specifically applicable to those surveys. However, many of the proposals are developed from practices already used in other parts of the western and southern areas, or which may be applicable to these other surveys. The proposals are mainly intended to provide a framework for future study rather than recommendations for immediate implementation. However, in some cases it should be possible to implement improvements without significant impact on the surveys themselves.

4.3.1 Background

Scotland carries out two bottom trawl surveys on the west coast of Scotland in areas VIa and VII.

1st Quarter – 3 weeks, March, IBTS survey

4th Quarter – 3 weeks, November, Mackerel recruit survey

The surveys are carried out on FRS Scotia. Gear used is GOV with ground gear C and kite. Samples are taken at one station per ICES rectangle. Maximum depth is 200m nominal. The survey design and practice is basically identical to that used in the North Sea IBTS surveys.

The assessments for a number of species on the west coast are compromised to some degree by a mismatch between data derived from commercial landings and data from the surveys. There may be a number of reasons for this, some of which may be related to the conduct and practice of the surveys carried out on the west coast. This section is intended to present the potential problems associated with the surveys and some possible solutions.

4.3.2 West coast versus North Sea

The west coast surveys are essentially North Sea IBTS surveys transplanted to the west coast. However, there are a number of important differences between these two areas that should be borne in mind. Topographically, the west coast is dramatically different to the North Sea. It is characterised by having a very complex coastline (sea lochs and islands) and large areas of very difficult sea bed for fishing, particularly with a relatively fragile gear like the GOV. In contrast the North Sea is relatively flat and is largely made up of good fishing substrate. The shelf break in the North Sea defines one edge of a large area, whereas it is a dominating feature of the west coast. The west coast is hydrographicaly more variable, being strongly influenced by the presence of the shelf break current. Finally, sampling intensity is much lower on the west coast. Each rectangle is sampled only once, as opposed to the multiple multi-ship sampling in the North Sea.

4.3.3 Possible improvements

The following sections represent a range of possible improvements to the conduct and analyses of these surveys which may be able to improve the quality of the output data. In a few cases these changes could be implemented immediately, in most cases investigations of feasibility and cost effectiveness will have to be carried out first.

The possible improvements fall into four general categories:

- Stratification
- Area coverage
- Gear
- Ancillary variables

4.3.3.1 Stratification

Density dependent stratification

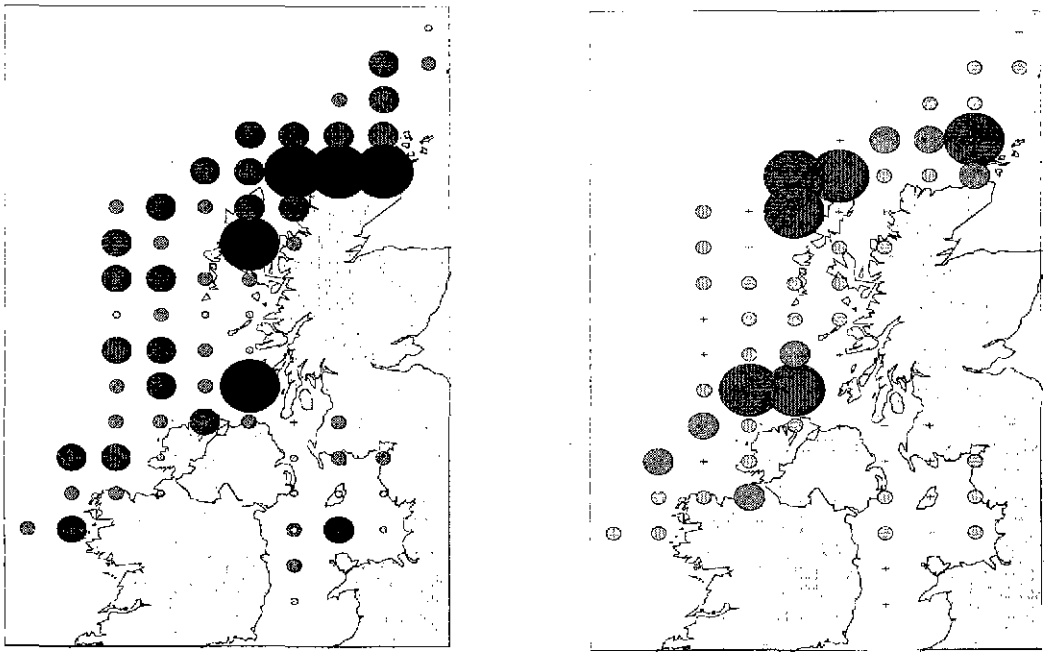


Figure 4.3.1 CPUE distribution for haddock (a - left) and mackerel (b - right) from Scottish Q4 Mackerel recruit survey 1997. Scales are arbitrary and logarithmic

Currently one trawl is taken per stratum (rectangle). Based on historical time series data it should be possible to identify specific areas which are particularly important for the main target species. Figs 4.3.1a & 4.3.1b show distribution maps for haddock and mackerel form the 1997 quarter 4 survey. For both species there are clear areas of high abundance and these could be targeted with extra sampling. It should be noted that this requires an identification of a small number of target species.

Depth dependent stratification

It is widely recognised that species and age distributions have a depth dependency (Figure 4.3.2). Within a rectangle based survey design this problem could be addressed by the identification of those rectangles with substantial depth change and then targeting extra trawls over the depth range as appropriate.

Alternatively, the surveys could be switched to a fully depth stratified design such as that used in Portugal and Spain and in western french waters. The applicability of such a design should be investigated for these surveys with an emphasis the control of variance.

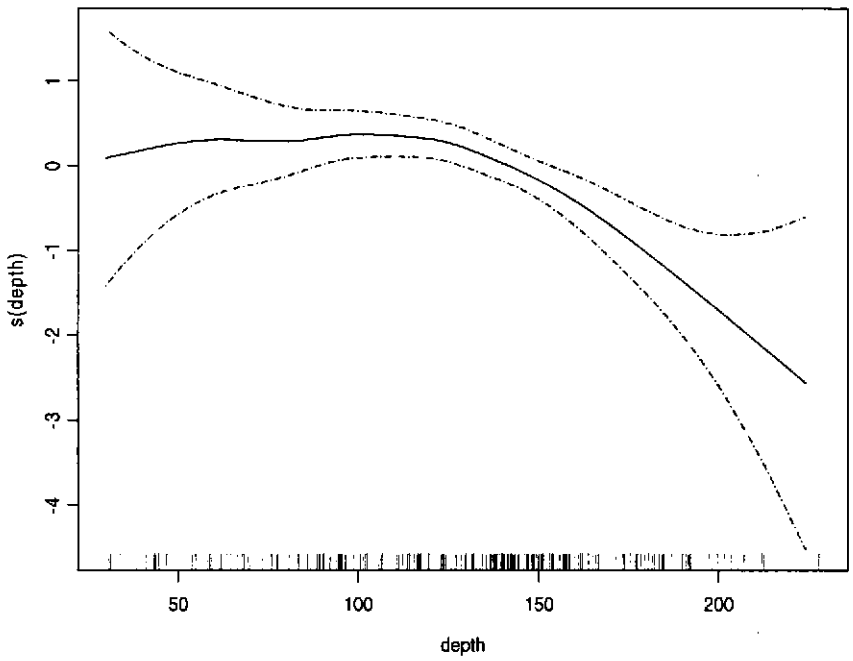


Figure 4.3.4.2. GAM plot of the relationship between haddock CPUE (vertical axis) a spline smooth of depth (horizontal axis) from the Scottish mackerel recruit surveys 1994 - 98.

4.3.3.2 Area Coverage

Scottish western IBTS are restricted within the 200m contour. This misses the main range of monkfish, which is currently one of the most valuable fisheries in Scottish waters. Recent evidence from commercial vessels has also shown substantial catches of haddock in this fishery. It was agreed that the Scottish western IBTS surveys should be extended to the 500m contour to include these fish. This would also harmonise with the Portuguese, Spanish and French surveys in the area, it was also agreed that the Irish surveys would adopt the same limit.

The present survey design does not cover the extensive sea loch areas of the Scottish west coast, which are believed to be important for juveniles of a number of species. The potential for surveying in these areas possibly with a smaller vessel and appropriate gear should be explored.

4.3.3.3 Gear

The fishing gear currently used on the Scottish west coast surveys is the GOV with modified ground gear. While this gear works well in the North Sea it is probably less appropriate for the more variable and difficult substrate of the west coast.

Given that there are substantial areas of the west coast where it is difficult or impossible to deploy a GOV, there is s a requirement to investigate the use of an alternative net for use in those areas where the GOV is not suitable. To this end the WG has recommended that a group should be established in conjunction with the FTBWG in order to investigate the design of survey nets.

4.3.3.4 Ancillary variables

Bottom trawl surveys are able to collect a range of ancillary or external variables which can be used to enhance the quality of the results. The most obvious application for such data is in the weighting of samples or in modified raising to rectangle.

Acoustics

One area which has attracted attention, is the use of acoustic observation at and between trawl stations. Modern echo sounders can be used to calculate an acoustic biomass by rectangle based on the transit between trawl stations. This can be used as a separate index or as a weighting factor in the calculation of a mean CPUE. For example, a large catch could be down weighted if the acoustic observations showed little fish in the rest of the rectangle. A possible enhancement would be to carry out an acoustic run over the tow track prior to fishing. A ratio of the integrated biomass per mile of track on and off the tow track could then be used as a weighting factor.

Topography/Substrate

As mentioned above, many areas on the west coast are characterised by seabed which is difficult or impossible to fish upon. Each rectangle could be assessed for the proportion of ground which is similar to that of the tow track i.e. fishable. Trawl data from rectangles with a high proportion of unfishable ground could then be down weighted accordingly. The rectangles could be characterised using a combination of hydrographic and substrate charts with underway data collection from echo sounders and acoustic substrate typing systems such as RoxAnn.

Other external variables and modelling

A number of techniques are now widely available to model the relationship between ancillary variables and trawl results. Possible techniques include GLM (Generalised Linear Modelling)and GAM (Generalised Additive Modelling). Potential input variables would include; time of day, water depth, latitude, longitude, temperature, salinity, and also vessel and gear, even the abundance of other species. These models can be used in a number of ways. One possibility is to use the modelled relationships as correction or weighting factors. Alternatively, they could be used to generate an abundance surface and then integrate under this to provide a composite index. The main aim here would be to allow us to include external factors which are well known to affect abundance in trawl hauls (e.g. time of day - see Figure 4.3.3.) into the analysis of the results.

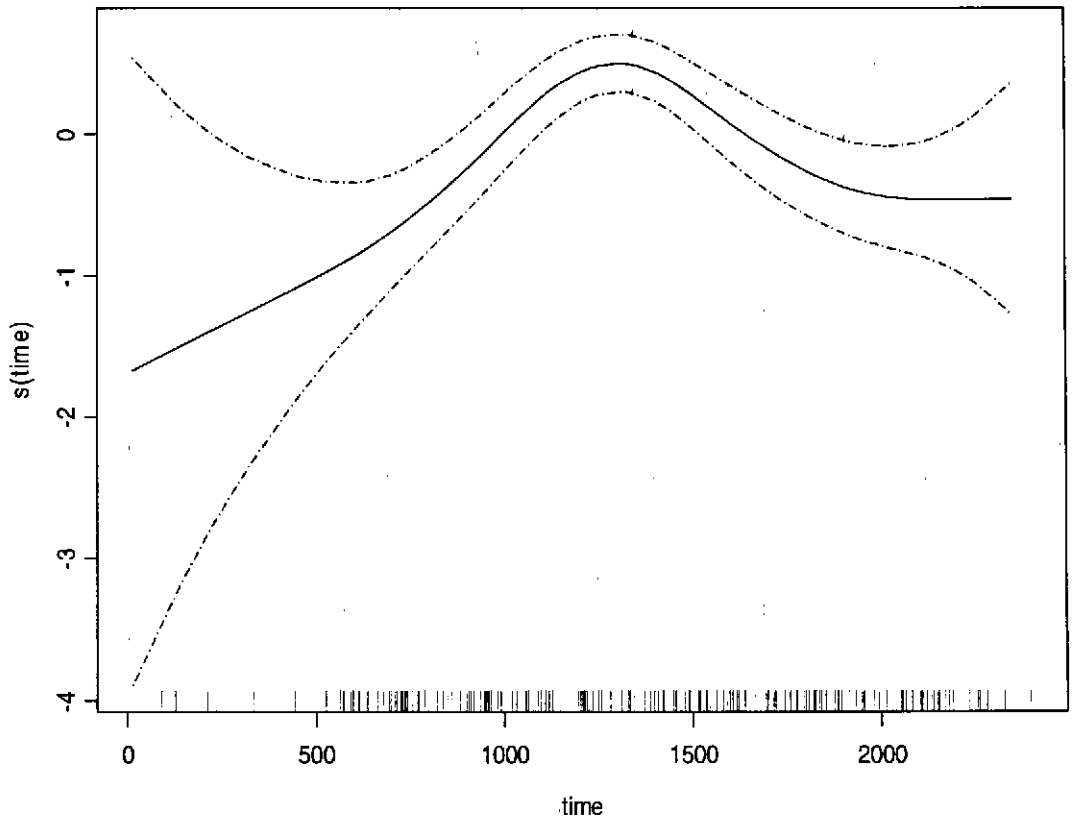


Figure 4.3.3. GAM plot of the relationship between haddock CPUE (vertical axis) a spline smooth of time of day (horizontal axis) from the Scottish mackerel recruit surveys 1994–98.

4.3.4 Wider considerations

o some extent it is reasonable to suggest that IBTS should be carried out with an awareness of the pattern of the commercial fishery. One possible explanation for mismatch between surveys and commercial data is that the two operations are working on different parts of the stocks. For instance, the GOV restricts IBTS to easily fishable ground, while the fishermen may concentrate their activities on different ground. To this end we should investigate the utility and quality of effort data derived from commercial landings. It is often suggested that such data are unreliable, at best, but little effort has been made to quantify this. A concerted programme to examine the quality of these data would be very useful. This could include examination of the relationship between reports from scientific observers on fishing vessels and the reported landings. It should also include input from any other potential sources of corroborative information e.g. fisheries officers and vessel skippers themselves. There has been some success in Scotland, Ireland and the Netherlands in persuading pelagic skippers to provide high quality catch information, if possible, this should be extended to the demersal sector.

4.4 Progress on Standardisation

The 1997 IBTS focused specifically on quarter 4 surveys in the western area. Four quarter 4 surveys are carried out by France (EVHOE), UK (SMR) and Ireland WCGS, ISCSGS). Following the 1997 IBTS meeting contacts were established between each of the laboratories involved in these quarter 4 surveys. These contacts were maintained throughout the 1997 and 1998 surveys and the gears used, survey protocols, survey coverage and the establishment of overlapping tows and areas were discussed and implemented during the 1998 surveys. These areas will be further extended during 1999 and 2000 following the funding of a EU project (see later). The co-ordinator has also established a database of safe tow positions in the western area. This data set will be further extended to include past survey position and non quarter 4 surveys. The objective will be to establish a comprehensive set of trawling positions in the area in order to aid discussions on survey coverage.

Ireland commissioned a new 32 m research vessel in July 1997. The vessel was fitted out with a GOV trawl (28.9/37.1) in line with IBTS guidelines. A reservoir of safe tows was compiled based on tow positions sourced from UK and French surveys and from Irish commercial fishermen. These tows were used to establish the survey grid for the new Irish Sea Celtic Sea Groundfish survey. The survey fished 75 stations over a three week period in Divisions VIIa and VIIg. Contacts were established with the Scottish Mackerel Recruit Survey (SMR) and comparative tows were carried out in the Northern Irish Sea. A preliminary analyses of these data are presented in section 4.6 of this report.

The WCGS (Part A in Divisions VIa and VIIb; Part B in Divisions VIIb, VIIj) was carried out by Ireland in quarter 4. The survey coverage for the WCGS Part A was extended to include a number of overlapping stations with the UK (Scottish) SMR. The survey coverage for the WCGS part B was extended further south to overlap with the French (EVHOE) surveys which was also extended further north. Data from the WCGS (Part A) were presented to the ICES Northern Shelf Working Group for the first time and were used during the assessments of VIa cod, whiting and haddock.

All surveys are following standard IBTS sampling protocols. However there are major gear discrepancies. Ireland uses a small GOV while France do not place a kite on the headline. Furthermore, Ireland and Scotland do not adopt the depth stratified random survey design used by the French. These areas will be addressed in EU Study Contract 98-057.

To further improve co-ordination of surveys and standardisation of surveys, Ireland placed an observer on the SMR survey in 1998. This process will continue in 1999 when there will be an exchange of observers between France, Ireland and Scotland.

The absence of an IBTS WG meeting in 1998 did not hinder the co-ordination of western surveys. A considerable amount of work was carried out on an ad-hoc basis by correspondence. A significant factor that will enhance the co-ordination and standardisation of quarter 4 bottom trawl surveys in western area was the funding of a two year project by the EU (STUDY Contract 98-057). This project will focus on survey coverage, survey design, calibration of tows and standardisation of survey protocols. The results from this project should be available for the IBTS WG in 2001.

The following is a brief resume of the project.

International Program of Standardised Bottom Trawl Surveys off Northwestern Europe (EU Study Contract 98-057).

Objectives and outline

The program is an EU funded study that will be carried in 1999 and 2000 and involve the Marine Laboratory (UK Scotland), the Marine Institute (Ireland) and IFREMER (France). The project is co-ordinated by IFREMER.

These laboratories conduct fourth quarter research vessel surveys in ICES areas VI, VII and VIII in order to provide indices of abundance by age group of the major commercial species exploited in these areas. Those indices, obtained through a scientific sampling protocol, are unbiased and provide an independent source of information, apart from the fisheries cpue. In addition, biological data on sex and maturity will be obtained to facilitate the estimation of spawning stock sizes. The data are needed for standard stock assessments to provide information on the present state of the stocks and estimates of future catches and sustainable exploitation rates. The surveys will also provide data on the abundance and status of fish species of commercial interest but not managed by the European fisheries commission and or taken as a by-catch in commercial fisheries.

Abundance indices from bottom trawl surveys are currently used in the assessment of demersal fish stocks as they perform well when used to tune the VPA especially in giving estimate of recruitment. It is therefore essential to obtain reliable time series of the parameters required for the assessment of fishing resources and determination of trends in the marine ecosystems.

Currently, indices of abundance are calculated for cod, megrim, monkfishes, whiting, haddock and mackerel. The information acquired is used at the following ICES Working Groups to produce scientific advice in support of the Common Fisheries Policy:

Working Group on the assessment of Northern Shelf demersal stocks
Working group on the assessment of Southern Shelf demersal stocks
Working Group on the assessment of mackerel, Horse mackerel, sardine and anchovy

Standardization of the methodology used in bottom trawl surveys.

In the North-Eastern Atlantic national surveys have been conducted by Portugal, Spain, France, United Kingdom, Scotland and Ireland. This piecemeal approach left gaps in the areas surveyed and in 1997 it was decided that the surveys should have a more co-ordinated methodology. Moreover, since those surveys cover adjacent areas, abundance indices for some species do not cover their entire range of distribution. In considering the use of a combination of indices from different surveys, standardisation of the protocol used in the different surveys (stratification and biological sampling) has to be carried and catchability coefficients for the participating Research Vessels have to be estimated (by mean of comparative towing).

The ICES International Bottom Trawl Working Group appointed Dr. Paul Connolly of FRC, Dublin as the co-ordinator and the first co-ordinated international survey occurred in November 1997. Ireland, the UK(Scotland) and France discussed the survey grids and station positions before the surveys and a series of comparative tows were carried out. This first attempt highlighted areas which contain deficiencies. However, in the absence of an IBTS meeting in 1998, there is no forum in which to discuss the comparative tow results and further plan for the 1998 results. This proposal will help to rectify perceived problems and improve the quality and quantity of data from areas in which limited resources are deployed.

A first project of standardisation (SESITS) will end in June 1999 and covered the surveys carried by France in divisions VIIg,h,j, and VIIa,b Spain in divisions VIIIc and IXa and Portugal in Division IXa during the fourth Quarter.

The present project aims to extend this standardisation process to the North and will involve France for Divisions VIIg,h,j and VIIa,b , Ireland and Scotland for Divisions VI and VII.

Surveys

France, Ireland and Scotland propose to conduct integrated surveys during November of 1999 and 2000. The research vessels *Celtic Voyager, Scotia* and *Thalassa* will be deployed in the area of study and half-hour tows using a GOV trawl will be made according to a standardised stratification scheme taking into account the IBTS working group recommendations.

Standardisation

Even working within the framework of the ICES International Bottom Trawl Working Group it is evident that some aspects of the survey work have drifted from agreed standards; this is a perfectly understandable situation given that most effort of the Working Group has been concentrated in the North Sea. Workshops will be held to discuss all aspects of the methodology already used in order to achieve standardisation in area and biological sampling (stratification, set duration, detail rigging of gear, re-establish protocols on measuring, ageing, sexing and maturing of fish etc...)

Calibration

In order to make meaningful comparisons between the data obtained by the three vessels involved it is essential that calibration trials occur to assess the relative catching power of the three vessels. Each nation will conduct 5 days of survey time each year of the project in an area nominally assigned to another nation and during this time attempts will be made to conduct parallel tows with the other vessel on the same fishing ground. Whilst this is the optimum desirable method it has to be recognised that weather etc. may influence ship availability and that a second, more expedient, method i.e. identical tows but in a different time frame, may have to be used.

Environmental data

After each set, a CTD station will be held and the salinity and temperature data will be processed to monitor any change in the basic environmental characteristic of the area surveyed.

4.5 Stratification used in the French EVHOE Survey

The depth stratification was defined with respect to fish assemblages based on the analysis of the data from the first series of surveys initiated in 1987. The depth strata are defined according to the following slicing :

depth stratum	depth range
1	0- 30m
2	31 - 80 m
3	81-120 m
4	121 - 160 m
5	161 - 200 m
6	201 - 400 m

A geographic stratification separates the Bay of Biscay in 2 areas and the Celtic Sea in 3 according to the Figure 4.5.1.

The sampling strategy is of a stratified random allocation, the number of sets per stratum being optimised by a Neyman allocation on numbers variance averaged on the 4 most important commercial species (hake, monkfishes and megrim) with a minimum number of two stations per stratum. 140 sets are planned every year. This number of sets is adjusted according to the time at sea available.

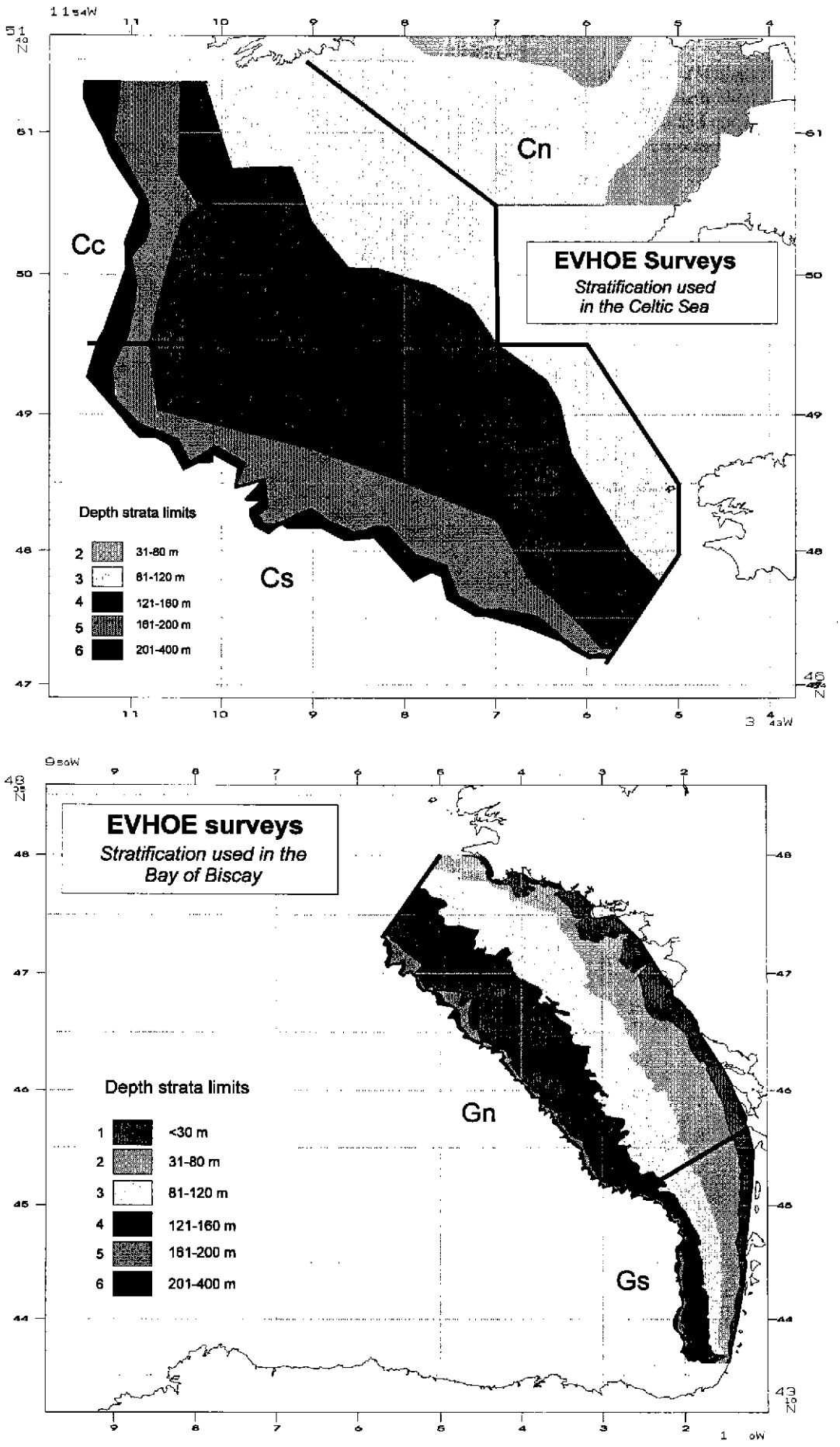


Figure 4.5.1. Stratification used in the French EVHOE surveys.

4.6 Comparative Fishing

In 1998, the *RV Scotia*, *RV Celtic Voyager* and *RV Thalassa* carried out their respective groundfish surveys in the Irish Sea and Celtic Sea areas (see section 4.2 for descriptions). In the past two years co-ordination between these surveys has been much improved and a number of overlapping tows were established in the survey design during the 1998 survey programme. It was decided to have a 'first look' at the signal coming from the catch of each vessel from these comparative tows. The comparative tows which were available are given in Table 4.6.1.

The three surveys are carried out on vessels which are very different in size and which use different forms of the GOV trawl (see Table 4.1.1). The GOV trawl configuration for the three vessels towing at circa. 4 knots, at a depth of 100m are shown in Figure 4.6.1. *Celtic Voyager* has the highest headline height, but the door spread is up to 27m greater in *Scotia* and *Thalassa.*

In terms of selecting appropriate comparative fishing tows for analyses, the approach was to identify the valid tows from each vessel, which were carried out in close proximity and at similar depths. This reduced the number of comparative tows given in Table 4.6.1 as some tows were invalid, while others carried out in similar areas were at very different depths. In the end, only three valid comparative tows were available for *Celtic Voyager/Scotia* in the northern Irish Sea and two from *Celtic Voyager/Thalassa* in the Celtic Sea.

The catch compositions from each tow were compared (catch numbers for *Celtic Voyager/Scotia* comparisons; Kgs for *Thalassa/Celtic Voyager* comparisons). The length frequency distribution of the main commercial species were examined and significant differences were detected using a Kolmogorov-Smirnov (K-S) goodness of fit test (Netter *et al.* 1992). The catch composition in *Scotia* and *Celtic Voyager* were similar, however *Scotia* tended to have larger catches in terms of numbers. *Thalassa* displayed a similar catch composition, but the size of the catches were much higher for some species (eg whiting x 4) and similar for others (e.g. haddock). The results from the K-S tests are given in Table 4.6.2 and show that there was no significant difference in the length frequency of whiting and haddock catches between *Celtic Voyager* and *Scotia* in the northern Irish Sea. However, there were significant differences in the length frequency of whiting and hake catches between the *Celtic Voyager* and *Thalassa* in the northern Celtic Sea Area.

The data set were not available in a common electronic format and there was much manual data manipulation which highlights the needs for a common data exchange format for these surveys. It is recognised that these results represent a very preliminary examination of the surveys using a very limited data set. However, the process of comparing basic data from the surveys from similar areas has started. The countries involved in these surveys have now commenced an EU funded project (EU Study Contract 98–057) to standardise protocols and carry out a more extensive set of comparative fishing operations in order to further investigate survey variability.

Table 4.6.1

Irish Sea - Celtic Sea - IBTS Surveys 1998

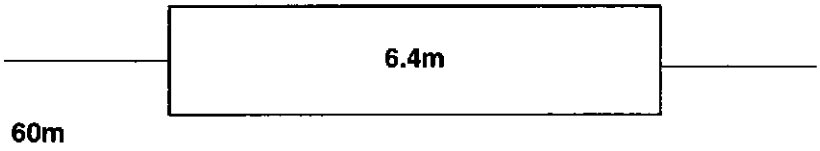
Overlapping Tows

RV Celtic Voyager (IRL), *RV Scotia* (UK), RV Thalassa

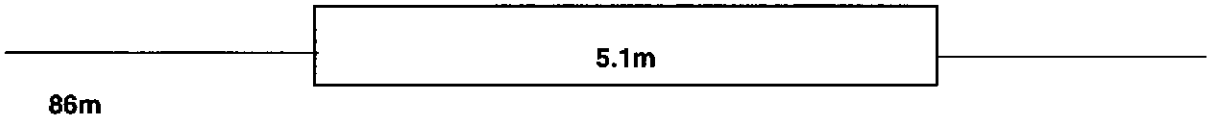
ICES Rectangle	*RV Celtic Voyager*	*RV Scotia*	RV Thalassa
38E4	14	No Tow	No Survey
38E5	15	524	No Survey
38E6	No Tow	523	No Survey
37E4	9, 10, 11, 12, 13	No Tow	No Survey
37E5	17	521, 525	No Survey
37E6	16	522	No Survey
36E3	7, 8	No Tow	No Survey
36E4	5, 6	518	No Survey
36E5	No tow	519	No Survey
36E6	No Tow	520	No Survey
35E3	1, 2, 19	No Tows	No Survey
35E4	3, 4, 18	515, 516, 517	No Survey
35E5	20	No Tows	No Survey
35E6	No Tow	No Tows	No Survey
31E2	43, 42	No Survey	C0506
32E3	36, 37, 38	No Survey	C0547
32E2	46, 47	No Survey	C0502
31E1	54	No Survey	C0514
TOTAL	20	11	4

Figure 4.6.1 IBTS - Western Waters (Ireland, UK, France)
Trawl Gear Used and Some SCANMAR Details

RV Celtic Voyager **GOV 28.9 / 37.1 (@ 100m)**



RV Scotia **GOV 36 / 47 (@ 107m)**



RV Thalassa **GOV 37 / 47 (No Kite) (@ 100m)**

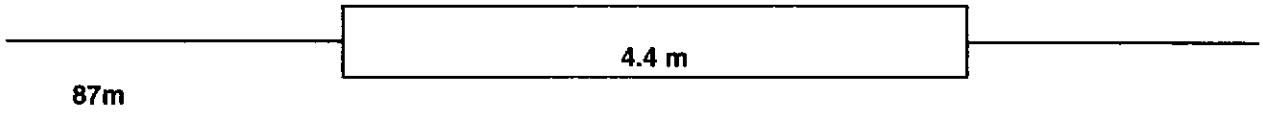


Table 4.6.2
Analyses of Length Frequency of Comparative Tows from Celtic Voyager/Scotia (A) and Celtic Voyager/Thalassa (B)
K-S test *** significant difference at 0.05.
ND = No Data

(A)	5/518	3/516	16/522	Combined
Whiting		***		
Haddock	***	ND		

(B)	42/CO506	46/CO502		Combined
Whiting	***	***		***
Hake	***	***		***

5 SOUTHERN DIVISION SURVEYS

5.1 Co-ordinator's Overview

The project SESITS (South-western European Shelf International Trawl Surveys) was designed in order to attempt to solve the lack of co-ordination and standardisation of the surveys carried out in the South-western Europe continental shelf. The main objectives of the SESITS project are to:

1) standardise the methodology of the bottom trawl surveys in the area;
2) estimate abundance indices for the target species, and analyse their spatial-temporal variability and the possible effects of the hydrographic parameters;
3) to maintain and standardise the surveys data base.

The target species are: hake, blue whiting, megrims, monkfish, horse mackerel and Norway lobster. The total zone covered by this project corresponds to Eastern Atlantic waters from Southern Ireland to Strait of Gibraltar. IEO (Spain), IPIMAR (Portugal) and IFREMER (France) participate in the project which is co-ordinated by IEO (F. Sánchez).

In this project special effort was directed to the standardisation of the methodology of the surveys. Estimation of the catchabilities of the different sampling gears (NCT, Baka, GOV) were planned and performed. Intercalibration of the different surveys were attained by overlapping areas and sampling the same fishing stations of adjacent countries (Portugal/Spain and Spain/France) (Figure 5.1.1). Catchability conversion factors were estimated between length distributions of the species, as well as for indices of abundance.

The SESITS project is co-financed by the EC (D.G. XIV Study Contract reference: 96-029).

5.2 National Surveys

The two series (1997 and 1998) of four Autumn groundfish surveys anticipated in the project were accomplished. The first series of surveys was performed from 19 September until 19 November 1997. The second series of surveys was performed from 17 September until 19 November 1998. The European Atlantic shelf from Southern Ireland to the Strait of Gibraltar was sampled. All the area was stratified according to 14 geographical sectors (Figure 5.2.1) and depth strata (Figure 5.2.2). A brief resume of each survey is given in Appendix III.

In the French area the surveys were conducted with the R/V *Thalassa* and the gear used was the GOV 36/47 without Exocet kite (standard gear for the SESITS area). The area covered was the Celtic Sea and Bay of Biscay (Figure 1). In the Spanish area the surveys were performed with the R/V *Cornide de Saavedra* and the gear used was the Baka 44/60. Two different zones were surveyed: Northern continental shelf (Galician waters and Cantabrian Sea) and Gulf of Cádiz. In the Portuguese area the surveys were conducted with the R/V *Noruega* and the gear used was the NCT (Norwegian Campell Trawl), with bobbins in the groundrope. The characteristics of the gears used by these surveys are given in Table 4.1.1.

Figures 5.2.3.a and b show the location of the fishing hauls during the 1997 and 1998 Autumn surveys (334 and 348 valid hauls respectively). The mean coverage in the whole area during the 1998 survey was 5.4 hauls per ICES rectangle.

Oceanographical stations (CTD probe) took place at the end of the fishing stations in the whole area. Only in the Northern Spanish area a total 21 profiles (with three CTD cast each one) were made outside the break shelf. A total of 366 stations were performed in 1997 and 526 stations in 1998 (Figures 5.2.3.c and d). The sampling strategy satisfy the requirements of high resolution sampling along tracks to separate mesoscale features. Acquired data were processed to discard warm-up data, to smooth anomalous density profiles and to configure the working files. After, an objective analysis technique was applied to construct the total field of temperature, salinity and dynamic topography at different depths.

5.3 Standardisation within SESITS project

Gear calibration surveys, overlapping experiences, and estimation of abundance indices by age class of the demersal resources from the Autumn surveys of 1997 and 1998 were conducted. Four Workshops were carried out to analyse the gear calibrations data; to obtain conversion coefficients; to estimate the abundance and distribution of target species and to co-ordinate the different activities in progress. During the Nantes SESITS Workshop a working document about the Objective Data Analysis was presented, and the criteria for the sampling strategy of hydrographic data were defined.

Special emphasis was placed on the analysis of mesoscale-macroscale dynamics associated with the primary production processes.

All the available information concerning the methodology applied during the three different surveys (IFREMER-France, IEO-Spain and IPIMAR-Portugal) will be summarised in a Manual. In this Manual, it is expected to adopt modifications to converge the methodology of the three Institutes. Also, the exchange data file formats for SESITS data analysis were defined.

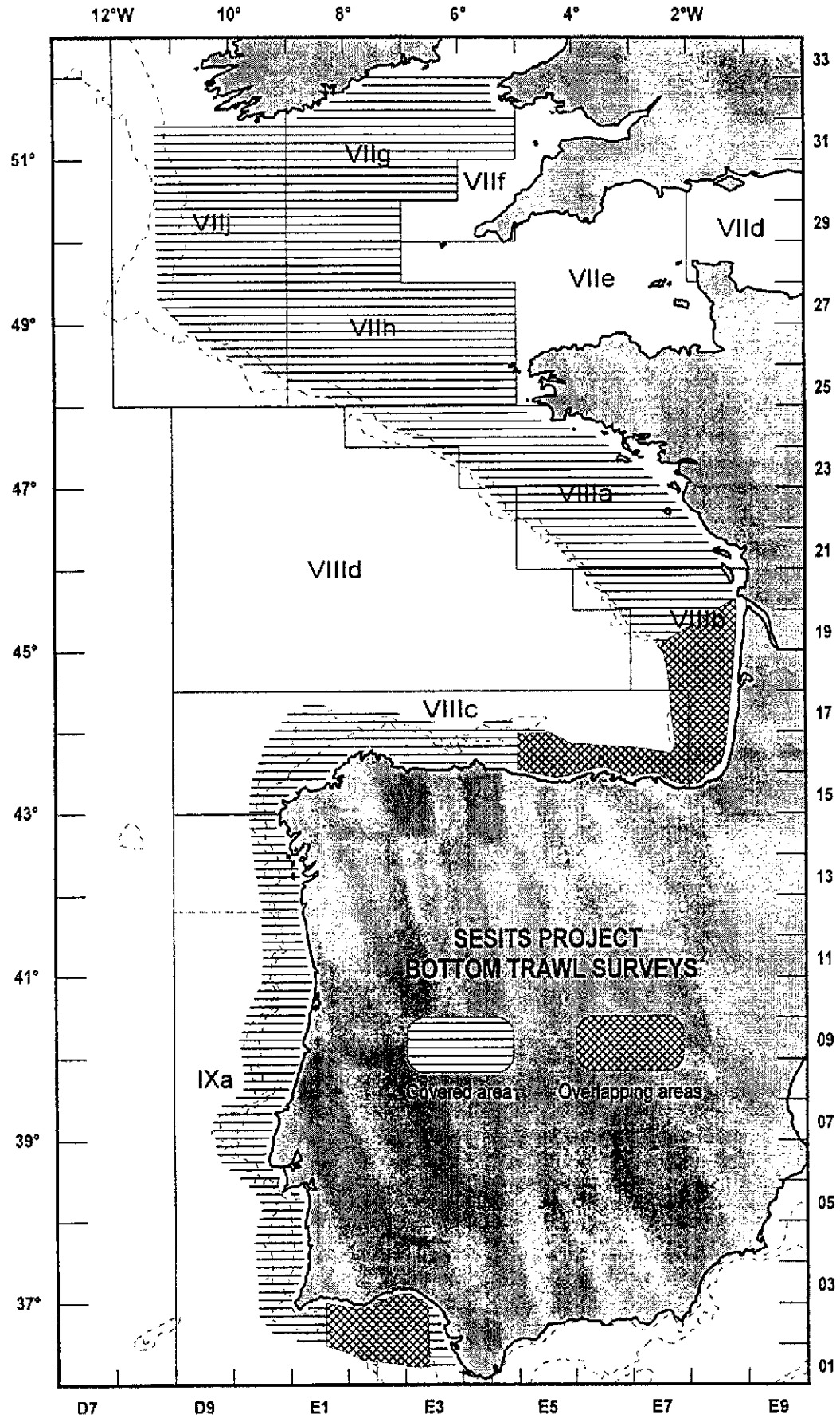


Figure 5.1.1. Covered and overlapping areas in the SESITS project.

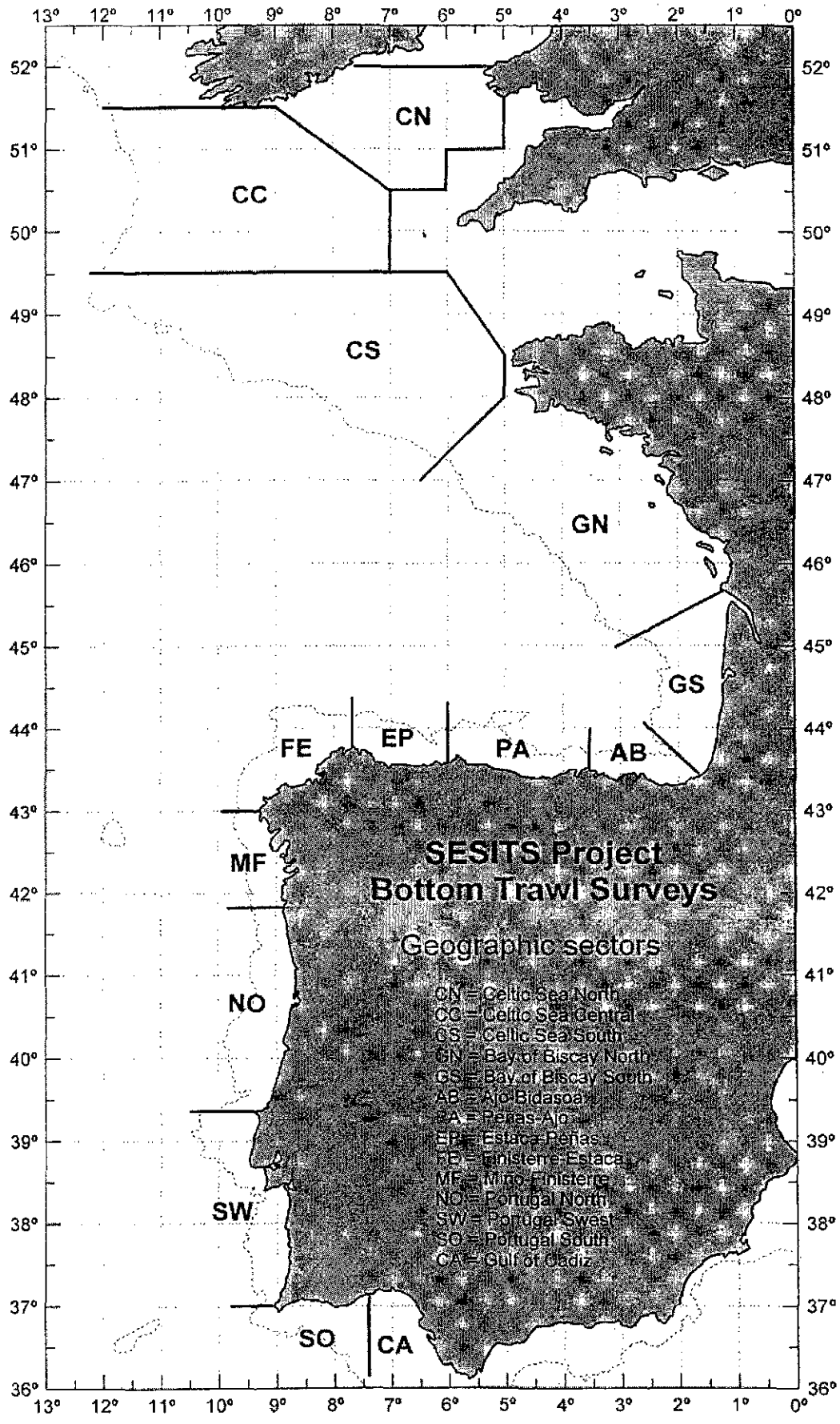
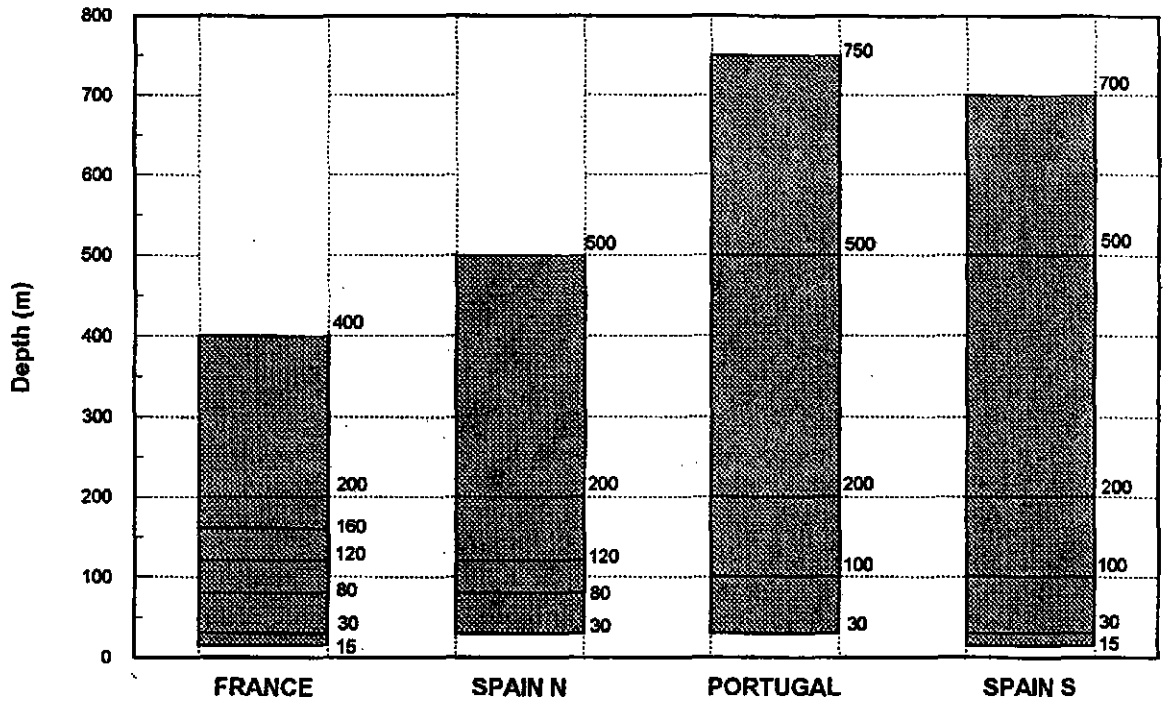


Figure 5.2.1 Geographical sectors in the SESITS area.



Figures 5.2.2 Depth strata in the SESITS surveys.

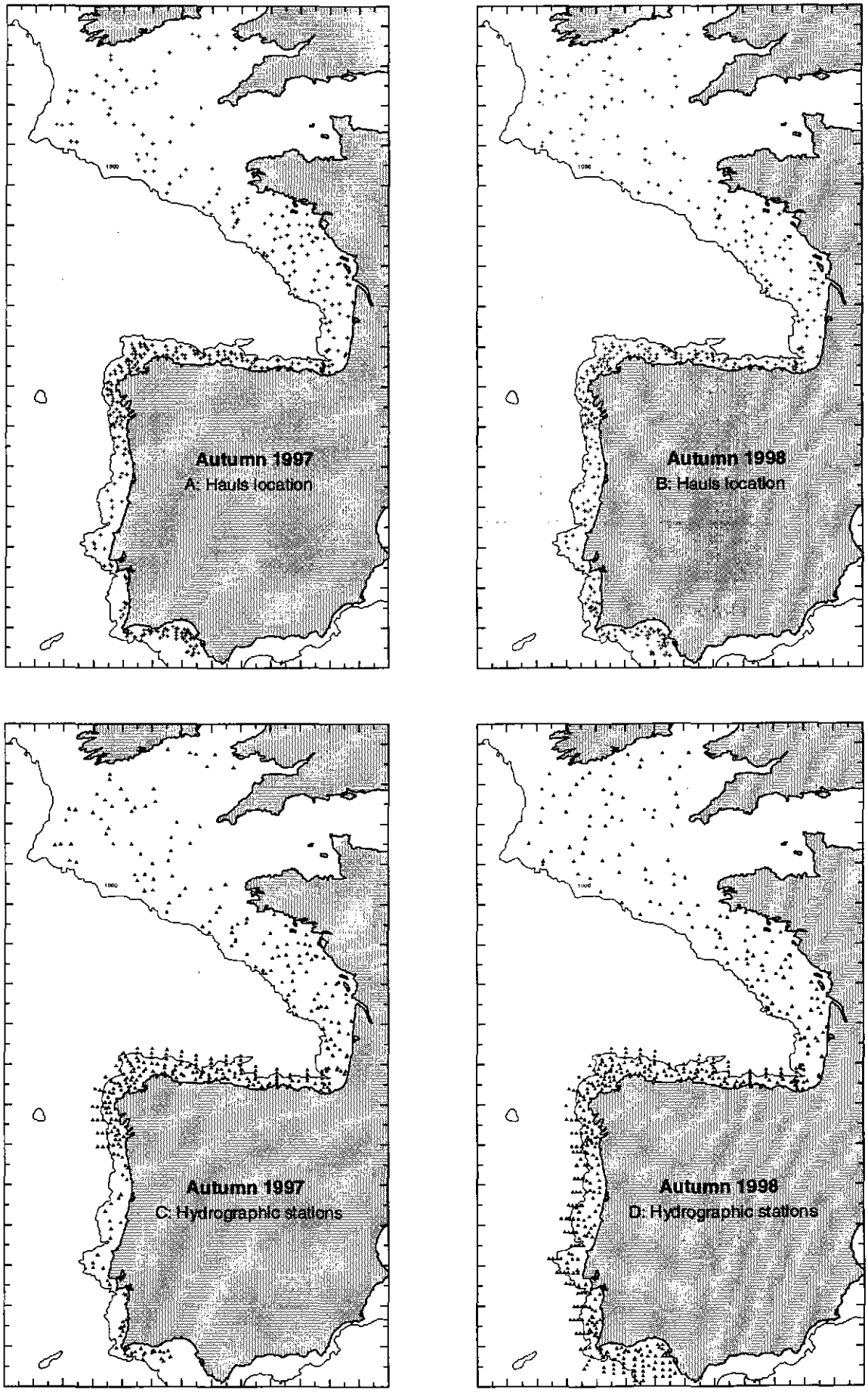


Figure 5.2.3.a-d. Location of hauls and hydrographic stations during 1997 and 1998 SESITS surveys.

5.4 Calibration experiments between NCT, Baka and GOV trawls

According to task 1 of the SESITS project two experiments took place in Spanish and in Portuguese waters in 1997 and in 1998, during about 15 days, with the R/V *Cornide de Saavedra* and R/V *Noruega*. The main goals of these four experiments were:

a) To ensure an adequate performance of the GOV 36/47 trawl gear;
b) To estimate the catchabilities of the GOV gear upon the target species;
c) To compare catches in number and weight between NCT and GOV gears and between BAKA and GOV gears;
d) To compare the population structures by length classes of the target species caught with both gears.

In the Spanish surveys a total of 27 paired half-hour tows and 13-paired hour hauls were done respectively in 1997 and 1998. In the Portuguese surveys a total of 21 paired half-hour tows and 18-paired hour tows were carried out, respectively in 1997 and 1998. (See details in Cardador, *et al*, 1999, Working Document No. 2)

All the hauls were carried out during the daylight period. A haul carried out in one day with one of the gears was repeated in the following day, on the same place and time (or as close as possible) with the other gear. This method was used because the extra time needed to change the gears was not compatible with the ship time available. Scanmar equipment was used to provide information on horizontal and vertical openings of the net and distance between doors.

The experiments were supervised by experts in fishing gear technology: Jean-Paul George from IFREMER (Lorient) for the Portuguese surveys and Alfredo Igelmo from Instituto Politécnico Marítimo Pesquero de Pasajes for the 1997 Spanish survey.

In the 1997 calibration experiments different approaches were used. Spanish survey priority was given to the use of GOV (speed of 4 knots and warp length) as is described in the IBTS manual, while in the Portuguese experiment the main objective was to obtain the recommended IBTS gear performance (speed of 3.5 knots). Nevertheless, in both experiments the GOV did not performed correctly (according to the theoretical values presented in the IBTS Manual).

In the 1998 Portuguese survey to get an adequate performance of the GOV (speed of 4 knots) it was necessary to increase the warp length given by the IBTS manual and to increase the weight of the groundrope. Regarding the 1998 Spanish survey, to avoid low vertical opening of the GOV, the towing speed was reduced to 3.5 knots to ensure an adequate performance of the gear.

It is important to refer that in the French EVHOE groundfish surveys, the fishing gear used is the GOV 36/47 without the Exocet kit, with 18 floats in the headlines and 24 + 24 in the winglines, adding a total of 66 floats. This number is different from the 60 floats used in the calibration experiments: 20 in the headlines and 20 + 20 in the winglines (following the recommendations of the IBTS Manual). Also, the sweeps length used in the French surveys changes with the bottom depth: 50 m at depths smaller than 120 m and 100 m at deeper depths; contrary to the constant 100 m used in the calibration experiments (SESITS, 1998). Comparisons of gear parameters obtained are shown in the following table:

Sampling material	IFREMER				IEO		IPIMAR	
	EVHOE97		EVHOE98		1997	1998	1997	1998
Research vessel	*Thalassa*				*Cornide de Saavedra*		*Noruega*	
Type	Stern trawler							
GRT	3022				1133		495	
Kw	2200				1650		1100	
Overall length (m)	73.65				67		47.5	
Gear parameters								
Depth range (m)	24-115	120-560			96-344	26-172	47-680	76-568
Trawling speed (Knots)	4				4	3.5	3.5	4
Doors weight (kg)	1350				850		650	
Doors surface (m^2)					3.7		3.75	
Sweep length (m)	50	100	50	100	100			
Diameter of Lower Bridle	22 mm				22 mm			
Diameter of Upper Bridle	12 mm				14 mm			
Diameter of Middle Bridle	12 mm				14 mm			
Exocet Kite	NO				NO			
Floats in Headline	18				10			
Floats in winglines	24+24				20+20			
Mean vertical opening (m)	3.9	3.5	4	4.1	2.7	3.0	4.2	3.8
Mean doors spread (m)	74	112	76.9	112.7	103.7	80.5	83.4	87.5
Mean horizontal opening (m)			18.7	20.5			17.2	19.0
REMARKS	IPIMAR 1998 - Groundrope weight increase by 40 kg							

Due to the problems with GOV and to the impossibility of obtaining a performance in agreement with the theoretical specifications expressed in the IBTS Manual, IEO and IPIMAR made the decision of continuing working with their gears (BAKA and NCT, respectively) in the immediate future. The reasons to keep the same gears are as follows:

Baka in the Spanish surveys

1. The main goal of the Spanish surveys is to estimate hake recruitment indices. The baka gear has a higher catchability than GOV for the juvenile of this species (conversion coefficient estimated during the SESITS project = 0.8).

2. The main species with commercial interest in Spain are benthic and demersal species. The baka has a higher catchability than GOV for these species: conversion coefficients estimated in the project SESITS are for megrim CF=0.2 and monk CF=0.5. A gear with low catchability and with low abundance levels for some species, a reliable sampling level may not be reached, since minimum sample size may not be obtained.

3. The common gear used by the Spanish fleet that fishing in the area is the baka. Using as sampler the same gear as the fleet allows to estimate the effects of trawlers in the ecosystem (by-catch, discards, etc.).

4. The design of the baka gear is very simple and it is composed of only two mesh types (PE1400-80 and PA3570-80). This implies that the repairs on board of damages are carried out easily maintaining operative characteristics.

5. The baka gear is very cheap (for the price of a GOV three bakas can be bought), which considerably reduces the surveys costs since the gear is easily damage due to the roughness of the fishing grounds of the Cantabrian Sea.

6. The Reports of the ICES Stock Assessment WG show that the indices provided by the Spanish surveys are used for the following species:

   Hake: Abundance indexes (L/S tuning) and recruitment index since 1983.

   Megrim: Abundance index by age class since 1988.

   Blue Whiting: Abundance index by age class since 1985.

   Horse Mackerel: Abundance index by age class since 1985.

   Mackerel: Abundance index by age class to know the distribution pattern.

7. The GOV gear in the Spanish calibration experiments did not operate properly, or at least, not accordingly IBTS Manual references.

8. The Spanish surveys have a historical series with unaltered methodology from 1980. To change the sampling gear means to break almost 20 years-old important and stable historical series.

NCT in the Portuguese surveys

1. GOV bottom trawl gear was tested in Portuguese waters but only at the South (Algarve) where the bottoms are soft or muddy. The risk of being damage is very high fishing in rough bottoms. NCT gear can operate in rough bottoms due to the presence of bobbins in the groundrope. Particularly in the North of the Portuguese coast where the bottoms are rocky, the use of bobbins reduces the risk of damaging the net. GOV is a very expensive gear when compared with NCT gear (almost three times more expensive).

2. The GOV gear in the Portuguese experiments did not operate properly, or at least, not accordingly IBTS Manual references. It was necessary to increase the warp length (when compared to the table in IBTS manual) and to increase the weight of the groundrope to get an adequate performance of the gear.

3. NCT is an adequate gear for all species except for benthic, the case of megrims and monkfish. However for those species another type of Portuguese surveys is conducted to estimate abundance indices, *e.g.*, deep sea fish surveys, since 1994.

4. The abundance indices provided by Portuguese groundfish surveys using NCT gear are used for assessment purposes at ICES Assessment Working Groups for hake, horse mackerel, blue whiting, mackerel and Norway lobster.

5. NCT bottom trawl net has been used in the Portuguese groundfish surveys since 1979. Abundance and biomass indices are available for hake, horse mackerel, and blue whiting since then; for mackerel, Spanish mackerel, Norway lobster, rose shrimp, red shrimp, seabreams, bluemouth since 1989; and for non commercial species like snipefish since 1980. To change the sampling gear means breaking 20 years of important historical series.

5.5 Comparison between Thalassa and Cornide de Saavedra, Noruega and Cornide de Saavedra

According to task 1 of the SESITS project four overlapping experiments were conducted in 1997 and 1998 in the Southern French shelf, Northern and Southern Spanish shelf and in the Portuguese South shelf (Figure 5.1.1). These experiments took place during the Autumn surveys, of the three countries, between R/V *Thalassa*-GOV and R/V *Cornide de Saavedra*-BAKA and between the latter and R/V *Noruega*-NCT (for details see Borges *et al.*, 1999, W.D.).

In the Northern and Southern overlapping experiments a total of 83 half hour hauls and 32 hour hauls have been performed, respectively.

The conversion factors for the Northern overlapping experiments were estimated by quasi-likelihood method according to Pelletier (1998), after an exploratory analysis, with analysis of variance and linear regression (See Table 5.5.1). For the Southern experiments the same methodology is currently being applied and will be presented in the SESITS final report (June 1999).

The SESITS objective was to consider the *Thalassa*-GOV as the reference vessel/gear for the area. However using two steps conversion factors for the Portuguese data (NCT->BAKA->GOV) could lead to problems in estimating the precision of the conversions. Therefore, the IBTS meeting considered that the *Cornide de Saavedra*-BAKA should be the reference vessel/gear for the conversion of the catches of the countries involved in the SESITS area.

Table 5.5.1 - Conversion coefficients between *Cornide de Saavedra*-Baka to *Thalassa*-GOV for target species (1997-1998) of the SESITS project.

Species, strata and length class	Coefficients	Error	80 % confidence interval		
			Lower bound	Upper bound	Width
Hake Strata 2, 3, 4, 5, 6 Length < 22 cm	0.80	0.07	0.70	0.89	0.19
Hake Strata 2, 3, 4, 5, 6 Length > 21 cm	1.00	-	-	-	-
Blue whiting Strata 3,4,5,6	2.65	0.17	1.88	3.34	1.46
Horse mackerel Strata 2,3,4,5,6	2.28	0.19	1.71	3.04	1.33
Megrim (*L. boscii*) Strata 4,5,6	0.20	0.21	0.14	0.28	0.14
Megrim (*L. whiffiagonis*) Strata 4,5,6	0.10	0.16	0.08	0.13	0.05
Monkfish (*L. budegassa*) Strata 2,3,4,5,6	0.57	0.23	0.37	0.80	0.43
Monkfish (*L. piscatorius*) Strata 2,3,4,5,6	0.47	0.19	0.34	0.63	0.29
Norway lobster Strata 3,4,6	1.00	-	-	-	-

(strata 2 – 30 to 80 m depth, strata 3 – 81 to 120 m, strata 4 – 121 to 160 m, strata 5 – 161 to 200 m, strata 6 – 201 to 400 m)

5.6 Preliminary results of 1997 surveys

As abundance index, the stratified mean catch per trawl hour was used, following the methodology described by Cochran (1971) and Grosslein & Laurec (1982). Previously, the original data were transformed using the conversion coefficients obtained with the methodology previously described. Abundance indices and biomass indices of target species in the whole area are shows in Table 5.6.1.

Table 5.6.1 Abundance indices (number/hour) and biomass indices (kg/hour) of target species in the SESITS area using conversion factors between gears and vessels.

Specie	1997		1998	
	N / hour	Kg / hour	N / hour	Kg / hour
Hake	145.05	8.16	104.87	7.14
Blue whiting	5371.68	164.25	2986.33	129.42
Megrim (*L. boscii*)	4.48	0.33	3.51	0.33
Megrim (*L. whiffiagonis*)	20.20	3.28	22.43	3.48
Monkfish (*L. budegassa*)	1.41	1.32	1.16	1.02
Monkfish (*L. piscatorius*)	1.57	2.64	1.56	3.38
Horse mackerel	2574.62	164.16	2682.69	181.12
Norway lobster	9.98	0.37	19.15	0.52

The abundance indices (number/hour) by geographical sector for hake during 1997 and 1998 Autumn surveys show the highest densities located in the Cantabrian Sea and Galician waters, due to the high concentrations of recruits. The highest yields in biomass have been obtained in Portuguese waters. In 1998 a serious drops in abundance and biomass was observed in the areas of the Bay of Biscay and the Cantabrian Sea and to a lower extent in the Portuguese waters.

Four spot megrim (*L. boscii*) presents the same distribution pattern in the two years and it is particularly abundant in the Cantabrian Sea and the Celtic Sea. Megrim (*L. whiffiagonis*) shows the same distribution pattern in the two years. It is very abundant in the Celtic Sea, decreasing progressively in the Gulf of Biscay and Cantabrian Sea. The catches to the south of Cape Finisterre are occasional.

Hake age class distribution during the autumn of 1997 is shown in Figure 5.6.1. The Bay of Biscay appears as the main nursery area of European hake with the highest densities in the Cantabrian Sea and North of Galician shelf. It is also highlighted the concentration of the *Grande Vasière* in the French Bay of Biscay shelf. Hake of age class 1 is found in the recruitment areas previously mentioned and in the Portuguese shelf. The age class 2 is particularly abundant in Portuguese waters. Hakes of 3 year-old or older are distributed in a homogeneous way along the whole SESITS area.

The class 0 of blue whiting appears in the whole SESITS area although it is more abundant in the North area (Figure 5.6.2). It surprises that being considered a species with the spawners located in the North area , juveniles of age class 0 appear in the Gulf of Cádiz. Individuals older than 1 year show a tendency to be more abundant in the Bay of Biscay.

The muddy bottoms close to 200 m depth in the Cantabrian Sea constitute the main nursery area for megrim (*L. boscii*), as we can observe in Figure 5.6.3. The waters of Galicia and the Cantabrian Sea seem to be the main distribution area of juveniles of 1 and 2 years of this species. Individuals older than 2 years also appear in deeper bottoms of the Bay of Biscay and Celtic Sea. During the 1997 survey a small number of class 0 of megrim (*L. whiffiagonis*) appears in the Cantabrian Sea (Figure 5.6.4). The juvenile of age classes 1 and 2 appear either in the Cantabrian Sea as in the Celtic Sea while the adults show higher densities in the Celtic Sea.

Juveniles of the two monkfish species are more abundant in waters of Galicia, Cantabrian Sea and Celtic Sea (Figures 5.6.5 and 5.6.6). Individuals older than 2 years are distributed in the whole Bay of Biscay and Celtic Sea.

Significant concentrations of juvenile of class 0 of horse mackerel have been captured in the north area of Portugal and lesser in the French shelf of the Bay of Biscay (Figure 5.6.7). In Autumn of 1997 the class 1 has appeared mainly concentrated in the Bay of Biscay. In the Gulf of Cádiz and South of Portugal the index of abundance of 2 year-old individuals have been the most important ones for this species.

The Norway lobster was particularly abundant in the French shelf of the Bay of Biscay (*Grande Vasière*) and in the Subdivision VIIg of ICES in the Celtic Sea (Figure 5.6.8). In general terms, this distribution pattern is also repeated in 1998. In Galician waters and Cantabrian Sea the Norway lobster appears only in very restricted areas. The Gulf of Cádiz seems to be an appropriate area for the Norway lobster, probably due to the high presence of muddy bottoms on its shelf.

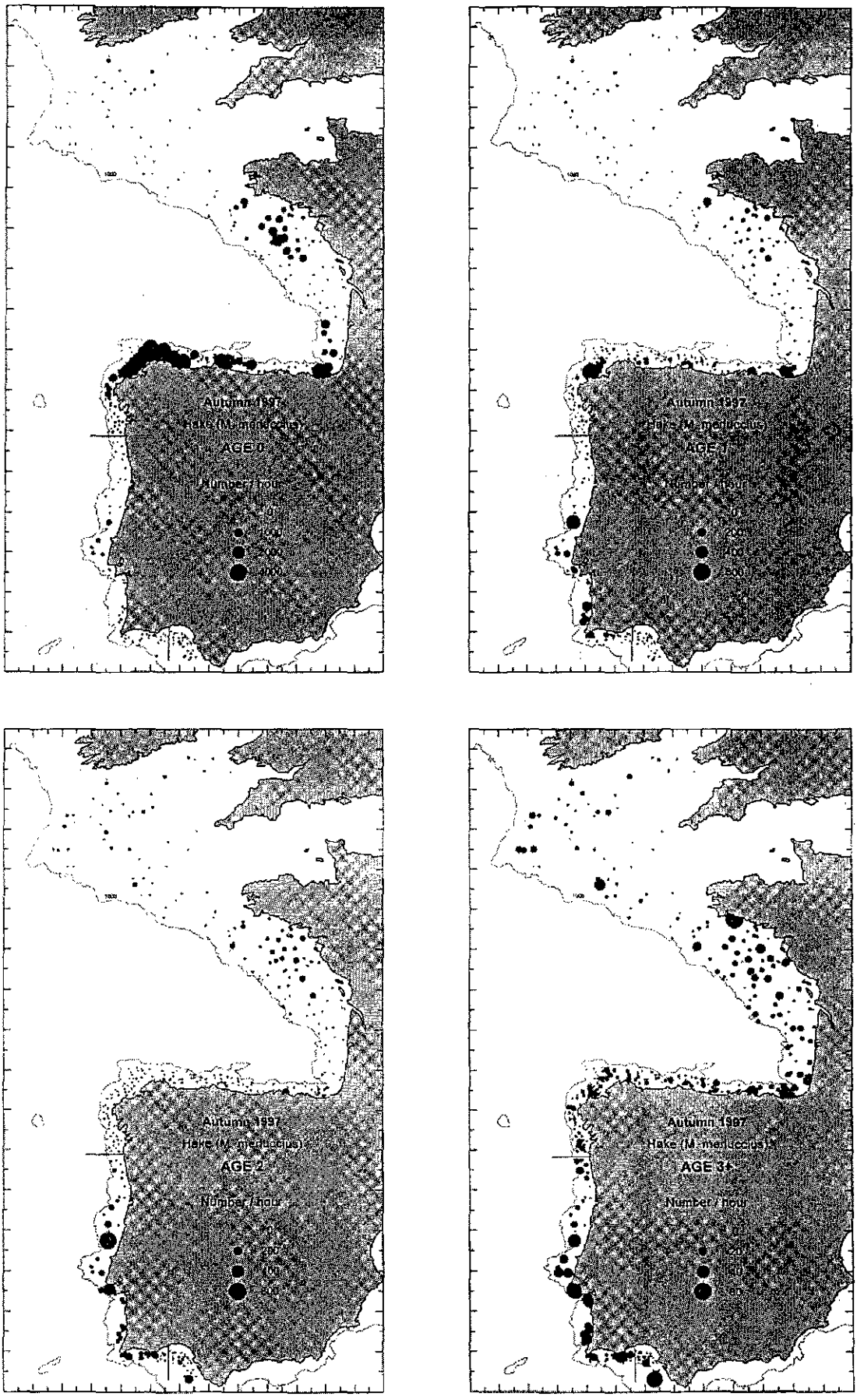


Figure 5.6.1 Hake age class distribution in the SESITS area. Original data (without conversion) in Portugal.

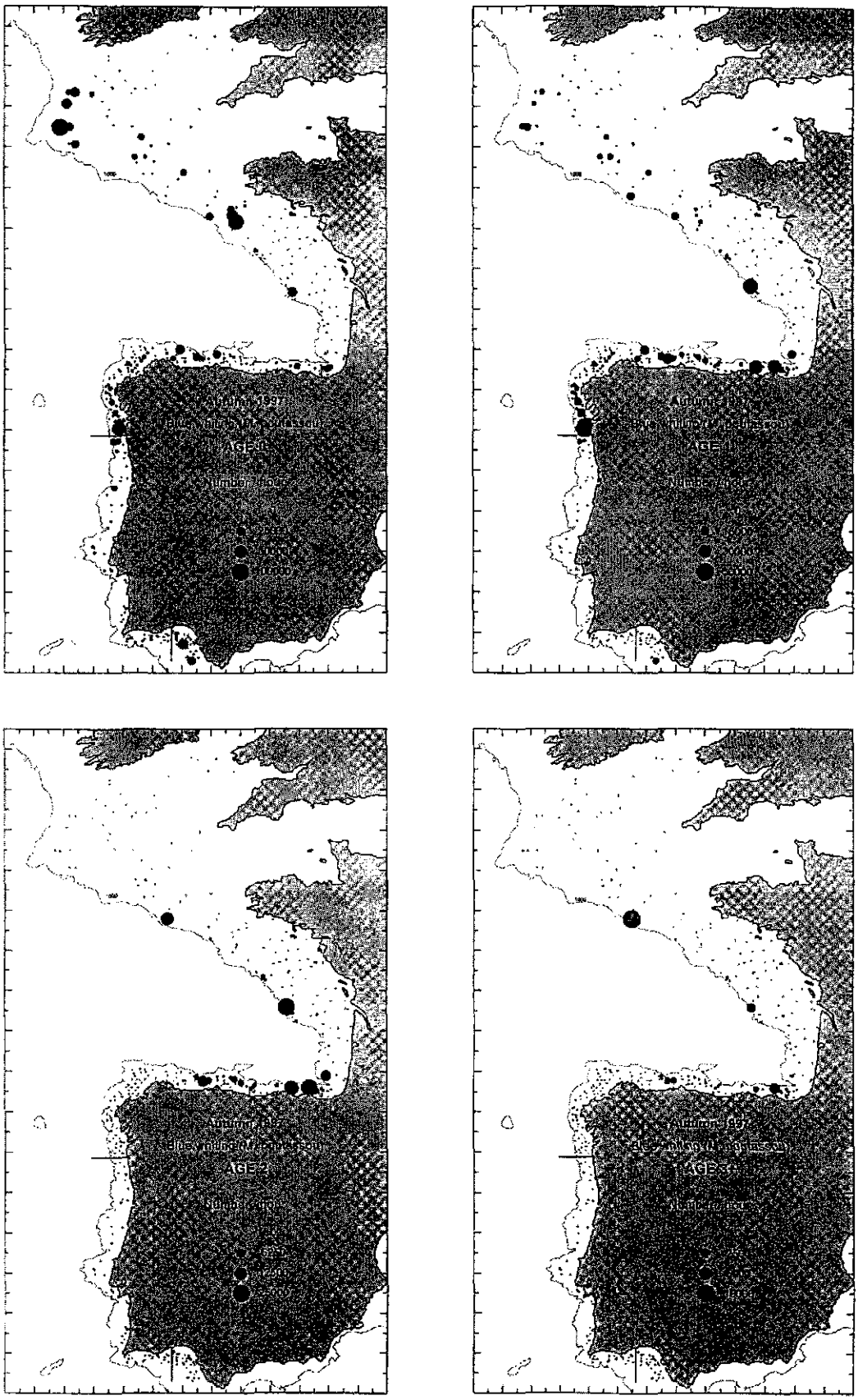


Figure 5.6.2 Blue whiting age class distribution in the SESITS area. Original data (without conversion) in Portugal.

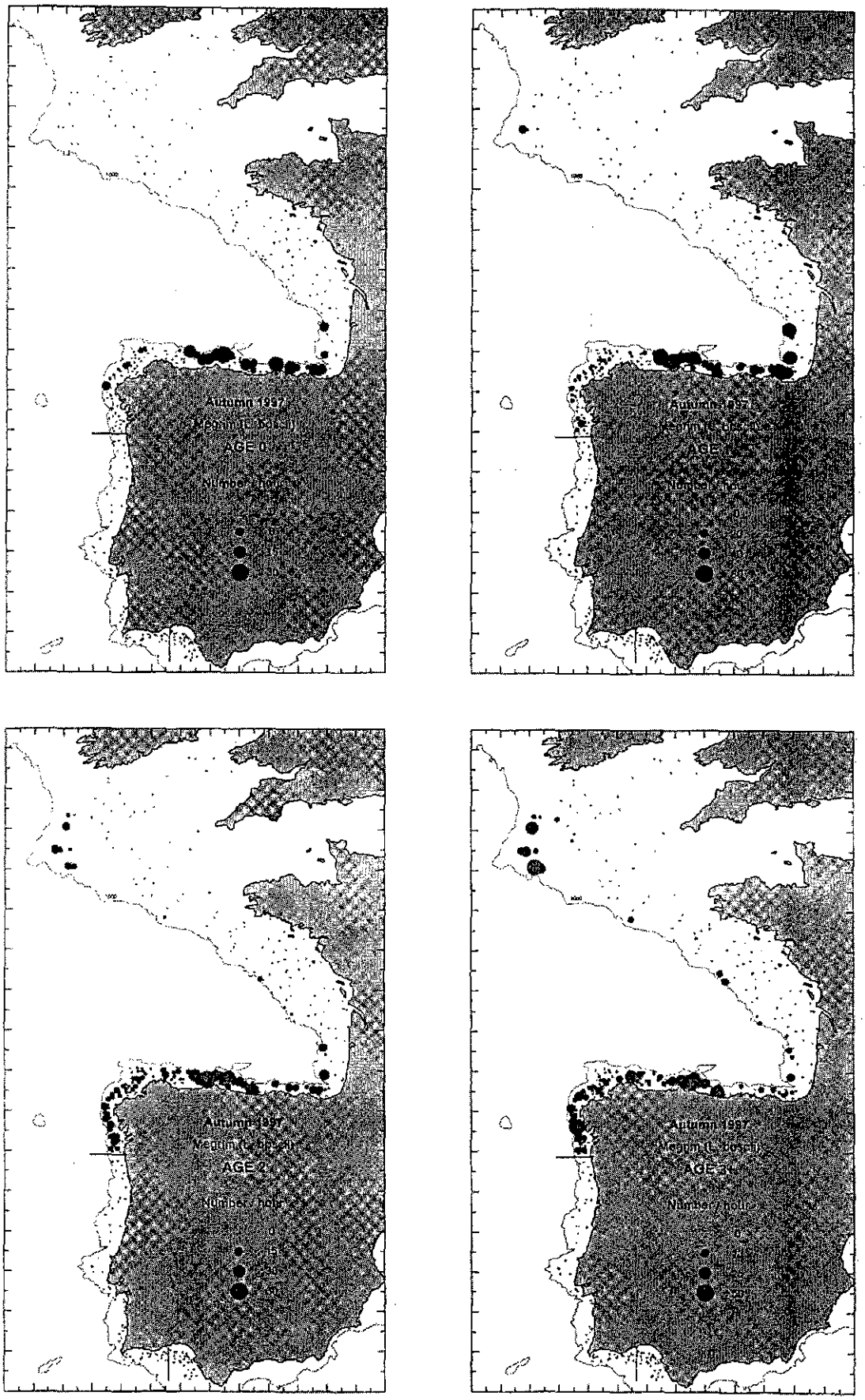


Figure 5.6.3 Megrim (*L. boscii*) age class distribution in the SESITS area. Original data (without conversion) in Portugal.

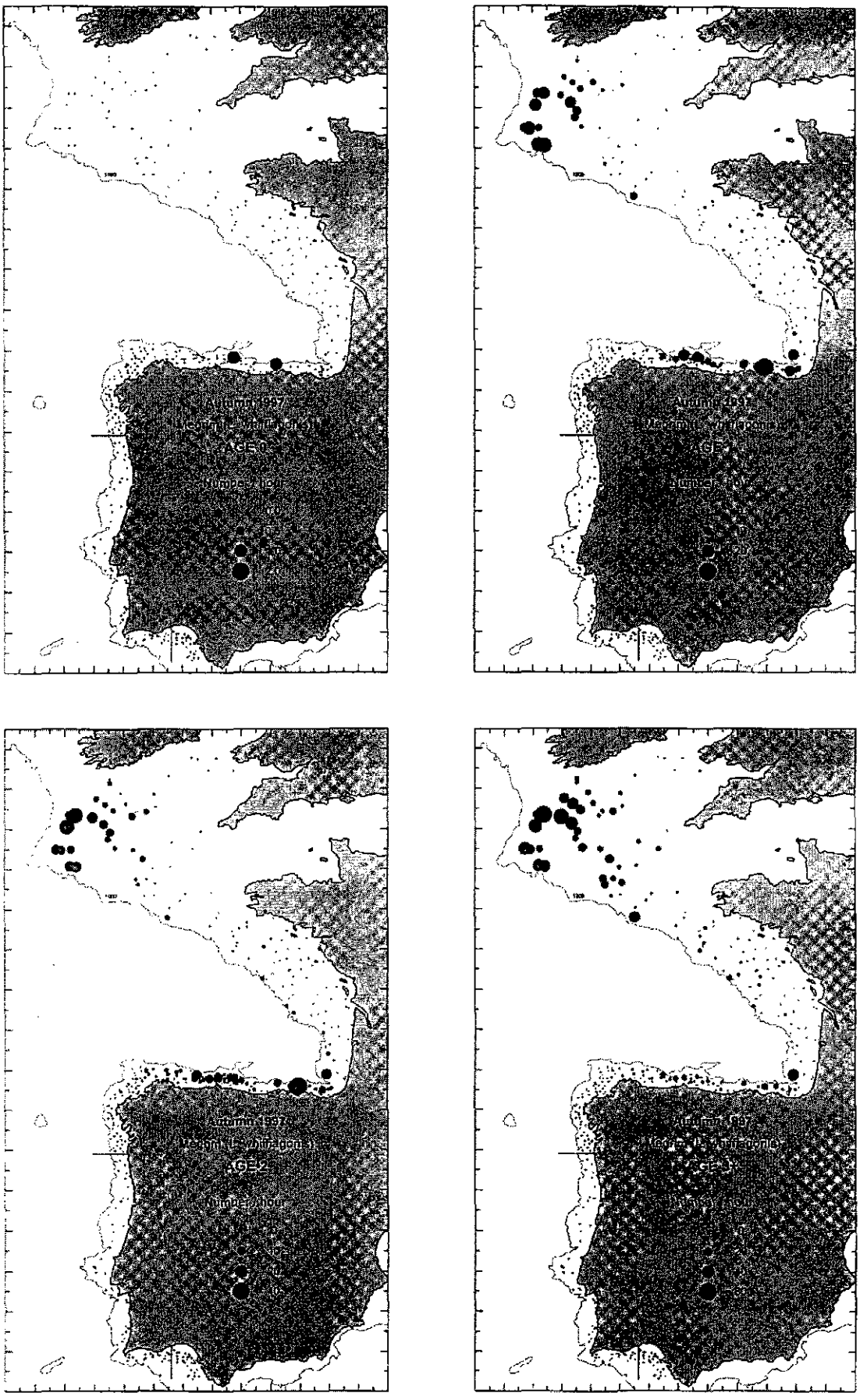


Figure 5.6.4 Megrim (*L. whiffiagonis*) age class distribution in the SESITS area. Original data (without conversion) in Portugal

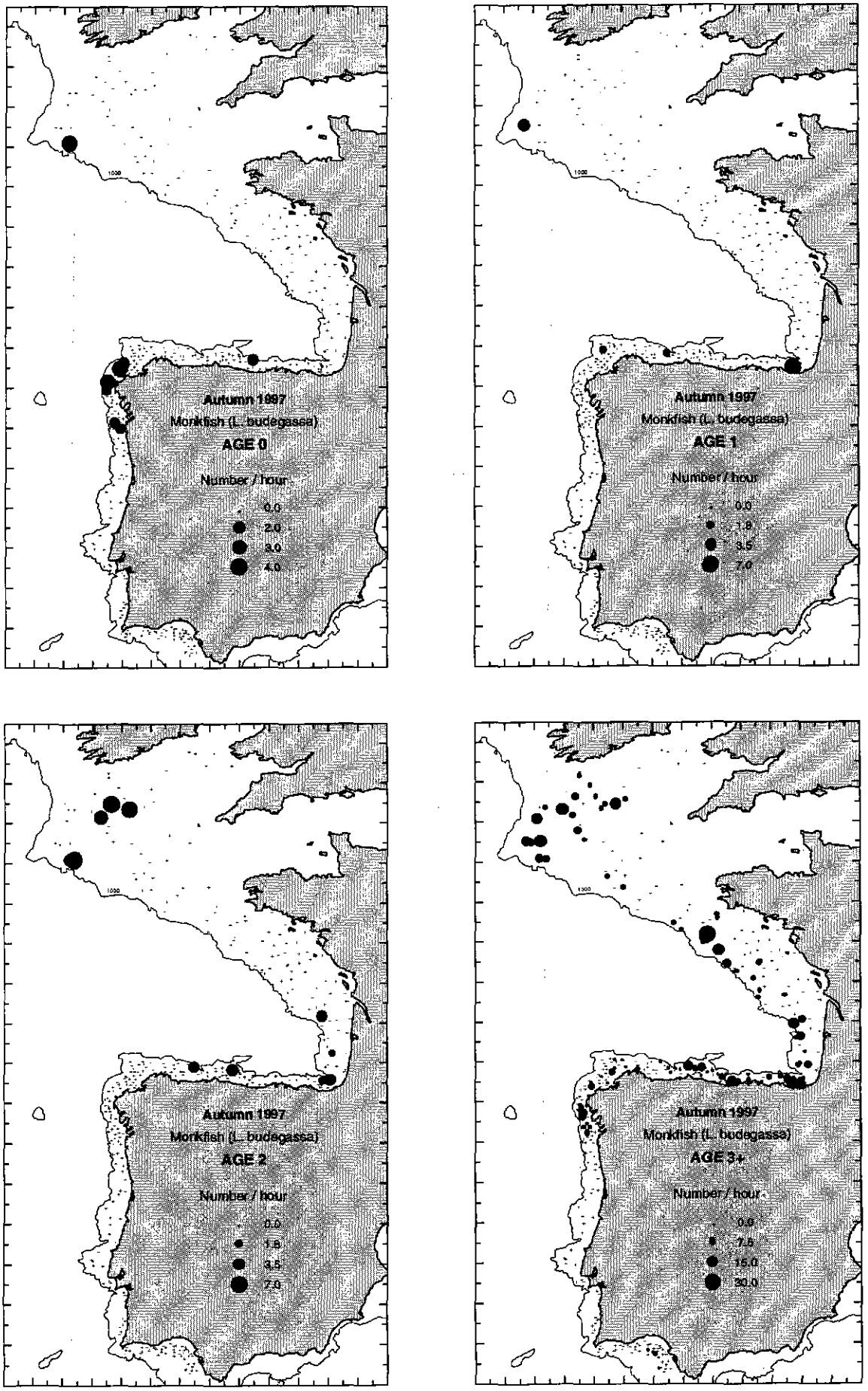


Figure 5.6.5 Monkfish (*L. budegassa)* age class distribution in the SESITS area.

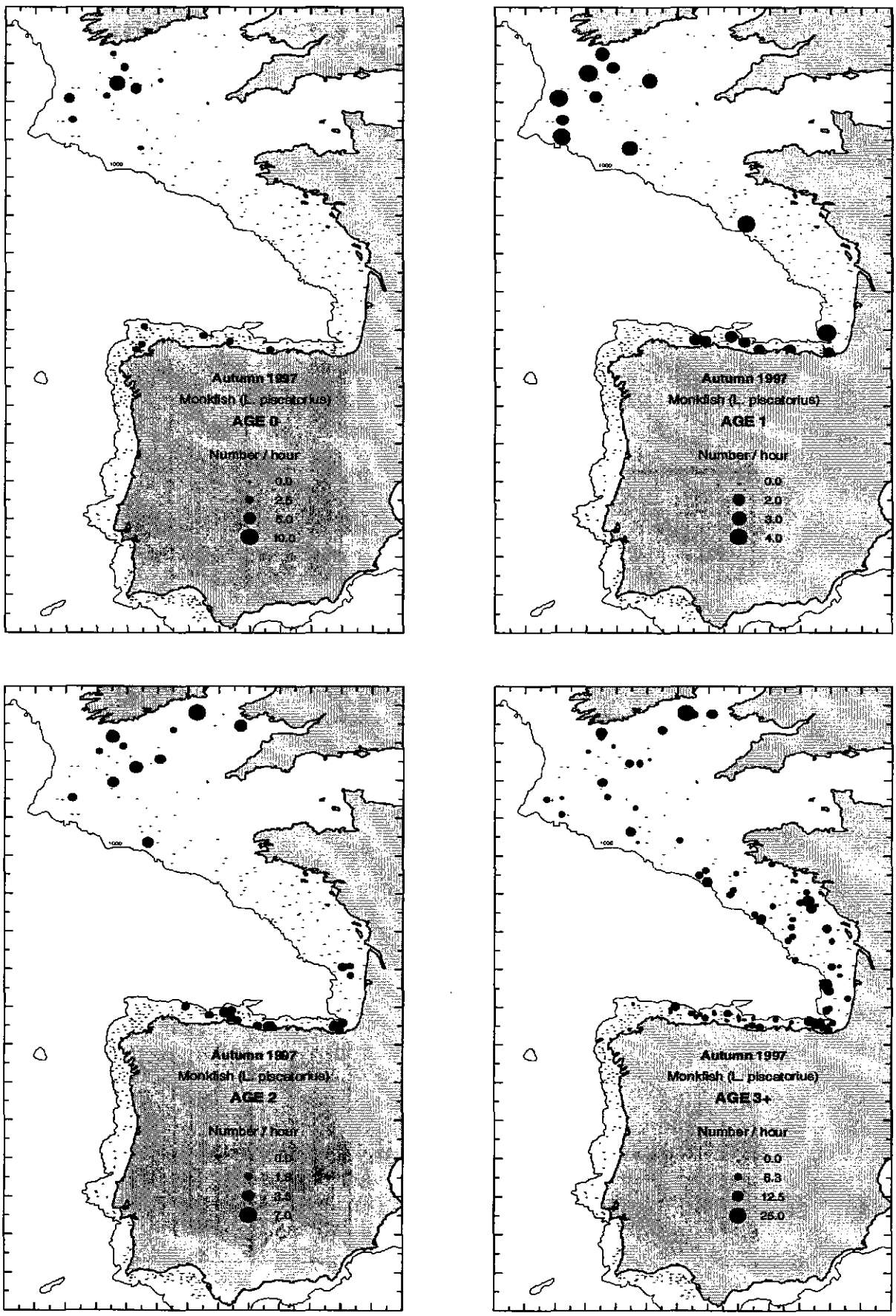


Figure 5.6.6 Monkfish (*L. piscatorius*) age class distribution in the SESITS area.

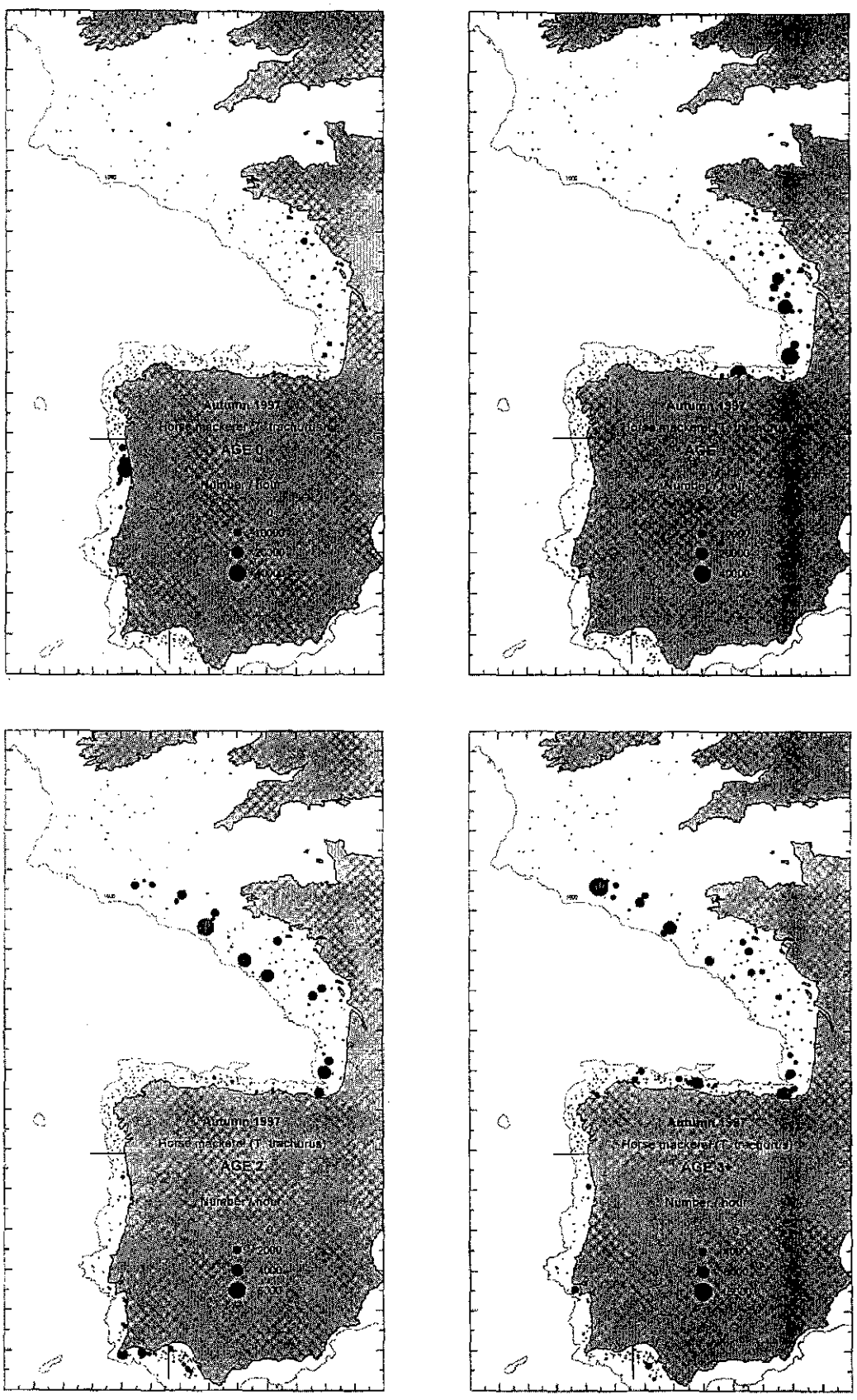


Figure 5.6.7 Horse mackerel (*T. trachurus*) age class distribution in the SESITS area. Original data (without conversion) in Portugal.

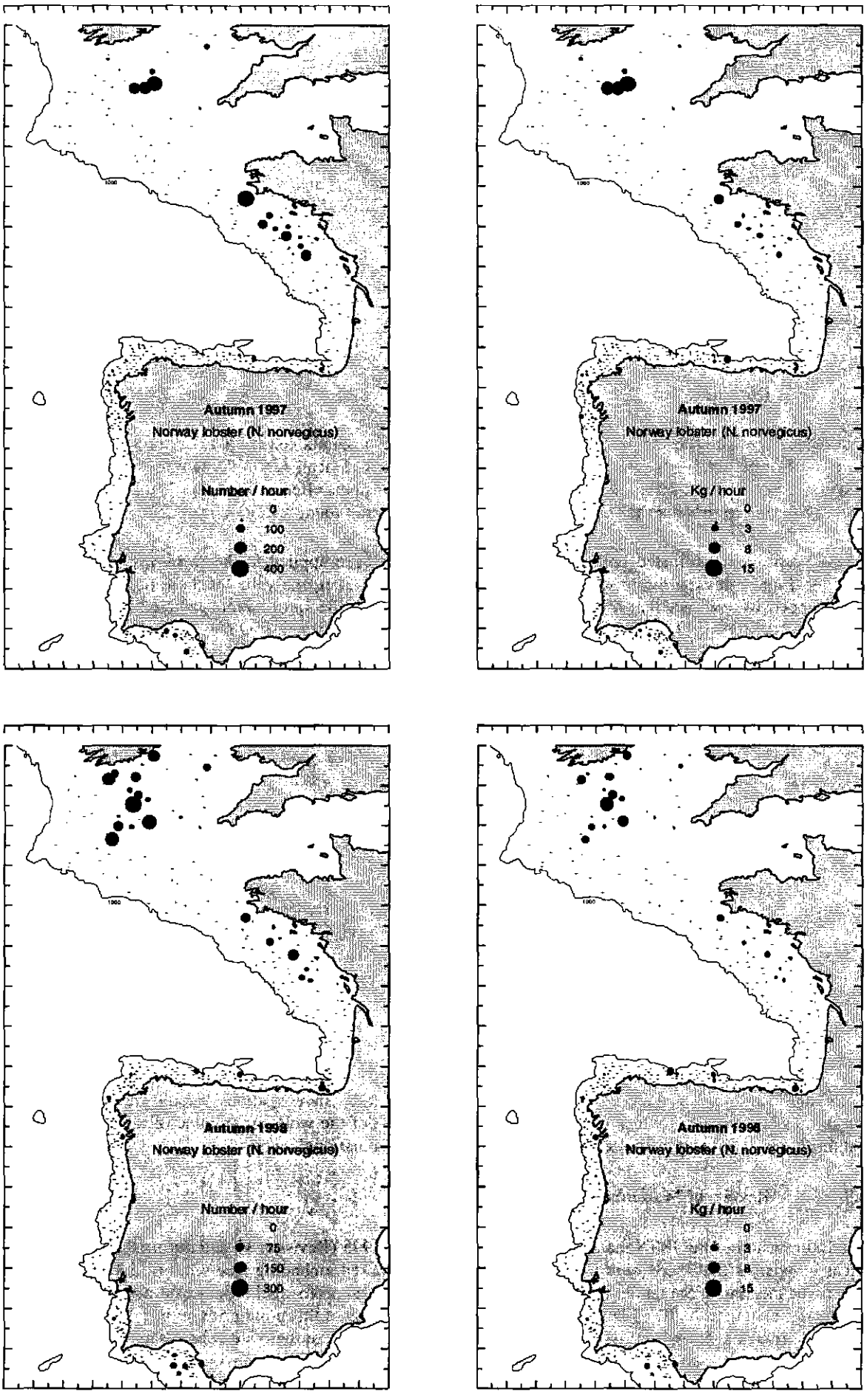


Figure 5.6.8 Norway lobster distribution in the SESITS area.

6 GENERAL

6.1 Millennium 'Bug'

The ICES Secretariat pointed out that there was a problem with defining the date in the IBTS Data Exchange Format. In the HH, HE, HL and HA files the year is only allocated two digits and historically all data has been exchanged using only the last two digits of the century with the assumption that the first two were 19. Obviously a problem arises with the year 2000. The Secretariat explained that it was beyond their current financial and staff resources to provide a suitable 'fix' and suggested that participants should assume that starting in year 2000 the assumption should be made that the missing prefix becomes 20. The existing database begins with information from 1965. Given this suggestion from ICES, there is a 65 year period before there is a conflict between years i.e. 1965 and 2065. As it was understood that the data base and the exchange format would be re-written before 2065 the ICES suggestion was accepted, but national institutes should alert potential users of the data to this problem and temporary solution.

6.2 Data Base

The database relating to the North Sea is well established and maintained by ICES at the Copenhagen Headquarters. The data held within the base are used extensively in ICES assessments (for VPA tuning and recruitment estimations) and are becoming increasingly important in the study of ecosystems effects of fishing. The database is also used for the occurrence of rare fish and the spatial and temporal distribution of many species.

The concept of co-ordinated bottom trawl surveys has now been applied to the western and southern divisions and sections 4 and 5 review the progress made in these areas. However, the value of these new co-ordinated surveys are handicapped by the fact that there is no central data base for the information gathered along the eastern Atlantic seaboard. National institutes e.g. IFREMER, IPIMAR, MI, MARLAB and IEO hold subsets of the data but to make full use the data a central, well maintained data base is essential. This course of action has been recommended after the last two WG meetings (1995 and 1997). However, it is recognised that ICES, who would be the logical operators of such a database, are constrained by limitations on staff and finances. The WG discussed this at some length and looked at alternative courses of action. It was finally decided that a viable alternative was to seek an EU Study contract (in conjunction with ICES) to establish this essential database. The current study contract relating to a Baltic Sea database will be used as a template. Due to existing work loads and the tight time schedule it has proved impossible to submit a proposal for 1999, but Fatima Cardador of IPIMAR may be able to act as co-ordinator of a project to be submitted in year 2000. The situation will be reviewed by correspondence during the next 12 months.

6.3 IBTS and Global Ocean Observing System (GOOS)

During the meeting the group received a message from the ICES Hydrographer informing the meeting that the IBTS database had been selected to be a project within the GOOS Initial Observing System. This information was duly noted but without comment as none of the participants possessed sufficient knowledge of GOOS to make a considered judgement on the implications for the IBTS surveys and the database.

6.4 ICES Centenary

The group also received a note from the ICES Hydrographer concerning the ICES Centenary in 2002. The Centenary Committee have mooted that research vessels engaged on 'ICES investigations' should make a visit to Copenhagen during the Centenary activities. Currently the WG are unsure of the work programme of the various vessels for 2002, but this request will be transmitted to the relevant colleagues at national level.

6.5 Review of Manuals

The last revision of the IBTS manual occurred in November 1995 (Revision V) and during the course of this meeting it became apparent that there were a number of items that required amending (see sections 3.4, 3.7 and 7). In addition, during the meeting at Santander in 1997 it had been proposed that protocols for the western and southern surveys should be incorporated into the IBTS North Sea manual. In consideration of this point draft proposals (annex 11) were included in the last revision. However, two years of experience have shown that there are considerable difficulties in merging the protocols used in the North Sea with those used in the western and southern divisions.

During the meeting it was decided that two manuals should be the standard – one relating to the North Sea and the other to the eastern Atlantic seaboard. Trevor Boon of CEFAS undertook to revise the North Sea manual taking into account various items mentioned in previous sections. Lisa Borges of IPIMAR will produce a western/southern manual based

on the experience of the SESITS project, but also with reference to colleagues in England, Ireland and Scotland. Work will be by correspondence with the aim of completing the task by August 1999 when the new manuals will be produced as annexes to the WG report. In the meantime Annex 11 of the North Sea manual should be disregarded.

6.5.1 Resume of protocols to be used in western/southern manual.

LIST OF SURVEYS

- **SCOTTISH SURVEYS:**
- Quarter 1, Groundfish survey in ICES Division Via (SGF6a)
- Quarter 3, Rockall Survey (SGF6b) (every second year)
- Quarter 4, Scottish Mackerel Recruit Survey (SMR)

- **IRISH SURVEYS**

- Quarter 4, West coast Groundfish Survey (WCGS)
- Quarter 4, Irish Sea-Celtic Sea Groundfish Surveys (ISCS)

- **ENGLISH SURVEY**
- Quarter 1, Celtic Sea and Western Approaches Groundfish Survey (CSGF)

- **FRENCH SURVEYS**
- Quarter 4, French Groundfish Survey in the Eastern Channel (Division VIId) (CGF)

- Quarter 4, French Groundfish Survey in the Celtic Sea and Bay of Biscay (Divisions VIIf,g,h,j; VIIIa, b) (EVHOE)

- **SPANISH SURVEYS**

- Quarter 4, Spanish Groundfish Survey in the Cantabrian Sea and Off Galicia (Divisions VIIIc and Northern part of IXa) (SPGFN)
- Quarter 2 and 4, Spanish survey in the Gulf of Cadiz (Southern part of division IXa) (SPGFS)

- **PORTUGUESE SURVEYS**

- Quarter 3 and 4, Portuguese Bottom trawl Survey (Portuguese shelf - Division IXa) (PGF)

AREA COVERED – SEE FIGURE 6.5.1

DEPTH STRATA --- SEE FIGURE 5.6.2 for a suggested example of a depth stratification.

STANDARD FISHING METHOD

Start time is defined as the moment when the vertical net-opening and door spread are stable. Stop time is defined as the start of pull back.

Net monitoring should be used in all fishing operations in order to ensure the proper gear deployment. Vertical net opening and door spread should be monitored at 30 second intervals and mean valid values should be reported. It is recommended that wing spread be also measured.

SAMPLING OF TRAWL CATCHES AND SAMPLING AREAS

Length composition

Length distributions are recorded for all fish and other commercial species caught. Length is defined as total length.

Length is measured:

- 1 mm below for commercial crustaceans
- 1 mm below for commercial cephalopods
- 0.5 cm below for herring, sprat, anchovy and sardine
- 1 cm below for all other fish species.

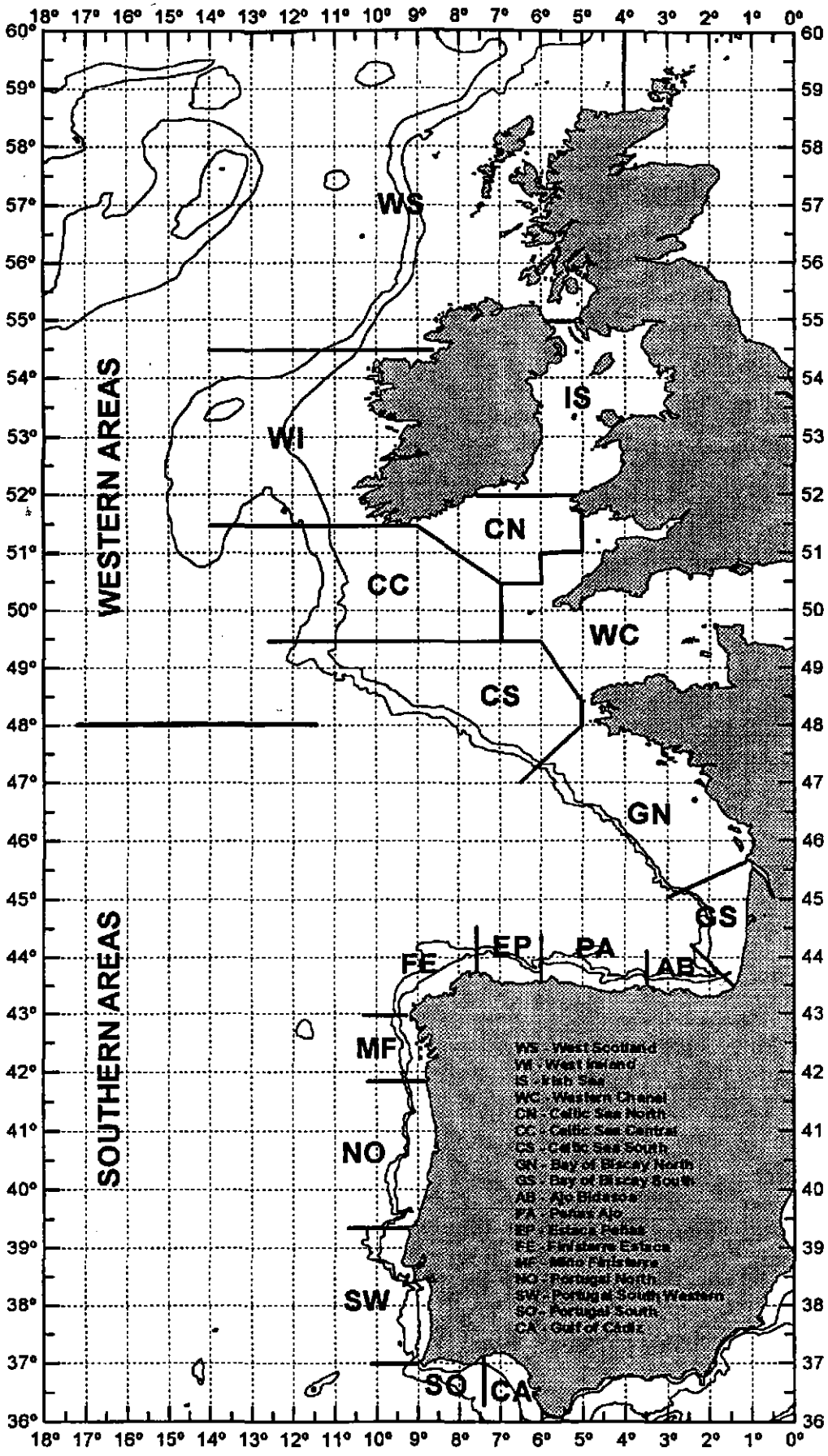


Figure 6.5.1 Geographic sectors in the Western and Southern areas.

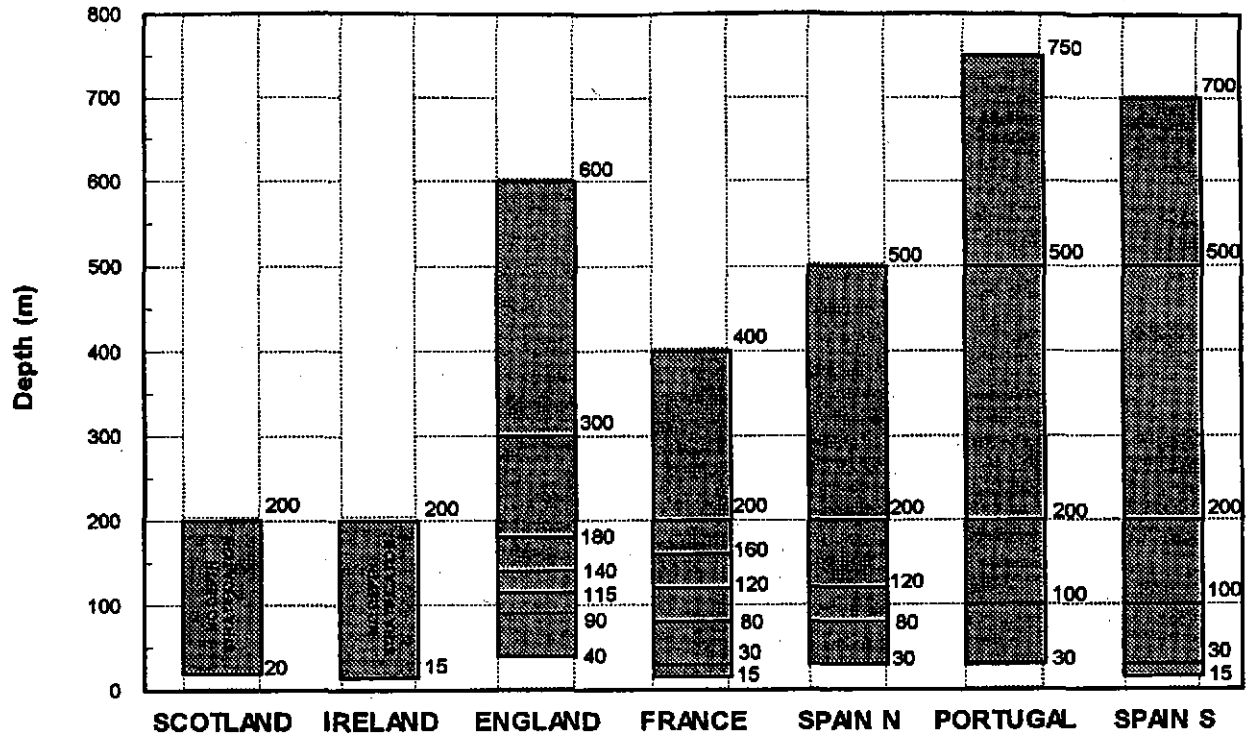


Figure 6.5.2 Depth strata in the Western and Southern areas.

6.6 Publication of IBTS results

Due to the reorganisation of the ICES Annual Science Conference the reports of the IBTS results are no longer be published as separate publications (in the past they have been published as CM/H: papers). The present Group finds it important that the reports continue to be registered publications as they are widely used and often referred to. The Group therefore recommend that the reports are published as Annexes to the now annual report of the IBTSWG.

6.7 Future Work

- The IBTS database at ICES headquarters contains detailed information on the gear parameters achieved during the national surveys. These data can be used to analyse net performance and ICES should extract these data before the next IBTSWG to enable an analysis to be undertaken at the meeting.

- Within the IBTS database all species are identified by NODC code. Some discrepancies have been detected in the list of codes and ICES have agreed to verify that they are using the last registered version (version 8). In addition it is known that some species occurring in the southern division are not recognised in the official NODC codes. Codes will be established for these species, perhaps by reference to the SAMMAR list of codes.

7 METHOT ISAAC-KID NET

7.1 Intensified sampling of MIK samples in the southern North Sea

During the first quarter IBTS survey in the North Sea two MIK samples (Methot Issac Kid) are made within standard rectangles by each participant. These rectangles are allocated each year.

Data are used by the herring working group assessment in the North Sea to obtain a herring larvae index. But, as the spawning period of the «Downs» herring component is in November in the Eastern English Channel, the « Downs » herring larvae are more concentrated in the Southern part of the North Sea when MIK samples are made during the 1st quarter IBTS.

In order to have a more reliable estimate of the « Downs » herring larvae abundance, a more detailed sampling scheme has been required in most of rectangles in the area south of 52°30 N (see table below). In addition, some samples are required in the square 30F1. This will result about 27 extra hauls in this area.

Rectangles where intensified sampling is required	**Number of hauls per rectangle**
31F1, 31F2, 32F1, 33F4, 34F2, 34F3, 34F4 35F3, 35F4	3
32F2, 32F3, 33F2,33F3	5 - 6
30F1	Additional samples

Intensified sampling in the southern part of the North Sea.

At present, two vessels (Tridens and Thalassa) sample this area where intensified sampling is required. Concerning the Thalassa survey, more MIK samples can be collected, principally in the area south of 52° N and in the square 30F1; but its contribution for MIK Samples in the North area where GOV trawling stations are occupied (standard area 4 and 7) have to be reduced. A reallocation of MIK sampling area between participants have to be redefined for the next survey.

7.2 Preservation of samples and exchange data

In the IBTS manual, it is recommended to preserve larvae samples in 4% formalin in fresh water. The formalin's irritative properties have lead to question if it could not be replaced by alcohol. After consultation among the participants, this proposition was accepted.

After the survey, MIK data are sent to the Danish Institute on a standard form as described in the manual. However, because of the short time available to get data ready before the Herring Working group, a standard Excel spreadsheet table will be prepared by the person in charge of collecting data (Peter Munk) and send to all participants before the next first quarter survey.

8 RECOMMENDATIONS

1. It is recommended that the ICES Secretariat develop programs that can calculate new abundance indices along the lines given in section 3.2.2, and that the new indices together with the 'old' indices are made available to the relevant assessment working groups.
2. It is recommended that the reports of the IBTS survey results in the future will be published as Annexes to the annual IBTSWG report.
3. It is recommended that the ICES Secretariat, on a regular basis, make hydrographical data available, which correspond to IBTS haul data.
4. Section 3.3 indicated that there may be annual variations in the length composition of the Down's component of the herring 1-ringers. Given the very short time between the end of quarter 1 IBTS surveys and the start of the annual HAWG it is recommended that the ICES Secretariat should make detailed files available to the HAWG which will allow the latter to split the herring 1-ringer index into a Down's herring index and an index for the rest of the herring.

5. The working group recommends that a group be set up, in collaboration with WGFTFB, to consider the specification for standard fishing gear for ICES co-ordinated bottom trawl surveys in the western and southern areas. The terms of reference for this group should be drafted in the context of the wider variation in seabed topography, substrate and target species in these areas vis-à-vis the North Sea, the requirement to deploy the gear from smaller (<40m) research vessels, and compatibility with the GOV trawl which is the current IBTS standard. The group should also consider the specification and performance of the GOV as a standard gear.
6. It is recommended that all information on tows used during IBTS surveys should be interchanged between participating institutes using the format outlined in appendix I of the North Sea manual.
7. It is recommended that the *Cornide de Saavedra*-BAKA should be used as the reference vessel/gear for the conversion of the catches of the countries involved in the SESITS area.
8. It is recommended that all bottom trawl surveys in the western and southern areas cover the area between the 20 and 500m isobaths and that sampling stratification by depth should be a considered option.
9. It is recommended that serious consideration should be given to establishing a western/southern survey database within ICES. Given the existing restrictions on resources alternative sources of funding should be explored.
10. It is recommended that the IBTS Working Group should work by correspondence during 2000 and meet in Dublin in either March or April 2001.

9 LITERATURE

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4. Wieland K. A reconsideration of the IBTS species-specific standard areas for cod, haddock, whiting and norway pout.

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APPENDIX II: LIST OF PROJECTS ASSOCIATED WITH IBTS SURVEYS

EU-study: The use of multivariate data for improving the quality of survey-based stock estimation in the North Sea (MIQES).
Date: 1.7.1998 – 30.6.2000. Co-ordination: Dr Astrid Jarre, DIFRES.

EU-study: Evaluation of Demersal Resources of South-western Europe from Standardised Groundfish surveys (SESITS).
Date: 1.4.1997 – 30.6.1999. Co-ordination: Dr Francisco Sánchez, IEO.

EU-study: Survey based abundance indices that account for fine spatial scale information for North Sea stocks (FINE).
Date: 1.4.1999 – 31.3.2002. Co-ordination: Dr. Sara Adlerstein, IHF Hamburg.

EU-study: International Program of Standardised Bottom Trawl surveys off Northwestern Europe.
Date: 1.1.1999 – 31.12.2000. Co-ordination: Dr J-C Mahe, IFREMER.

APPENDIX III: LIST OF BOTTOM TRAWL SURVEYS IN WESTERN AND SOUTHERN AREA

The Scottish Groundfish Survey in Division VIa (code: SGF6a)

Start:	1981
Gear:	36/47 GOV trawl, large bobbins, 20 mm liner
Timing:	quarter 1 (March since 1986)
Target:	cod, haddock, whiting , saithe and herring
Stratification:	by rectangle
Depth Strata:	none
No of Hauls:	50
Continuation:	yes
Contact:	K Coull, MARLAB, Aberdeen, UK

The Scottish Groundfish Survey in Division VIb (code: SGF6b)

Start:	1985
Gear:	48' Aberdeen trawl, large bobbins, 35 mm cover
Timing:	quarter 3 (September)
Target:	haddock
Stratification:	by rectangle
Depth Strata:	none
No of Hauls:	45
Continuation:	yearly until 1997, bi-annual starting 1999
Contact:	A Newton, MARLAB, Aberdeen, UK

The Scottish Mackerel Recruit Survey (code: SMR)

Start:	1985
Gear:	36/47 GOV trawl, large rubber bobbins, 20 mm liner
Timing:	quarter 4 (November/December)
Target:	mackerel only until 1985 (cod, haddock, whiting, herring added 1996)
Stratification:	by rectangle
Depth Strata:	none
No of Hauls:	50
Continuation:	yes
Contact:	A Robb, MARLAB, Aberdeen, UK

West Coast Groundfish Survey (code: WCGS)

Start:	1990
Gear:	commercial trawl, rockhoppers, 20 mm liner
Timing:	quarter 4 (October/November)
Target:	commercial species
Stratification:	by rectangle
Depth Strata:	none
No of Hauls:	71
Continuation:	yes
Contact:	Paul Connolly, MI, Dublin, Ireland

The Irish Sea and Celtic Sea Groundfish Survey (code: ISCSGS)

Start:	1997
Gear:	20/25 GOV trawl, standard groundgear, 20 mm liner
Timing:	quarter 4 (October)
Target:	commercially important species
Stratification:	by rectangle
Depth Strata:	<50, 50-100, 100-150, 15-200, 200-250, >250
No of Hauls:	50
Continuation:	yes
Contact:	Paul Connolly, MI, Dublin, Ireland

Appendix III (Continued)

The West and South Coast of Ireland Recruit Survey (code: WSCRS)

Start:	1992
Gear:	dual purpose otter trawl, medium bobbins, 20 mm codend
Timing:	quarter 3 (July)
Target:	inshore juvenile fish
Stratification:	by depth, fixed stations
Depth Strata:	none
No of Hauls:	74
Continuation:	yes
Contact:	Paul Connolly, MI, Dublin, Ireland

The Celtic Sea and Western Approaches Groundfish Survey (code: CSGF)

Start:	1981
Gear:	Portuguese high headline, medium rubber bobbins, 20 mm liner
Timing:	quarter 1 (March)
Target:	mackerel and commercially important species
Stratification:	by depth and latitude
Depth Strata:	0-89, 90-114, 115-139, 140-179, >180 m
No of Hauls:	75
Continuation:	yes
Contact:	John Nichols, CEFAS, Lowestoft, UK

The Northern Ireland Groundfish Survey in Division VIIa (code: NIGFS)

Start:	1991
Gear:	otter trawl, rockhoppers, 20 mm liner
Timing:	quarter 1 (March), quarter ¾ (Sept/Oct) (also June 1991-1994)
Target:	commercially important species
Stratification:	by depth, area and bottom type (7),fixed stations
Depth Strata:	<50 m, 50 m +
No of Hauls:	45 per survey
Continuation:	yes
Contact:	Mike Armstrong, DANI, Belfast, UK

The German Survey in the western waters (code:GSWW)

Start:	1991
Gear:	36/47 GOV trawl, standard gear, 20 mm liner
Timing:	quarter 2 (April)
Target:	commercially important species
Stratification:	by rectangle
Depth Strata:	none
No of Hauls:	40
Continuation:	suspended 1997, re-start 1998 and then triennial
Contact:	Nils Hammer, BFA-ISH, Hamburg, German

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

Start:	198
Gear:	20/25 GOV trawl, standard groundgear, 20 mm codend
Timing:	quarter 4 (October)
Target:	commercially important species
Stratification:	by sub rectangle
Depth Strata:	none
No of Hauls:	100
Continuation:	yes
Contact:	Andre Carpentier, IFREMER, Boulogne-sur-Mer, France

Appendix III (Continued)

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

Start:	1987
Gear:	36/47 GOV trawl, standard groundgear, 20 mm liner, no kite
Timing:	annually in quarter 4 (Oct/Nov) irregular in quarter 2 (May/June)
Target:	commercially important species
Stratification:	by depth
Depth Strata:	15-30, 31-80, 81-120, 121-160, 161-200, 201-400
No of Hauls:	165 per quarter
Continuation:	yes
Contact:	Jean-Claude Mahe, IFREMER, Lorient, France

The Spanish Groundfish Survey in Cantabrian Sea and off Galacia (code: SPGFN)

Start:	1980
Gear:	Baka 44/60 trawl. Chain wrapped combination, 20 mm codend
Timing:	quarter 4 (October)
Target:	commercially important species
Stratification:	by depth, random sampling scheme
Depth Strata:	30-80,81-120, 121-200, 201-500 m
No of Hauls:	100-120
Continuation:	yes
Contact:	Francisco Sánchez, IEO, Santander, Spain

The Spanish Groundfish Survey in the Gulf of Cadiz (code: SPGFS)

Start:	1993
Gear:	Baka 44/60 trawl. Chain wrapped combination, 20 mm codend
Timing:	quarter 1 (March) & quarter 3 (since 1997)
Target:	commercially important species
Stratification:	by depth, random sampling scheme
Depth Strata:	15-30,31-100, 101-200, 201-500, 501-700 m
No of Hauls:	30
Continuation:	yes
Contact:	Ignacio Sobrino, IEO, Cádiz, Spain

The Portuguese Bottom Trawl Survey (code: PGF)

Start:	1979
Gear:	Norwegian Campelen trawl, bobbins, 20 mm codend
Timing:	quarter 3 (July) and quarter 4 (October)
Target:	commercially important species – hake, horse mackerel, mackerel, blue whiting, Spanish mackerel, Norway lobster, red shrimp (Aristeus antennatus) and rose shrimp (Parapenaeus longirostris).
Stratification:	by depth, fixed stations
Depth Strata:	20-100, 101-200, 201-500,501-750 m
No of Hauls:	97 per quarter
Continuation:	yes
Contact:	Fatima Cardador, IPIMAR, Lisbon, Portugal