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Report of the Working Group on Mackerel and Horse Mackerel Egg Surveys [WGMEGS]

By Correspondence

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1 Summary

The Working Group on Mackerel and Horse Mackerel Egg Surveys (WGMEGS) is primarily responsible for the planning and analysis of the ICES Triennial mackerel and horse mackerel egg surveys. The meetings are held in the years before and after the surveys themselves. As 2004 was an egg survey year, the WG carried out its activities by correspondence. The terms of reference for 2004 and the outcomes were as follows:

- a) *plan for a joint meeting with the Study Group on the Estimation of Spawning Stock Biomass of Sardine and Anchovy SGSBSA on variance calculation and survey design*; Due to the constraints of the survey and availability of individuals, no meeting was possible this year. Contact and outline planning will be maintained.
- b) *consider the results of the Lowestoft workshop (October 2003) on mackerel and horse mackerel egg staging and identification and incorporate these into the 2004 survey*. The workshop made a number of recommendations on methods of sample handling, preservation and analysis, as well as recommendations for future workshops. The recommendations are detailed in the present report and the actions taken on these. In general all the recommendations were accepted and employed on the surveys in 2004
- c) *fine-tune survey execution in 2004*. Although the broad planning of the 2004 surveys was carried out at the 2003 meeting of the WG, the detailed conduct required co-ordination in year. Most importantly this involved ensuring that the coverage, in time and space, was as complete as possible with the vessel resources available. A second consideration was to be able to respond to perceived changes in spawning distribution seen in earlier surveys in the sequence. The surveys in Iberian waters proceeded as planned. Some modifications were made to the surveys in the western area, and these are documented in an Annex document. Further fine scale changes were also made throughout the survey, coordinated through the Chair.

The next meeting of WGMEGS will be held in Bergen, Norway in April 2004.

2 Introduction

2.1 Terms of reference

At the ICES Annual Science Conference in Tallinn, Estonia, in September 2003 it was decided that the **Working Group on Mackerel and Horse Mackerel Egg Surveys** [WGMEGS] (Chair: D. Reid, UK) will work by correspondence in 2004 to plan for a meeting in 2005 to:

- a) *plan for a joint meeting with SGSBSA on variance calculation and survey design*;
- b) *consider the results of the Lowestoft workshop (October 2003) on mackerel and horse mackerel egg staging and identification and incorporate these into the 2004 survey*;
- c) *fine-tune survey execution in 2004*.

WGMEGS will report by 1 June 2004 for the attention of the Living Resources and the Resource Management Committees.

3 Planning of Joint meeting with SGSBSA (referring to ToR “a”)

It was agreed at the 2003 meeting of WGMEGS that it would be useful to revisit the issue of variance calculation in the egg survey based biomass estimate for mackerel and horse mackerel. This was in recognition of the fact that the

currently used variance calculation method is quite old and that new approaches e.g., geostatistics, have come to prominence. As the issues concerned are common to both annual and daily egg production methods, it was felt that a joint meeting with SGSBSA would be appropriate. This is in recognition of the important work done by this group in this area.

As there was no programmed meeting of WGMEGS in 2004, and in addition, staff were heavily committed to the surveys themselves, it was not possible to organize a joint meeting in 2004. Furthermore, key individuals from the statistical side were not available in this year. Contact is being maintained between the two groups and efforts to arrange a joint meeting or workshop in 2005 will be continued.

4 Incorporation of WKMHMES recommendations in the 2004 triennial egg survey (referring to ToR “b”)

A workshop on Mackerel and Horse Mackerel Egg Staging and Identification was held at CEFAS, Lowestoft, from the 20–25 October 2003. The workshop made a number of recommendations for the conduct and analysis of the 2004 Triennial egg survey and beyond. The report is available in full on <http://www.ices.dk/reports/lrc/2004/wkmhmes/>

In the present report the recommendations and consequent actions are described. The original recommendations are in italics and the response is in normal face.

- a) *It is almost impossible to organise and run workshops such as this without some financial assistance. Standardisation of procedures and techniques is a requirement of all ICES working groups and is recognised as being vitally important. However, without access to central financial resources, each participant is wholly reliant on funding from their own institute for travel and subsistence. It is recommended that each institute include the cost of their participation in workshops such as this in their bid for EU Data Regulations funding.*

To the best of the Working Group’s knowledge this was carried out and was presented within the negotiations. It is not known if the proposal was accepted.

- b) *It is recommended that all microscopes at the next workshop are fitted with eyepiece graticules. These graticules should be calibrated to the same standard i.e., that one eyepiece unit (epu) should be equivalent to the same number of millimetres, regardless of microscope used.*

All institutes involved agreed that this was desirable and would attempt to put the measure in place. The degree of take up will be addressed at the next full meeting of WGMEGS in 2005, and in preparation for the next workshop.

- c) *A full range of egg stages of all species should be available for analysis during the next workshop (scheduled for 2006).*

Samples will be retained or obtained de novo for this purpose.

- d) *The Spray technique should be used as the primary method for sorting eggs from the rest of the plankton during the 2004 triennial surveys.*

All institutes involved agreed to deploy the spray method during the 2004 surveys. Preliminary reports suggest that this was used successfully on most surveys and was particularly useful in samples with significant numbers of eggs and abundant other plankton. There were, however, some suggestions that manual sorting was preferable where egg numbers were low and where there were lower densities of other plankton. The detailed recommendation suggested that samples should in any case be examined manually AFTER spraying.

- e) *All participants are reminded that the procedures described at Annex 1 should be followed during the 2004 surveys. Particularly that 4% formaldehyde, buffered with sodium acetate tri-hydrate, is the standard survey fixative and that plankton samples should never come into contact with formaldehyde of a concentration greater than 4%.*

This recommendation was made to ensure a standardised approach to the preservation of the samples was used by all participants. This was adopted by all parties in the survey.

- f) *It is recommended that all participants carry out artificial fertilisations of any species, which have eggs similar to those of mackerel and horse mackerel. It would be useful if egg and oil globule diameters are measured and that photographs are taken of as many stages as possible. It would also be beneficial if the eggs are preserved at various stages of development and any morphological changes noted.*

It was agreed that this exercise would be carried out where facilities on board were available and where suitable adult fish were caught during the surveys. It is recognized that some species have similar structures and size ranges to the survey target species and that this analysis would assist in discrimination.

- g) *All participants are requested to make measurements of egg and oil globule diameters from as many mackerel and horse mackerel eggs as possible from their standard survey samples in 2004. These data would provide both temporal and spatial resolution to egg sizes, for the first time.*

All participants agreed to carry out this work and a pro forma spreadsheet for data entry has been prepared and circulated. Due to the precise nature of the analyses required, this work is expected to be carried out in shore laboratories after the surveys.

- h) *Based on the experiences at the workshop a recommended binocular microscope should have the following features:*

- Options for a black or white stage plate for use with incident (top) light
- A transparent stage plate for transmitted (bottom) light
- Dark field illumination for contrast
- Adjustable brightness
- Magnification with click stops.
- A choice of 10x and 20x eyepieces
- Adjustable binocular head and ergonomic design to allow flexibility of movement.
- Adjustable focus on all eyepieces
- Calibrated eyepiece graticules
- Double (fibre optic) cold light source, with adjustable focus, to avoid shadows
- Mechanical stages to position samples easily in the field of view and to hold the samples firmly.
- Filters and polarisation

All parties agreed that this represented a useful standard recommendation, although it was not clear whether all institutes would have such instruments available for the analysis of the 2004 surveys. Again this will be reviewed by WGMEGS at its next meeting.

5 Fine tuning of the 2004 surveys (referring to ToR “c”)

One of the main tasks for WGMEGS at the 2003 meeting was the planning for the 2004 surveys, and this was carried out successfully. However, it should be recognized, that this could be an outline only, and that vessel and personnel availability could change. In addition weather or vessel breakdown could compromise one or more individual surveys requiring in season modifications.

The southern area surveys were programmed to start early in the season (early January in Portugal). These went ahead broadly as planned in the previous WGMEGS report (ICES 2003). Coordination in the western area required more manipulation. The final plan was provided to all participants in February 2004 and is attached as Annex 1.

The key changes were as follows:

- During period 3, a collaboration was organized with IMR Bergen which was carrying out a blue whiting egg and larval survey in the northern part of the western area. Initially it was hoped that the same protocols and samplers could be used on both surveys. However this did not prove possible in practice due to the relatively short lead time. It was provisionally agreed that in the future these surveys should be closely coordinated. Samples from both surveys will be analysed to provide appropriate egg and larval data to the other party.
- Period 4 was well supported by a number of countries and the opportunity was taken to make a strong and wide area coverage over as much of the spawning area as possible. Full survey coverage from the Portugal/Spain border to the north of Scotland was possible.
- In period 5 there was sufficient vessel time available to allow an extension of the survey area into the Cantabrian Sea. This addressed the problem that this area has not previously been surveyed during this period although it was believed that there may still be spawning at this time.

In addition to these planned modifications there were also ad hoc and responsive changes made to adapt the surveys to the actual observed pattern of egg distributions. Most importantly, this applied to the survey for period 7. Only one

vessel was available for this period, from IMI. In addition it was only available for a short period — 3–16 July. This meant that the area to be surveyed would have to be determined AFTER the period 6 surveys. The design would then be to take the survey through the likely areas of highest egg abundance.

Other small scale changes were made to allow for slight changes in cruise track or timing throughout the survey. All these were carried out in consultation with the Chair.

6 Proposed Terms of Reference for next meeting in Bergen, April 2005

- a) analyse and evaluate the results of the 2004 mackerel and horse mackerel egg surveys of the western and southern areas;
- b) calculate the total seasonal stage 1 egg production estimates for mackerel and horse mackerel separately for the western and southern areas;
- c) analyse and evaluate the results of the mackerel and horse mackerel fecundity and mackerel atresia sampling in the western and southern areas;
- d) evaluate the results of studies on horse mackerel fecundity determination and proxies on the basis of data collected during the 2004 surveys and in other relevant work;
- e) provide estimates of the spawning stock biomass of mackerel, using stage 1 egg production estimates and the estimates of fecundity and atresia, separately for the western and southern areas;
- f) evaluate the quality and reliability of the 2004 survey in the light of the previous surveys.

7 Annexes

Annex 1:- Triennial Egg Surveys 2004 – Detailed planning proposals for the western area

Contents

- 1) Introduction
- 2) Detailed comments by period
- 3) Table showing countries, vessels, areas assigned, dates and sampling periods for the 2004 survey
- 4) Maps with area assignments by period 3 – 7.
- 5) Vessel and contact information for the vessels in the survey

1 Introduction

This survey layout is for periods 3 – 7 inclusive and only for the Western area. The design is based on the dates provided at or after the Lisbon meeting. The latest versions of the dates are given in the table below. **If any of these are wrong please contact me. Do not circulate these to all participants.**

- The area assignments in each period are based on a number of factors;
- The home port of each ship – so Norway in the North etc.
- The days available – reduced for steaming
- The historic record of stations per day from the 2001 survey
- The expected egg distributions
- Please take a look at your assignments and decide if you can complete them.

2 Comments by Period

Period 3 – 2nd March to 12 April

IEO and AZTI will cover the Biscay area up to 46°N for IEO and 48°N for AZTI. The remainder of the area will be covered by Germany. This has been changed from the original proposal for Germany, which was to cover the whole area. Germany should ideally follow their plan for alternate transects down to 48°N and then contact IEO and AZTI to find out if there is a need to go further, in case of problems with weather or vessels. Germany can then fill in the missed transects on the way north with the emphasis on the areas of high abundance. We have established co-operation with a Norwegian survey in period 3. This is targeted on blue whiting eggs and larvae but will use a Gulf III in a similar fashion to the mackerel survey. It will cover the area 53 and 62°N and over the shelf and into deeper waters. It will operate with one degree transect spacing. It has been agreed that the German survey will interlace with this survey and that samples will be exchanged. **Please see note on alternate transects and fill-ins below.**

Period 4 – 13th April to 9th May

This period is very well supplied – we have 5 ships out in total. The area assignments are given in the table and on the figure. It should be possible to provide full coverage during this period. The area of operation for the German vessel will depend on what happens in period 3. If possible, it will interlace transects with the Scottish survey. The area and choice of transects will be agreed between the cruise leaders at the time. AZTI will also cover a small area at the inner corner of Biscay, prior to their main effort in period 5.

Period 5 10th May to 7th June

The English survey will continue north from the work in period 4 and survey the Celtic Sea from 49° 30' to 52°N. AZTI will cover the area south of 47°N in Biscay, and the Netherlands will cover the remainder of Biscay between 47 and 49° 30' N. The Netherlands will also cover the area of the Cantabrian Sea, bounded by 43° 30' to 44°N and 1°E to 10°E. Norway will cover the area from 52°N and north. Again I recommend that they do alternate transects on the southward

run and fill in on the way back based on observed egg distributions. **Please see note on alternate transects and fill-ins below.**

Period 6 - 8th June to 1st July

Here things start to get more difficult. We have only two vessels, Scotia and Tridens, both with quite short survey times. The total area comprises about 360 stations. The combined total estimated for the two vessels is 180 or around 50%. So it will be necessary to complete most of the area occupying ONLY every alternate transect. Again, the important things is to complete the coverage of the AREA. The cruise leaders will probably have to occupy every **fourth** transect on the way out and then infill the middle of the three missed transects on the way home. This will require careful consideration of the layout of the area, particularly where the shelf break runs east/west e.g., Porcupine and north Biscay. **Please see note on alternate transects and fill-ins below.**

Period 7 – 3rd July to 16th July

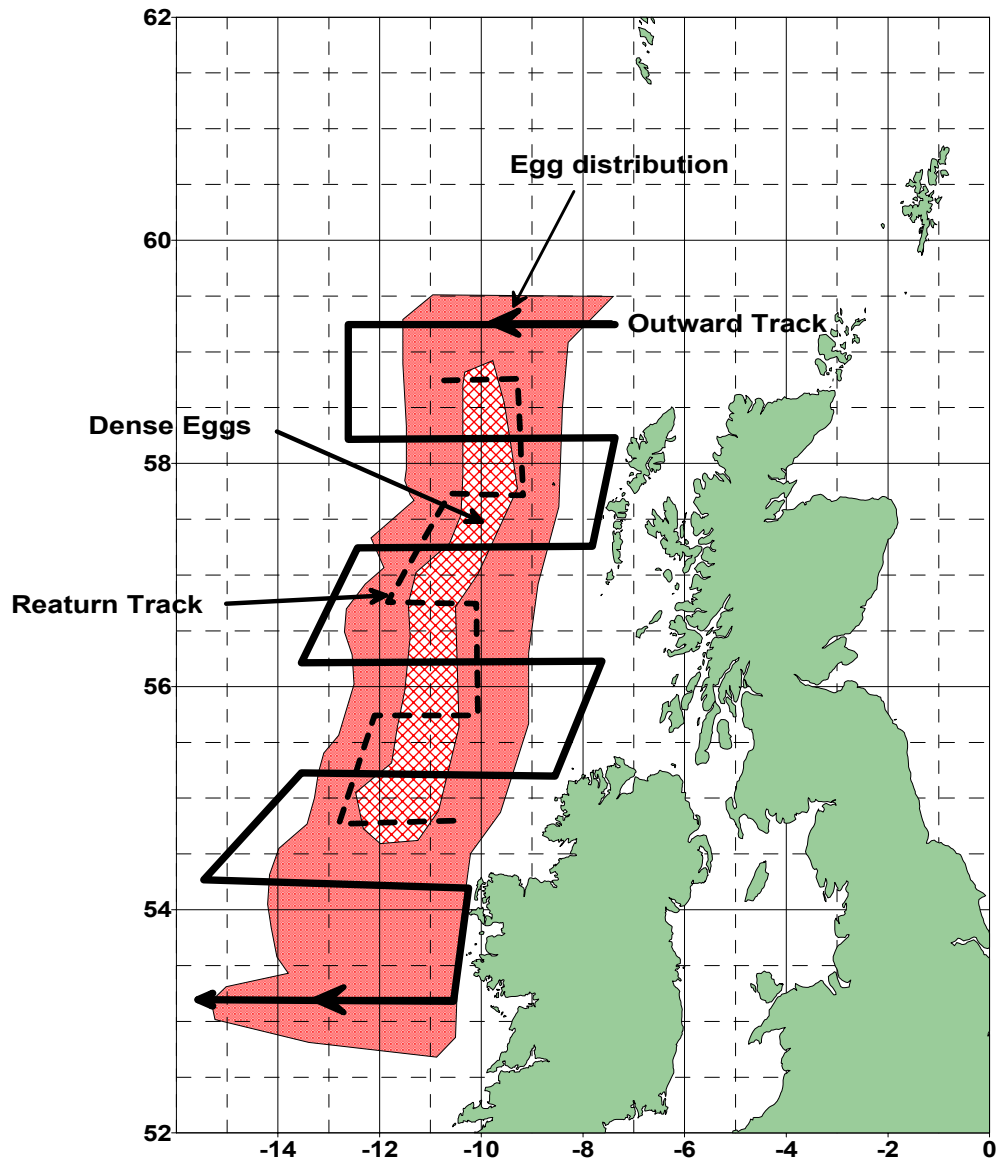
Finally, the Irish are all alone in period 7. I have assigned them the WHOLE area from 48°N northwards. I am not sure if this is possible. I would suggest that the Irish talk to Scotland and Netherlands to identify a southern border in June, and survey from here north. We tried this in 2001 and it didn't quite work as the egg production seemed to move south in the last period. But we can hope this will not happen in 2004. The area should be covered on every alternate transect for the whole survey.

Alternate transects and fill-ins

As indicated above, I feel that the best way to cover the area is to occupy alternate transects on the first half of your survey and then fill in the missing ones on the return journey. The first set of transects should definitely be taken to the edges of the distribution, so two samples with zero (or close to zero eggs). Care should be taken with areas where the shelf break does not run north/south. Make sure that when you turn onto the next transect you are likely to be outside the distribution.

For the fill in transects on the return leg, ideally you should be able to do full length transects. However, in some cases e.g., Germany in period 3, most boats in period 5 and in periods 6 and 7, this will not be possible. In these cases cruise leaders are advised to use shorter transects centred on the main concentrations of eggs. This will usually be at the shelf break (200m), but it may not be, so you will have to adapt. Just to make it simple so that an idiot or a Scotsman can understand I have drawn a picture !

Period 5 - 10 May - 7 June



You may adapt this design for your area, conditions and planned cruise track.

Finally

All cruise leaders should remember that this is an adaptive survey, and that where possible the transects should continue until there are no more eggs, or very few. The west and east boundaries of the areas on the map (and the *standard* area) are advisory only, you should not regard reaching the edge of the standard area or your assigned area as a reason to turn. Equally, if you run out of eggs before the end of the area you can turn early. I will emphasise again that the main key is to get the whole area covered. We can interpolate within the area surveyed, but cannot extrapolate beyond.

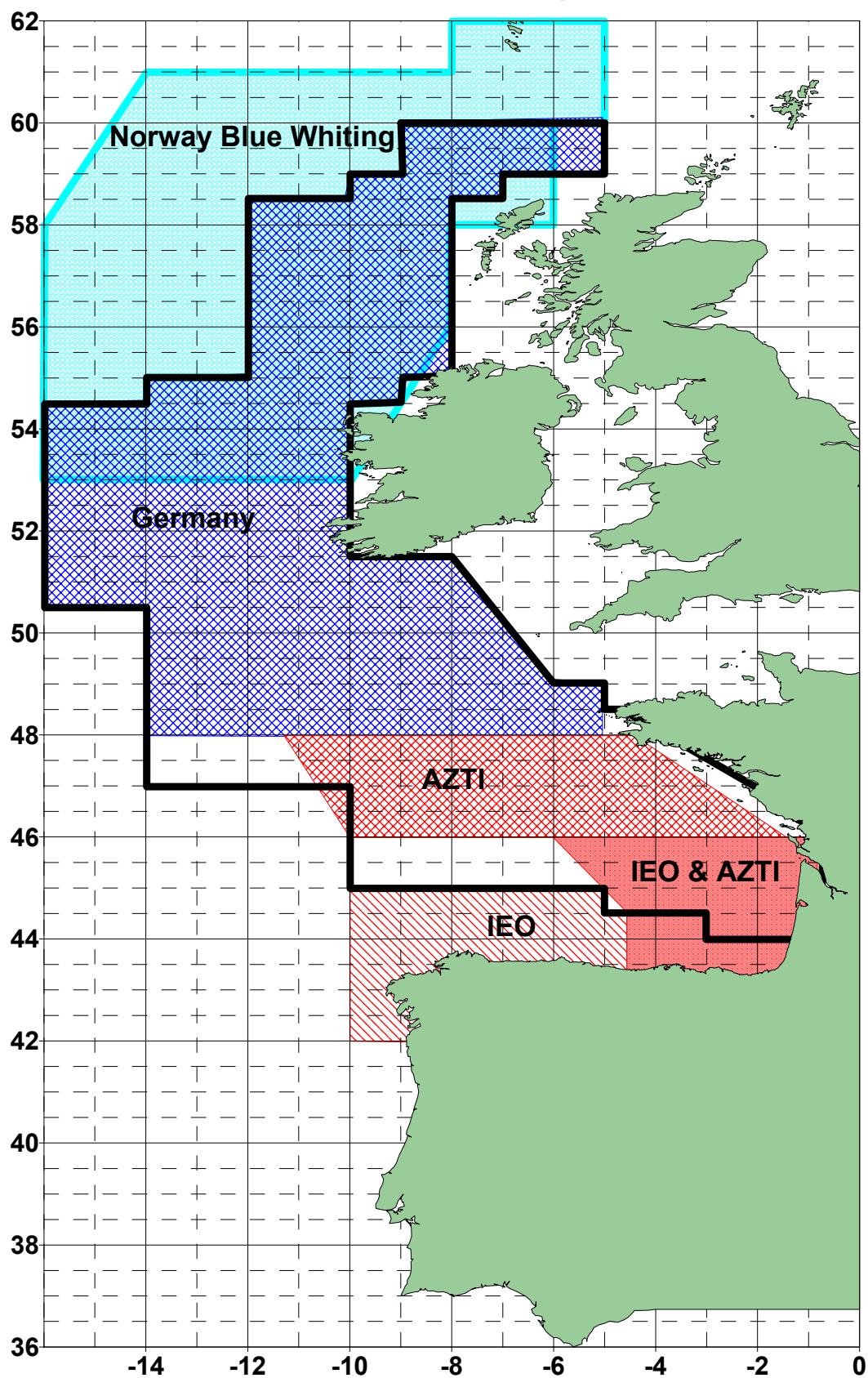
Attachments

- 1) Table of vessels times and areas
- 2) Maps of area assignments by institute

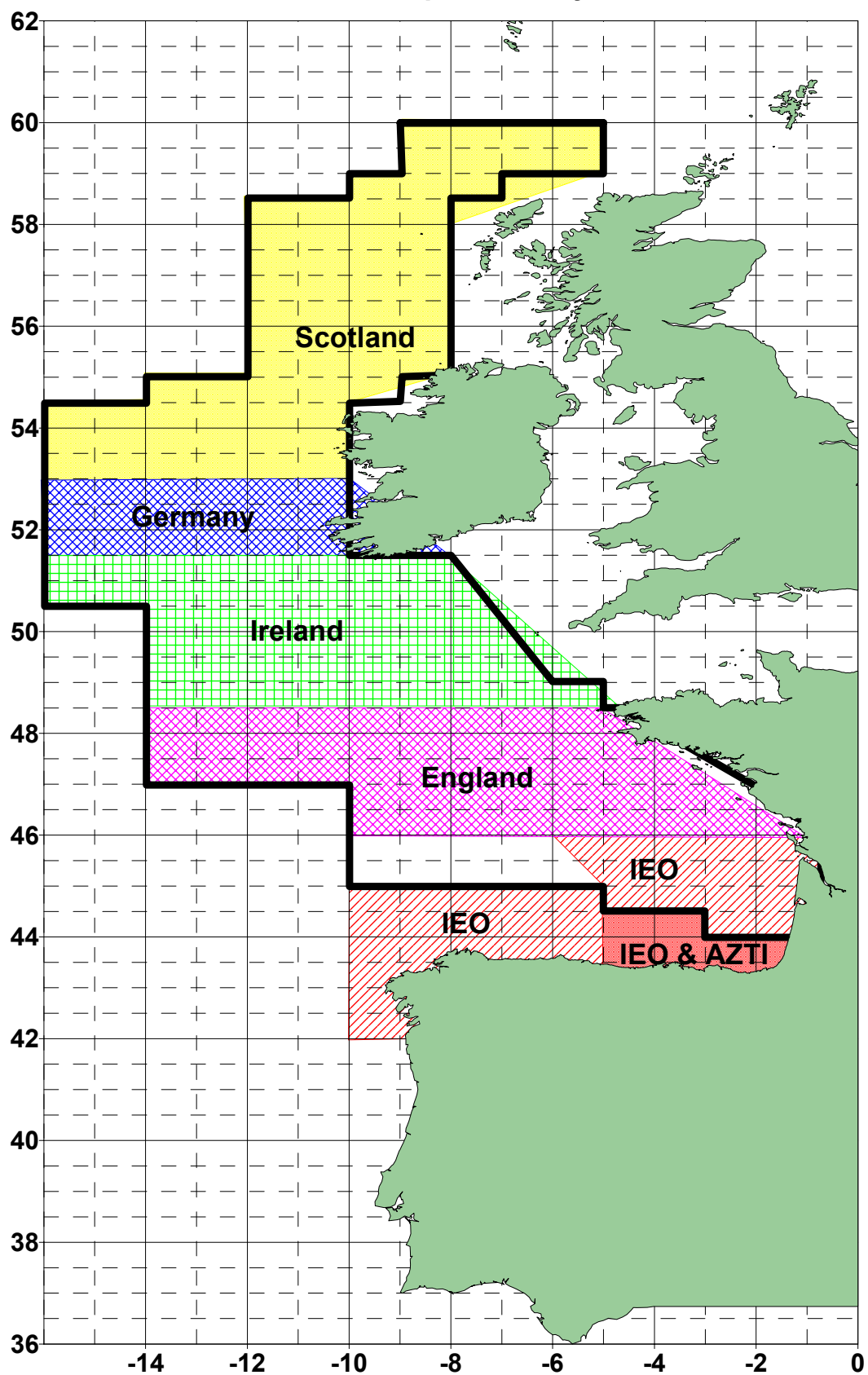
Table. Countries, vessels, areas assigned, dates and sampling periods for the 2004 survey.

Country	Areas from report	Coverage	Dates	Period
Spain (IEO) – survey 1	Cantabrian Sea	Biscay up to 46N	18 Mar – 6 Apr	3
Spain (AZTI)	Cantabrian Sea and Biscay	Biscay up to 48N	22 Mar – 12 Apr	3
Germany	Biscay (N), Celtic Sea and NW Ireland	West side 48 – 60N in period 3 51 30 – 53N in period 4	16 Mar – 23 Apr	3/4
Spain (IEO) – survey 2	Cantabrian Sea	Biscay up to 46N	12 Apr – 1 May	3/4
Ireland	Celtic Sea	Celtic Sea 48 30 – 51 30N	17 Apr – 7 May	4
Scotland	North west Ireland and West of Scotland	West side 53 – 60N	20 April – 9 May	4
UK (CEFAS)	N. Biscay and Celtic Sea	Biscay 46 – 48 30N in period 4 Celtic Sea 50 – 52N in period 5	24 Apr – 21 May	4/5
Netherlands	Biscay and Celtic Sea	Biscay 46 – 49N	10 – 28 May	5
Norway	North west Ireland and West of Scotland	West side 52 – 62N	19 May – 11 June	5
Spain (AZTI)	Cantabrian Sea and Biscay	Biscay up to 47N	2–22 May	5
Netherlands	Biscay and Celtic Sea	Biscay 47 – 49 30N	7 – 23 June	6
Scotland	Celtic Sea, North west Ireland and West of Scotland	West side 49 30 – 62N	8 – 28 Jun	6
Ireland	Biscay, Celtic Sea, North west Ireland and West of Scotland	West side 48 – 62N	3–16 July	7
Norway		West side from 53 – 62N – standard area and west	24 March – 18 April	3

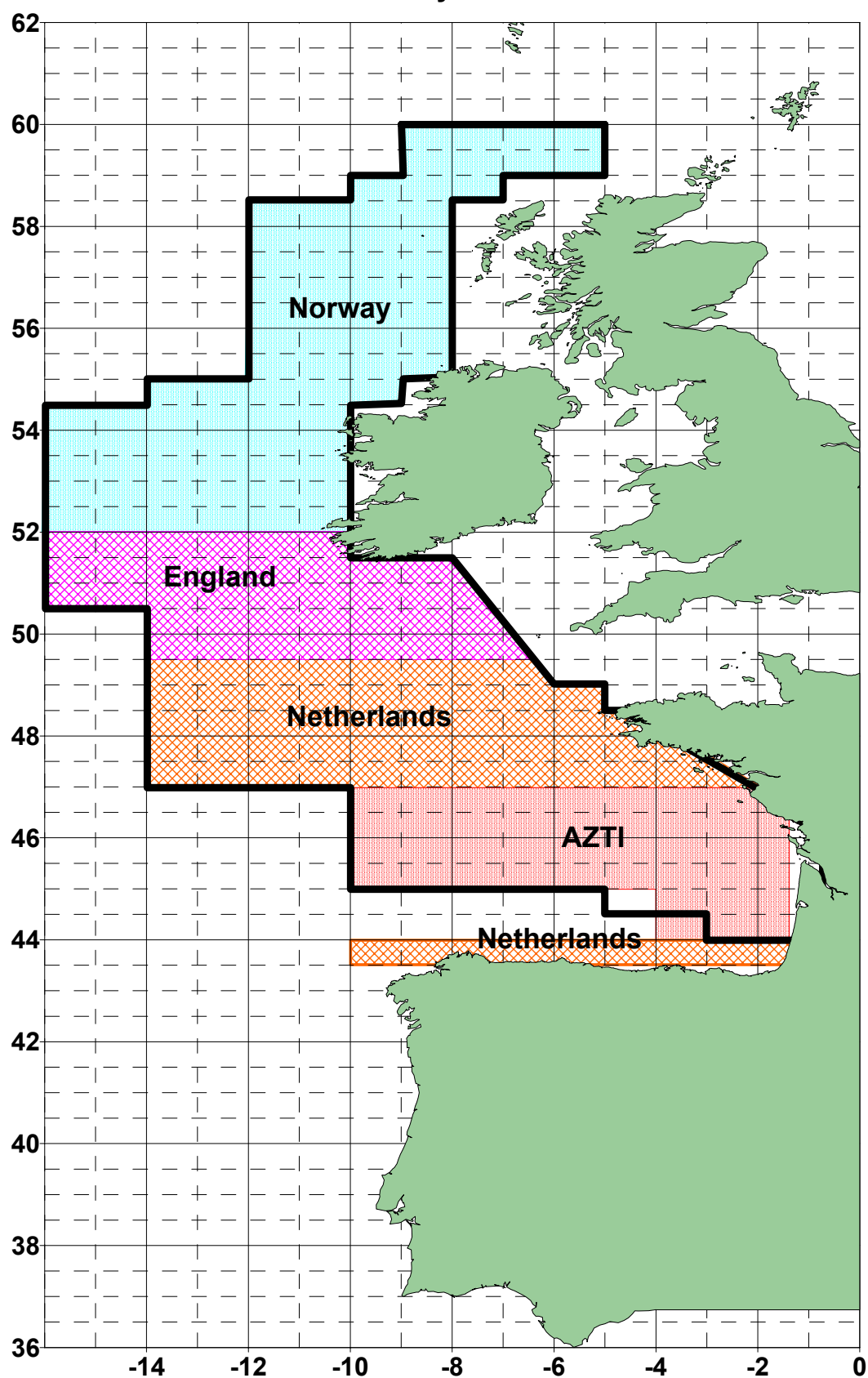
Period 3 - 2 March - 12 April



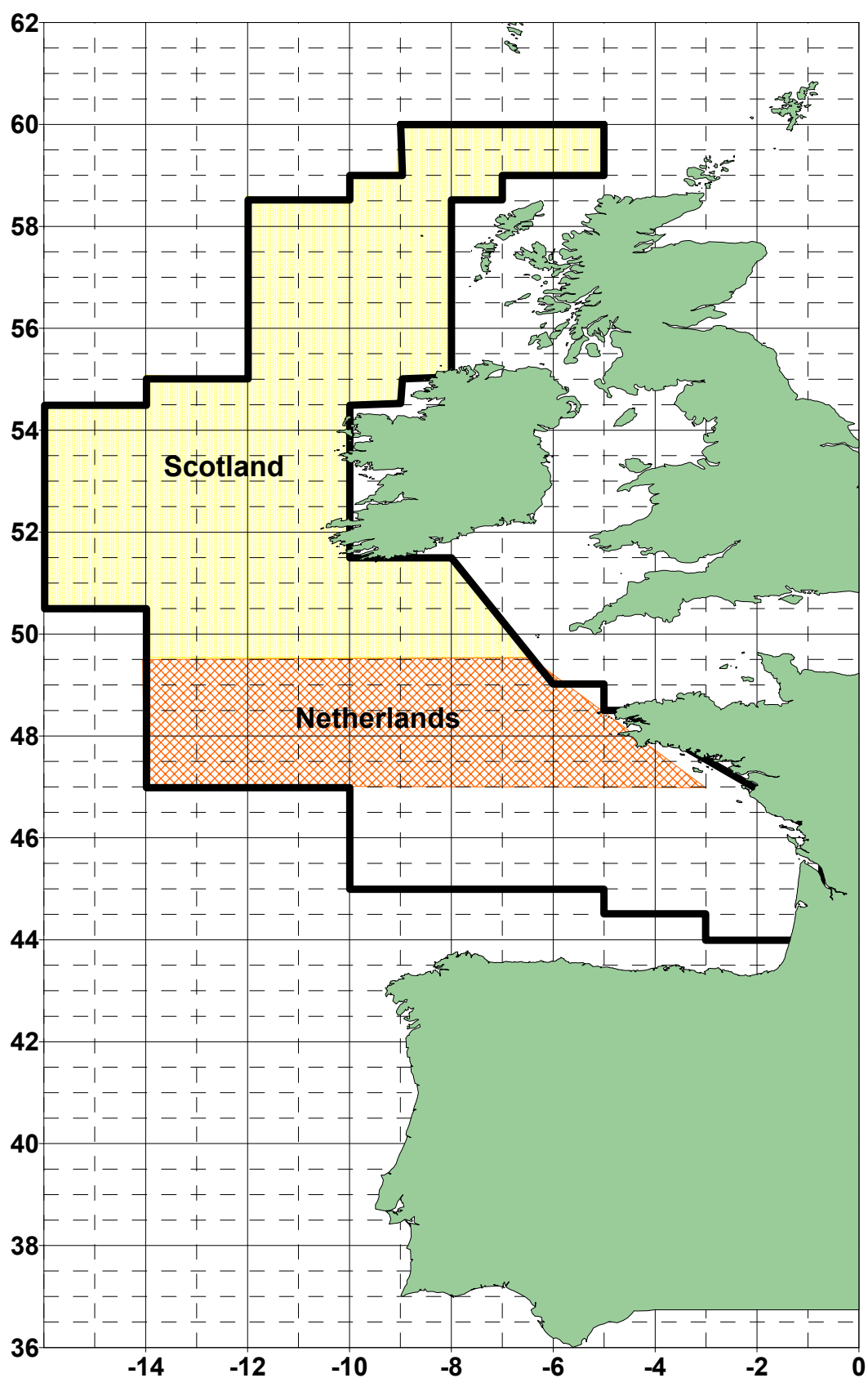
Period 4 - 13 April - 10 May



Period 5 - 10 May - 7 June



Period 6 - 8 June to 29 June



Period 7 - 6 - 20 July

