MANUAL FOR THE INTERNATIONAL BOTTOM TRAWL SURVEYS

REVISION VII

The International Bottom Trawl Survey Working Group

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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1 INTRODUCTION

The International Bottom Trawl Survey Working Group, formerly known as the International Young Fish Survey Working Group, has the responsibility of coordinating various research vessel surveys conducted within certain ICES areas. The first survey to be coordinated was the International Young Fish Survey (IYFS) that was conducted in the North Sea and Skagerrak/Kattegat in February of each year starting in the late 1960's. A procedural manual was produced for the use of scientists involved in this survey and subsequently two revised editions were produced as international co-operation developed. In 1991 this co-operative programme was expanded to include the three other quarters in the North Sea and Skagerrak/Kattegat. This necessitated major alterations to the manual and the revised edition was published as ICES CM 1992/H:3.

During the Annual Science Conference in St. John's, Newfoundland in 1994 the recommendation was made that the International Bottom Trawl Survey Working Group should also incorporate the coordination of bottom trawl surveys in ICES Sub-Areas VI, VII and VIII and Division IXa (these areas are designated as the western and southern areas).

In 1995 the manual was revised for a fifth time in order to clarify certain aspects of the surveys in the North Sea and Skagerrak/Kattegat. At the same time the opportunity was taken to review the manual to establish whether the same procedures could be applied to Sub-Areas VI, VII and VIII and Division IXa. It was decided that some aspects of the manual applied equally to all areas but some procedures required dedicated text. At the same time it was decided that a manual for the western and southern areas required further discussion and input from countries closely associated with these areas but who were unable to attend the meeting. Consequently procedures unique to the western and southern areas were provided in Appendix XI, of the fifth revision, as a draft awaiting approval by all participants.

At the IBTS Working Group meeting in 1999 (Lisbon 7–10 April) it became apparent that a single manual covering such an extensive area was inappropriate. As corrections and amendments were outstanding for the North Sea IBTS Manual, the opportunity was taken to revise this document (the sixth revision).

A separate manual for the western and southern waters was produced for the IBTS meeting in Dublin, in 2001, and is available separately.

At the IBTS Working Group meeting in 2003 (Lorient 7–10 April) it was again apparent that the sixth revision needed to be updated in order to better describe the history of the IBTS, the new checking procedures and SOPs that were in place in many of the countries participating in the IBTS and the new exchange format that was now needed due to the newly developed DATRAS database for survey data at the ICES Secretariat. Many of the revisions were made at the Working Group meeting in 2004 (Lisbon 25-29 March) and this seventh revision was ready for use by all participating countries by August 2004.

This manual seeks to describe the survey and it's history, paying particular attention to the current gears and practises in place. Description of gears, areas covered and data collected is described in detail along with information helpful to anyone participating in the surveys or interested in them.

2 IBTS SURVEY

2.1 History of the Survey

The following account has been adapted from Heessen *et al.* (1997).

In the spring and autumn of the years 1960 and 1961 a series of four large international research vessel trawl surveys were organised under the auspices of ICES, to map the distribution of juvenile herring *Clupea harengus* in the North Sea and to investigate the links between herring nursery grounds and the adult populations (ICES, 1963).

In the following years most of the countries participating in the former exercise continued similar surveys. From 1966 onwards these surveys were conducted annually with the objective of obtaining annual recruitment indices for the combined North Sea herring stocks. Gradually more countries started to participate in the survey, which was named the International Young Herring Survey (IYHS). For the first few years, sampling was restricted to the southern and central North Sea and, beginning in 1969, the Skagerrak and Kattegat.

Although the emphasis from the start of the surveys focused mainly on herring, data collected for whiting *Merlangius merlangus* were also analysed. In the course of the 1970s it was realised that the IYHS could provide recruitment indices not only for herring, but also for roundfish species such us cod *Gadus morhua*, haddock *Melanogrammus aeglefinus* and whiting. This growing interest resulted in a northwards extension of the survey area to cover the entire distribution of juvenile haddock in the North Sea, and also that of Norway pout *Trisopterus esmarki*. The whole North Sea, Skagerrak and Kattegat have been surveyed since 1974.

In 1981 the survey was renamed the International Young Fish Survey (IYFS), the first manual was produced (ICES, 1981b), and in 1984 the ICES 'Working Group on Young Herring Surveys' and the 'Gadoid 1-Group Working Group' were combined to form the International Young Fish Survey Working Group.

In 1990 the IYFS Working Group evaluated the usefulness of a number of bottom trawl surveys in the North Sea, Skagerrak and Kattegat (ICES, 1990). Apart from the international IYFS, these surveys were comprised of at least seven national surveys. The IYFS WG proposed to combine the IYFS and the national surveys in Quarterly Co-ordinated Surveys in the North Sea, Skagerrak and Kattegat, which were to be called the International Bottom Trawl Surveys (IBTS). It was recommended that quarterly surveys should run for a period of five years. These surveys should provide a full description of the seasonal distribution of the stocks sampled, which was considered urgently necessary for the further improvement of multispecies assessments and the development of spatially disaggregated assessment models.

This proposal resulted in a series of six years with quarterly surveys, which, with a few exceptions, covered the whole survey area in the North Sea, Skagerrak and Kattegat (ICES, 1996a). Subsequently, it has proved impossible to maintain these high levels of research vessel effort, especially as research budgets have decreased in most countries and, from 1997, the majority of countries have only carried out a survey twice a year; a first quarter survey (January-February) and a third quarter survey (August-September).

Appendix I shows the timeline of significant events in the history of the IBTS.

Having evolved from a herring survey, when only pelagic data was collected, the IBTS survey dataset is now made up of data collected on all finfish species. However, this current level of sampling has evolved gradually. In the manual revision VI, sampling was defined by two groups, 'standard' and 'closed by-catch'. Because all participants now sample all finfish species in one way or another, these have not been defined in this revision.

2.2 History of the Survey Gear

Before the IBTS was co-ordinated fully, there were many survey gears used. In 1960 the Netherlands used a Dutch Herring Trawl, in 1966 Germany started a survey in the North Sea and used a Herring Trawl. In 1967, UK (England) and UK (Scotland) join in and used the Dutch herring Trawl. By 1969, three different rigged Dutch Herring trawls and one Herring Trawl were being used in the North Sea to carry out the herring surveys. As the surveys moved away from concentrating on just herring, there was a move away from the herring trawls to a more multipurpose gear. In 1976 six different survey gears were being used by eight different nations. Then, in 1978, one multipurpose gear started to be used by more and more nations, and by 1983 all nations participating in the IYFS were using the GOV 36/47, albeit with slightly different rigging configurations of the sweep lengths. Since then, the GOV has been the recommended standard gear of the IBTS.

2.3 Survey Design

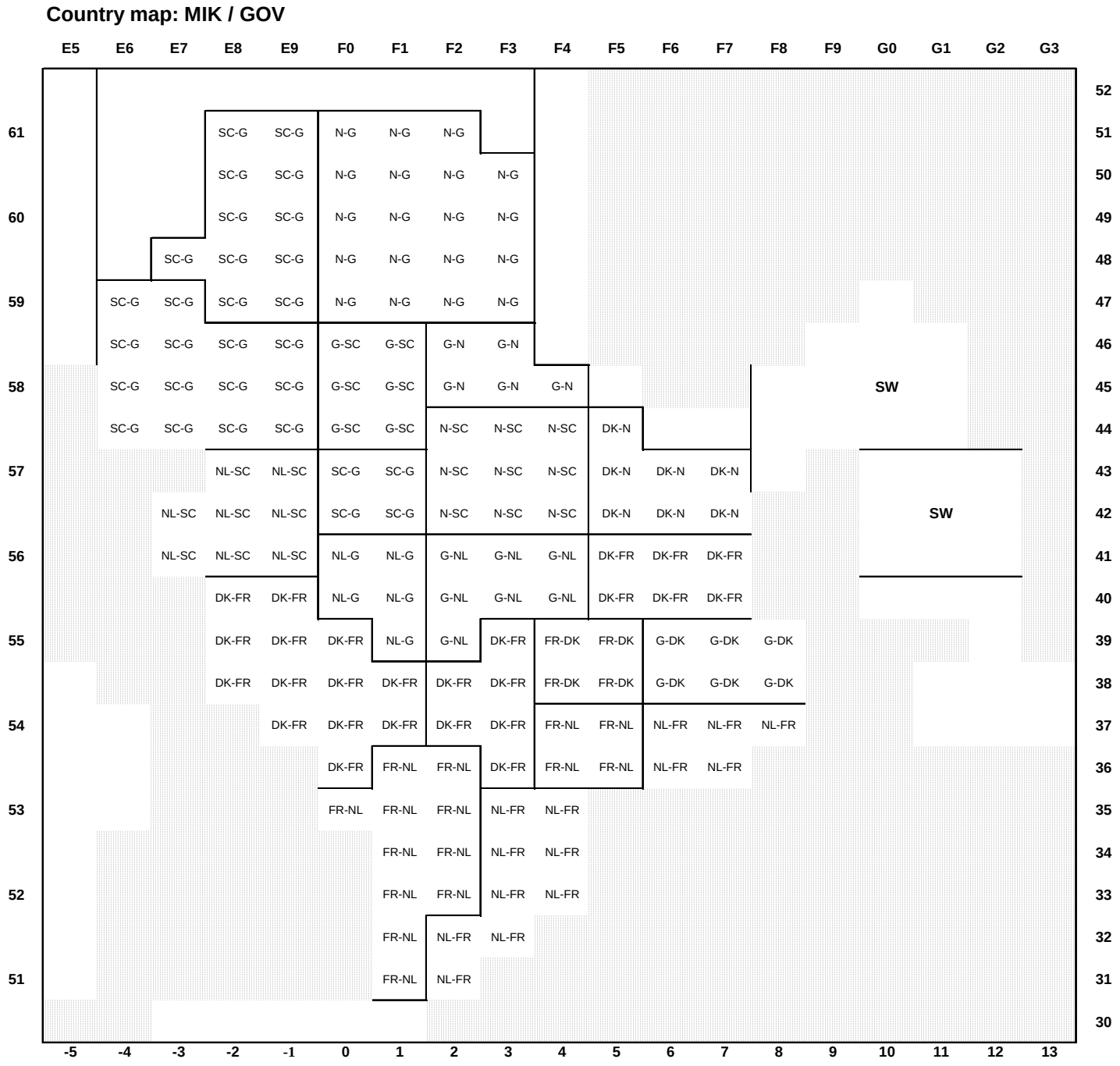
The stratification of the survey grid has always been based on ICES statistical rectangles (one degree longitude x 0.5 degree latitude). Each rectangle is usually fished by the ships of two different countries, so that at least two hauls are normally made per rectangle.

The design of the quarter 1 survey has gradually changed over the years. In 1974 the survey was still very much a herring survey (ICES, 1974). In that year the IYHS WG decided to use three strata, which depended on the amount of herring caught in the former years. This would result in a total of 214 hauls. After some years this system was dropped and for several years four hauls per rectangle were made in the south-eastern North Sea, the most important area for juvenile herring (between 50º30' and 57ºN, and 4º and 8ºE), and two hauls per rectangle in the remaining area. In 1991, at the start of the quarterly surveys, part of the research vessel effort from quarter 1 was shifted to the other quarters and from that year on the target was to make at least two hauls per rectangle over the whole survey area.

The allocation of stations to IBTS participants has changed slightly over the years. The latest main reallocation occurred in 1991, but it was then tried to keep at least one vessel in every sub-area, which had fished there over the most recent years. A typical allocation of the different vessels during the quarter 1 survey is shown in Figure 2.1, and quarter 3 surveys in Figure 2.2.1 to 2.2.7.

For the other quarters three different grids were introduced (ICES, 1990): the 'coarse' grid based on the routine in the English Groundfish Surveys which covers half of the rectangles in the North Sea, the ' complementary coarse grid' covers the other half, and a grid that consists of all the neighbouring rectangles in a certain area (as used for example in the Scottish Groundfish Surveys). The idea was that in every quarter at least 4 vessels should participate: one vessel should fish the coarse grid, one the complementary coarse grid, one should fish all the rectangles in the southern half of the North Sea and one in the Northern half. In this way all rectangles should be fished twice, by two different vessels. As discussed above, only the quarter 3 surveys have had this coverage since 1997.

Figure 2.1 – IBTS Quarter 1 Proposed Survey Grid All Participants



DK – Denmark, FR – France, G – Germany, N – Norway, NL – Netherlands, SC – Scotland, SW – Sweden.

Figure 2.2.1 - IBTS Quarter 3 Proposed Survey Grid All Participants

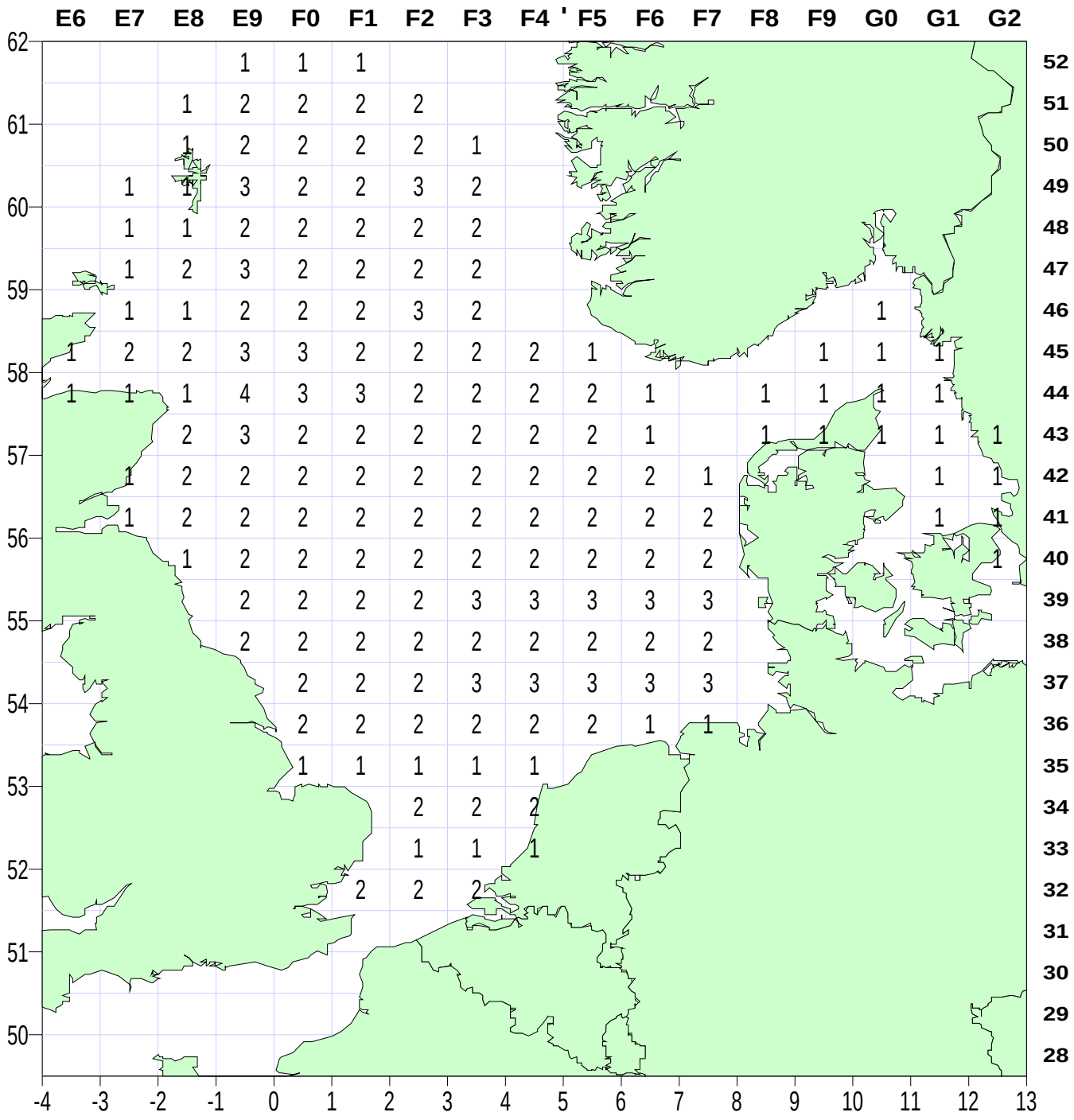


Figure 2.2.2 - IBTS Quarter 3 Proposed Survey Grid - Denmark

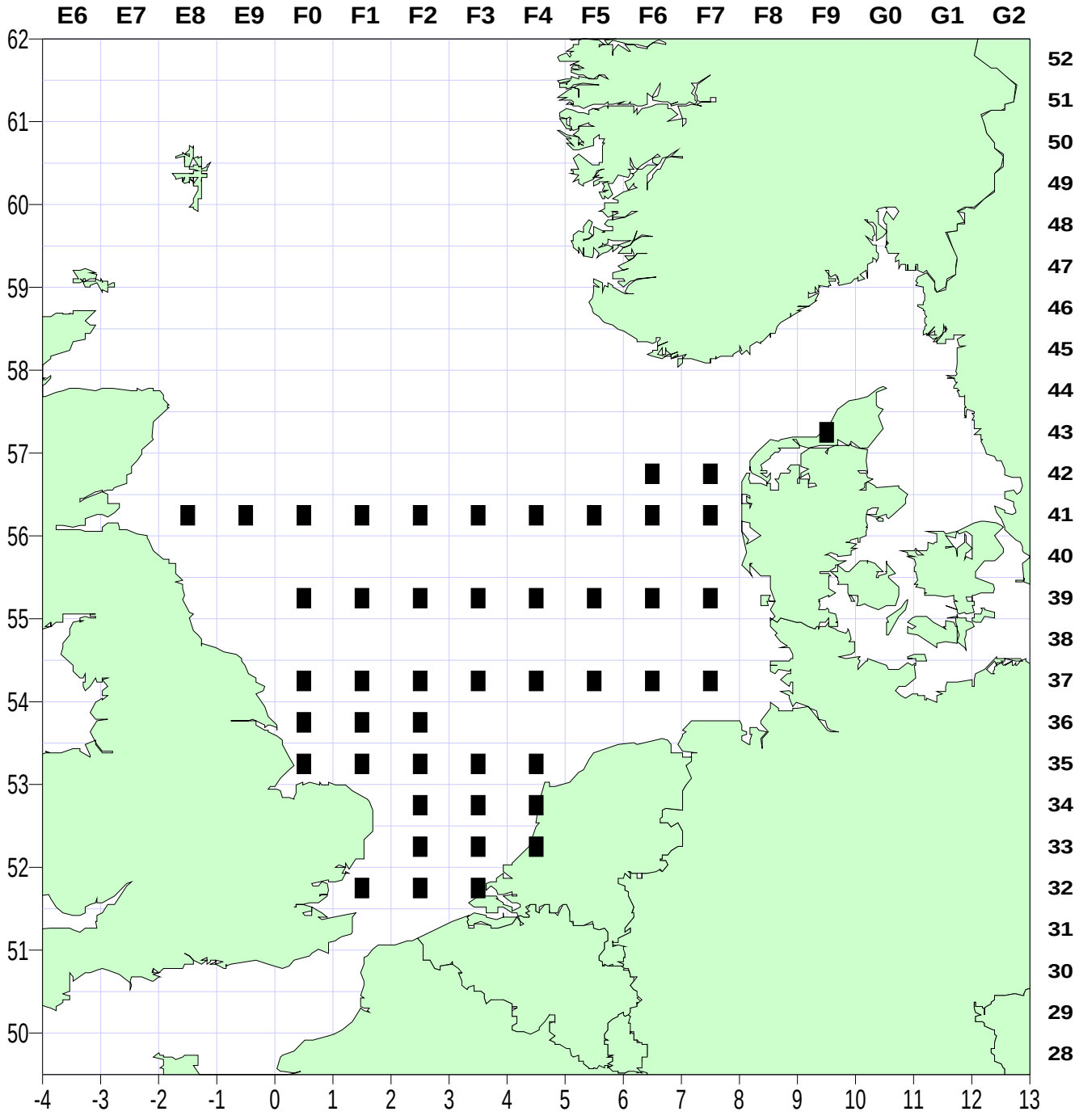


Figure 2.2.3 - IBTS Quarter 3 Proposed Survey Grid - England

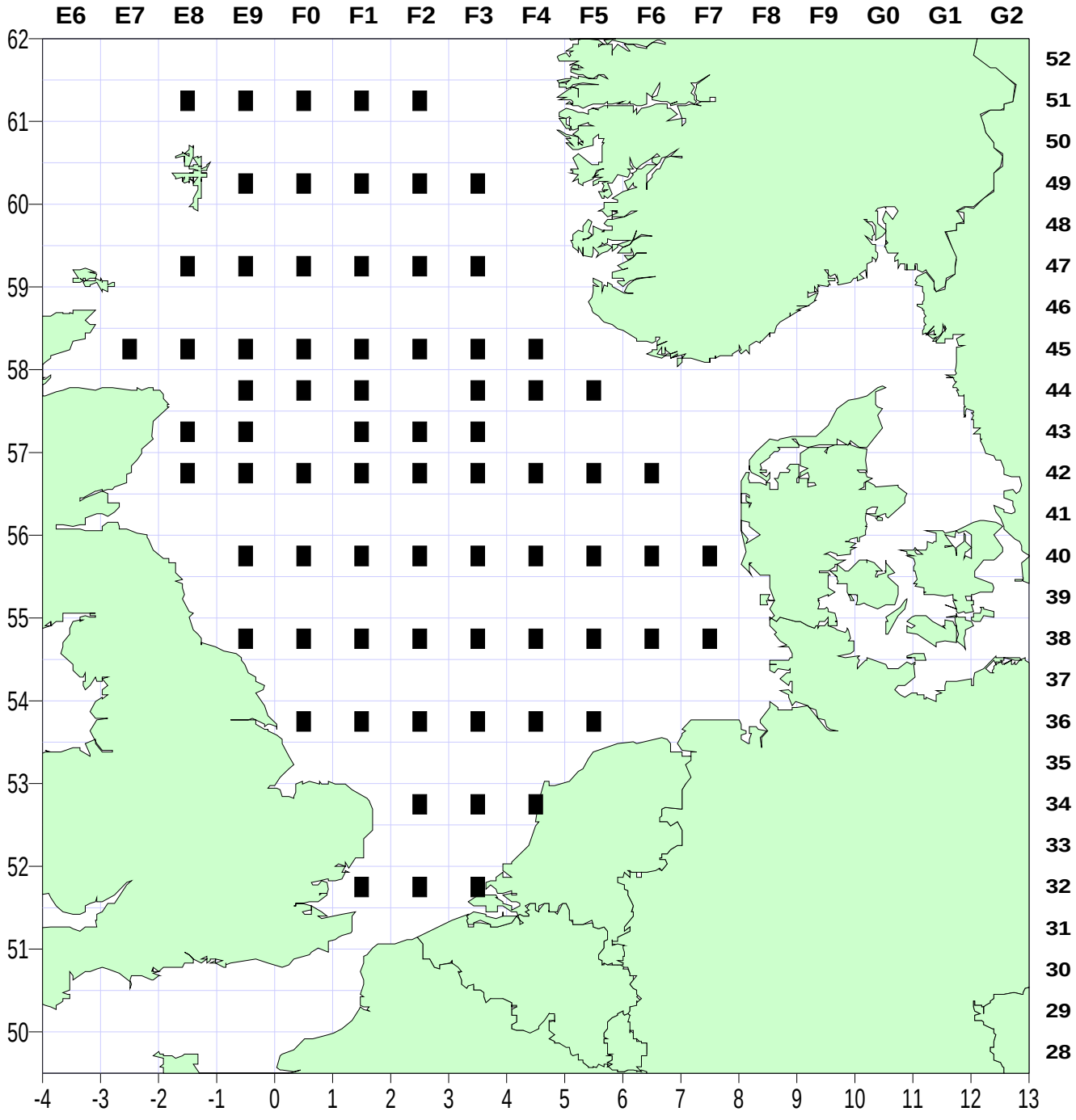


Figure 2.2.4 - IBTS Quarter 3 Proposed Survey Grid - Germany

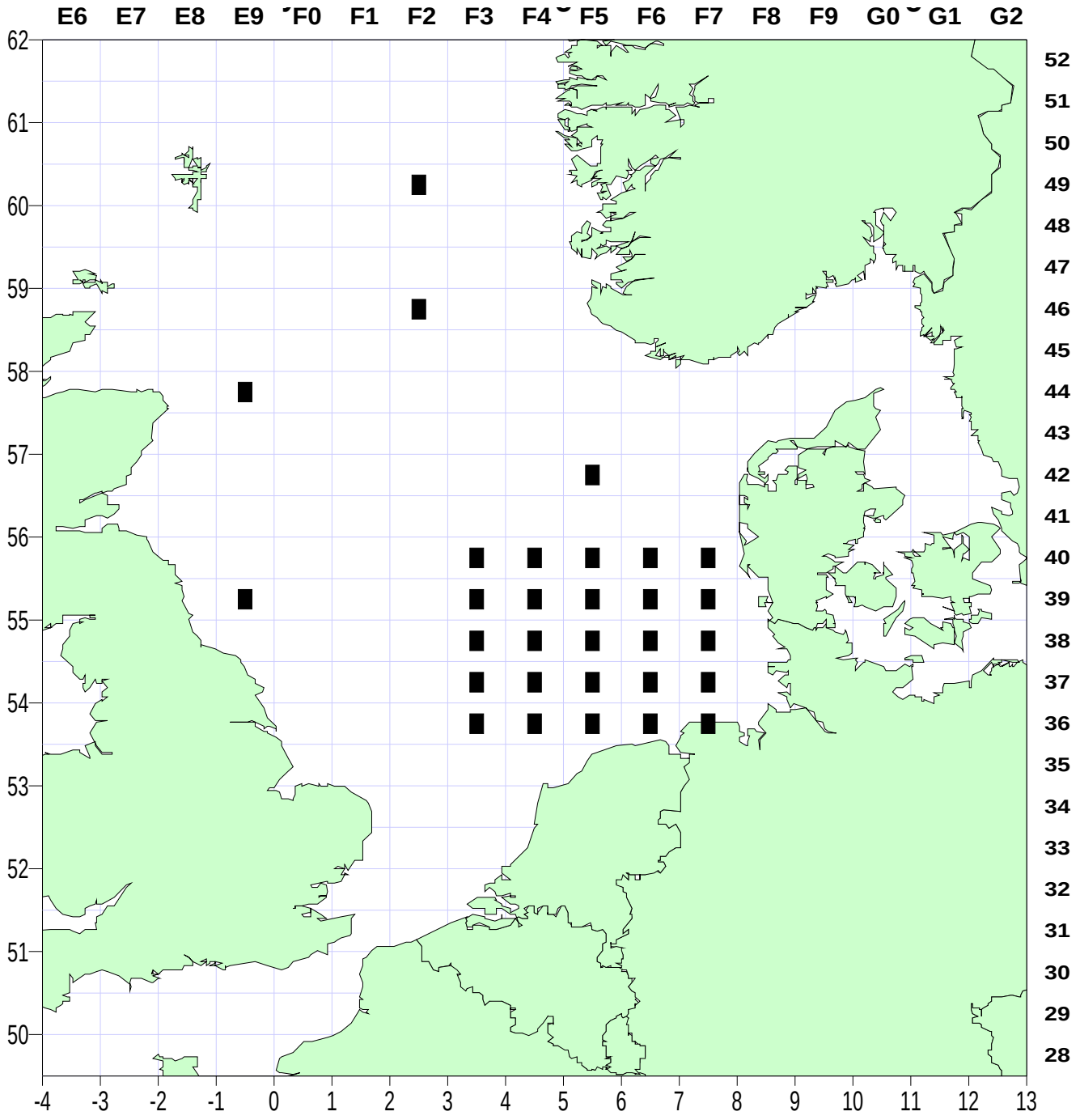


Figure 2.2.5 - IBTS Quarter 3 Proposed Survey Grid - Norway

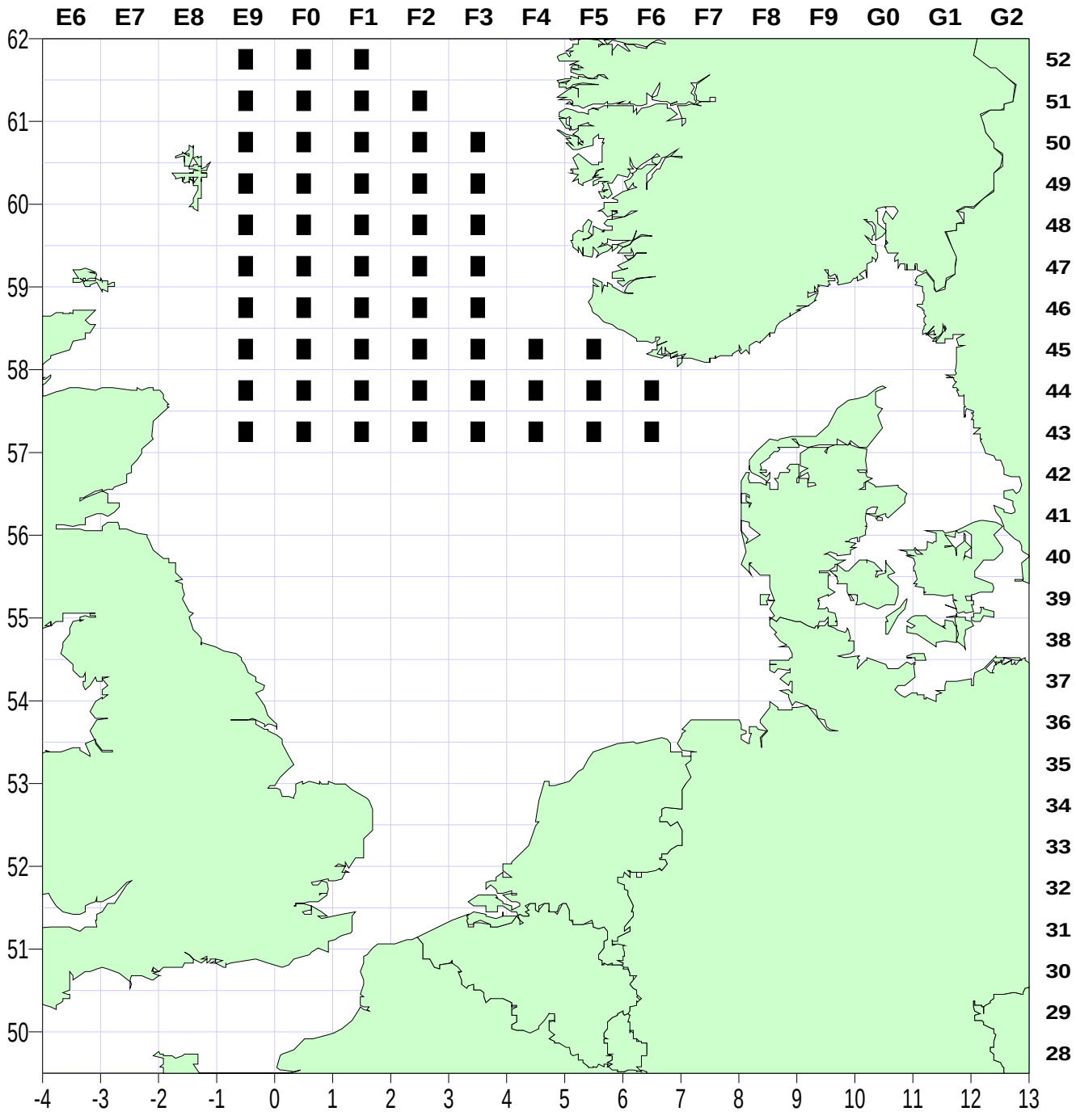


Figure 2.2.6 - IBTS Quarter 3 2004 Proposed Survey Grid - Scotland

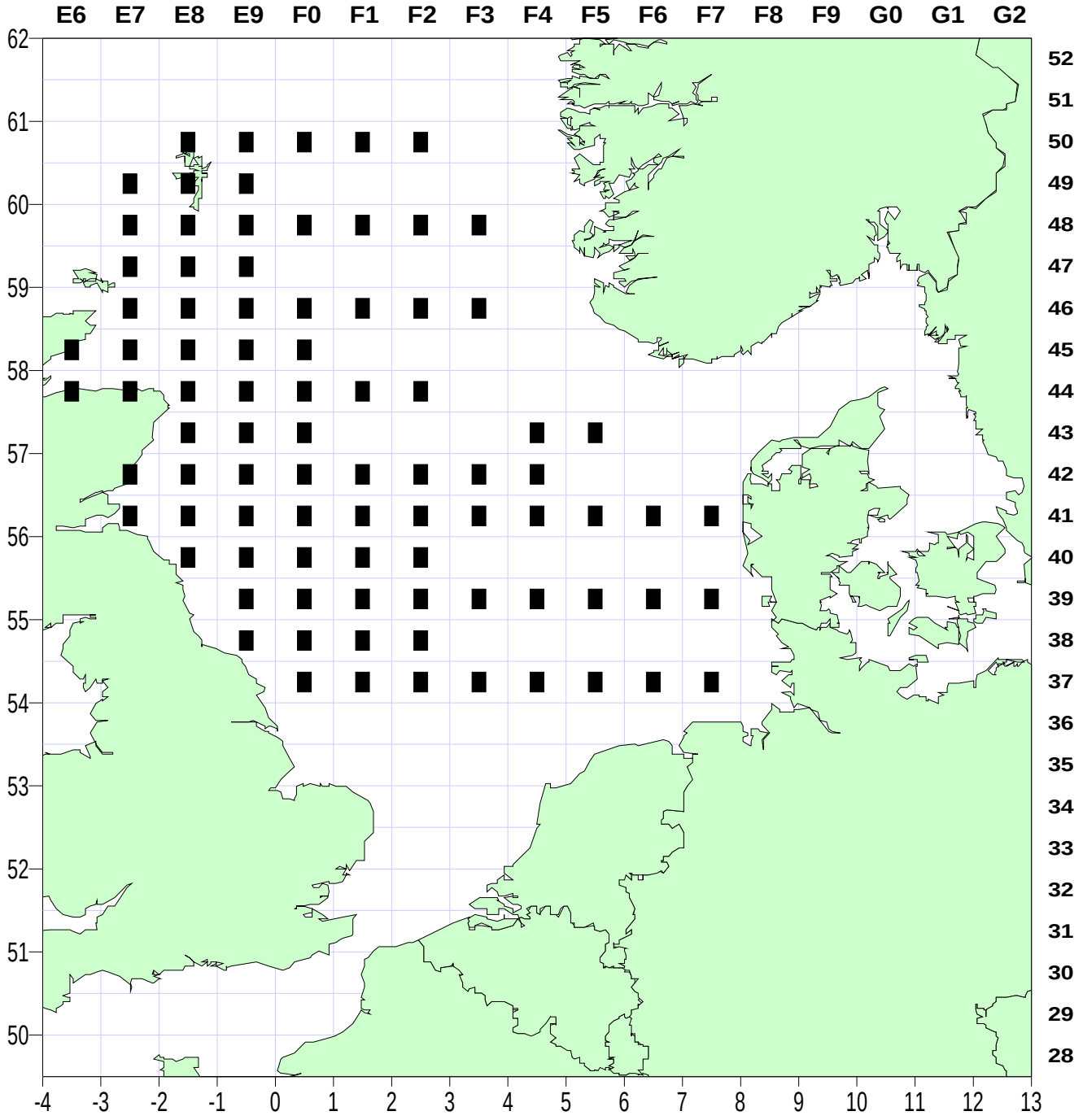
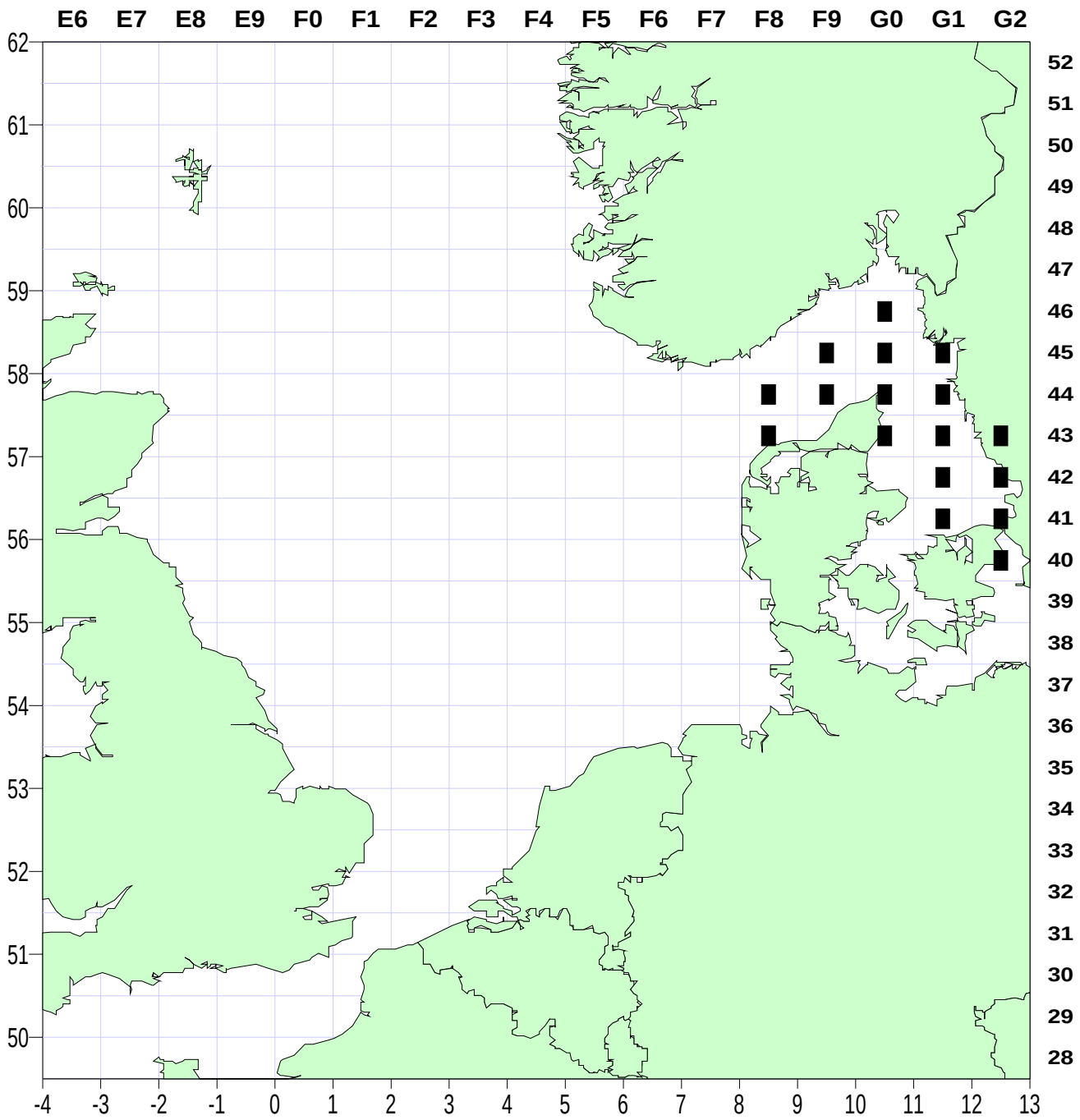


Figure 2.2.7 - IBTS Quarter 3 Proposed Survey Grid - Sweden



Initially one-hour hauls were made, but in 1976 with gadoid outburst contributing to increased catches and in order to allow for the opportunity to carry out more hauls in a day some participants changed to 30-minute tows. This was then made a recommendation at the Working Group in 1977 and all countries (with the exception of Scotland) reduced the standard haul duration to 30 minutes during the surveys in 1978. The Scottish institute continued to make one-hour hauls until 1998 when they changed to a new vessel and standardised to 30 minutes.

2.4 GOV-Trawl Construction

The construction of the 36/47 GOV-trawl is shown in Figure 2.3. A set of check sheets should be used to maintain a standard rigged GOV. These should be used to check all dimensions of the GOV and to ensure that it is rigged correctly on the vessel. When a new net is delivered check sheets 1 (Appendix II) and 2 (Appendix III) should be filled in to ensure that the net is manufactured to the correct specification.

Special attention is drawn to the lining of the cod-end. This lining should consist of 400 stretched meshes of 20 mm each, giving a total length of 8m. The total circumference of the lining should be 600 meshes.

Details of the "Exocet" kite and suggestions how to attach the kite to the trawl are shown in Figure 2.4. Five floats with a buoyancy of 2.9 kg each should be attached to the kite. If a kite other than the recommended one is used then the lift of this kite should be the same as of the Exocet kite so that the configuration of the net conforms to expected parameters. Figures 2.8 and 2.9 illustrate the expected warp out / headline height ratio and the warp out / door spread ratio.

Total buoyancy of the floats on the net should be 172 kg. The floats should be spread as evenly as possible over the wings and the square.

2.5 GOV Trawl Rigging

The rigging is given in Figure 2.5. On board the vessel when attaching the trawl to the bridles and doors, check sheet 3 (Appendix IV) should be used.

During the first quarter survey the length of the sweeps should depend on the bottom depth:

- 60m sweeps (including backstrops) are used in water depths less than 70 m,
- 110m sweeps (including backstrops) are used in deeper waters.

In the other quarters a sweep length of 60 m (including backstrops) is used throughout the survey area.

The standard groundrope with rubber discs as shown in Figure 2.6 should be used throughout the survey area. Again a check sheet (Appendix V) should be used to ensure the ground gear is to specification. The extra weights in the groundrope are 70 kg in the square, 35 kg in each quarter and 35 kg in each forward wing-end. These weights should be evenly spread over the appropriate length of groundrope and this can be achieved by wrapping chain externally around the groundrope or, preferably, by interspersing the groundrope rubber discs with steel discs of the same diameter. Approximate weight in air is given for each section of the groundrope.

It is very important to achieve good bottom contact over the whole groundrope and this should be checked regularly. A proper contact of the net could be indicated by acoustic devices, wearing on chains and presence of benthic organisms and flatfish in the catch. The contact of the net with the bottom can also be greatly influenced by changing the length of the adjustment chain between the lower leg and the bumper bobbin. The normal length of this chain is 2 metres but on rough ground it can be shortened to 1.7 metres; if the gear is fishing too light it can be lengthened to 2.2 metres.

For a proper performance of the net it is essential that the four upper bridles are of identical length, and regular checks should be made to ensure this. It is also recommended that a total check of the trawl is carried out prior to the survey.

2.6 Standard Fishing Method

Standard fishing speed is 4 knots measured as trawl speed over the ground. The recommended speed is set as a target and actual (ground) speed and distance towed should be monitored and reported. It is also recommended that the speed of the trawl through the water should be monitored and reported.

Each haul lasts 30 minutes. Start time is defined as the moment when the vertical net opening and doorspread are stable at a trawl speed of 4 knots. Stop time is defined as the start of pull back.

Vertical net opening and doorspread should be monitored at 30-second intervals and mean values should be reported. It is recommended that wingspread is also measured.

The recommended warp/depth ratio for the GOV trawl is shown in Figure 2.7. A minimum warp length of 150 m should be used as below this length the gear becomes unstable and insufficient spread is achieved. Maximum fishing depth in the North Sea is 200 m and in Division IIIa 250 m.

It is preferable to only conduct trawling operations during daylight hours although it is recognised that some institutes may wish to trawl both during the day and night. It is however strongly recommended that during the February survey the trawling in the old herring standard area (see Figure 6.4) is carried out during daytime only. In the morning the net should not be shot earlier than 15 minutes before sunrise. At the end of the day, the net must be hauled within 15 minutes after the time of sunset. A software package that calculates sunrise and sunset, called RiseAndSet, is available from RIVO. In order to make a quick calculation, the daylight hours for various periods can be calculated with reference to current latitude and the text table below:

Daylight period in UTC at 0 degrees longitude:

Dates		**South of 57° 30' N**			**North of 57° 30' N**		
01-10	Jan	08.09	-	15.58	08.45	-	15.25
10-20	Jan	08.01	-	16.17	08.31	-	15.45
21-31	Jan	07.47	-	16.35	08.15	-	16.07
01-10	Feb	07.29	-	16.58	07.49	-	16.36
11-20	Feb	07.08	-	17.20	07.23	-	17.05
21-28	Feb	06.47	-	17.41	06.55	-	17.30
01-10	Mar	06.27	-	17.57	06.32	-	17.50
11-20	Mar	06.03	-	18.18	06.05	-	18.15
21-31	Mar	05.35	-	18.38	05.32	-	18.39
01-10	Jul	03.15	-	20.55	02.28	-	21.40
11-20	Jul	03.26	-	20.47	02.49	-	21.24
21-31	Jul	03.41	-	20.33	03.08	-	21.03
01-10	Aug	04.00	-	20.12	03.34	-	20.38
11-20	Aug	04.19	-	19.50	03.59	-	20.09
21-31	Aug	04.37	-	19.26	04.23	-	19.42
01-10	Sep	04.57	-	19.00	04.48	-	19.09
11-20	Sep	05.16	-	18.34	05.12	-	18.38
21-30	Sep	05.35	-	18.08	05.35	-	18.08

Source: 'The Times Atlas' 1972, p 33.

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

2.7 Fishing Positions

Most statistical rectangles contain a number of possible tows that are deemed to be free of obstruction and vessels are free to choose any of these positions in the rectangles that they are surveying. In some rectangles sampling may be further stratified due to significant changes in seabed depth, which may, in turn, cause variations in the fish population.

In rectangles or strata that are to be sampled more than once by the same vessel it is recommended that valid hauls are separated by at least one day or by at least 10 miles wherever this is possible. Tows in adjacent rectangles should also be separated by at least 10 miles.

Fish shoals located by sonar or echo sounder should not influence fishing.

The exchange of clear tow and invalid tow positions is to be encouraged and this may be in the form of data formatted for immediate entry into a ship's navigational system or, alternatively, as an ASCII file as specified in Appendix VI. CEFAS,

Lowestoft, currently act as coordinators for this information and maintain a database of towing positions, which can be accessed on request.

2.8 Monitoring net geometry

All countries are using electronic equipment to monitor net geometry (e.g. SCANMAR). All institutes are recording headline height and door spread. It is recommended that wingspread also be recorded. The manual that is supplied with the units gives the correct way of attaching the units to the gear.

During the tow it is imperative that headline height and wing/door spread readings are monitored. If these readings are outside the recommended values (figure 3.6 and figure 3.7) for an unacceptable period of time it could mean that the gear has become fouled or damaged and should be hauled in.

It is recommended that the data stream should be saved to computer to allow mean values to be calculated and entered into the individual institutes databases. These values should be calculated from the time the gear has stabilised on the bottom to the time the gear is hauled.

2.9 Current Objectives

The current objectives of the IBTS are:

1. To determine the distribution and relative abundance of pre-recruits of the main commercial species with a view of deriving recruitment indices;

2. To monitor changes in the stocks of commercial fish species independently of commercial fisheries data;

3. To monitor the distribution and relative abundance of all fish species;

4. To collect data for the determination of biological parameters for selected species;

5. To determine the abundance and distribution of late herring larvae (February survey)

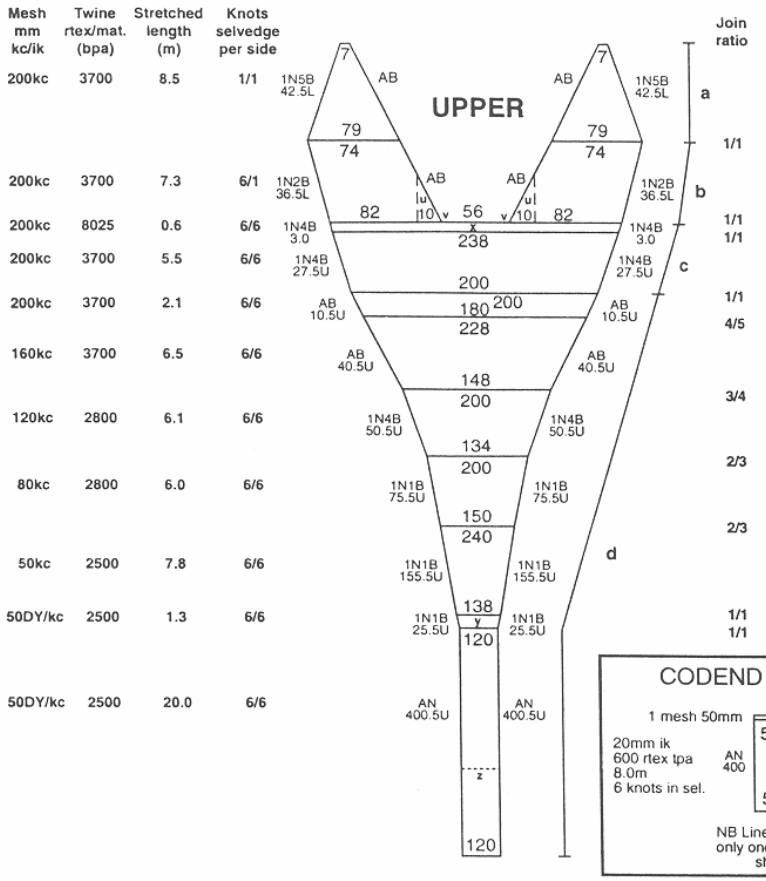
6. To collect hydrographical and environmental information

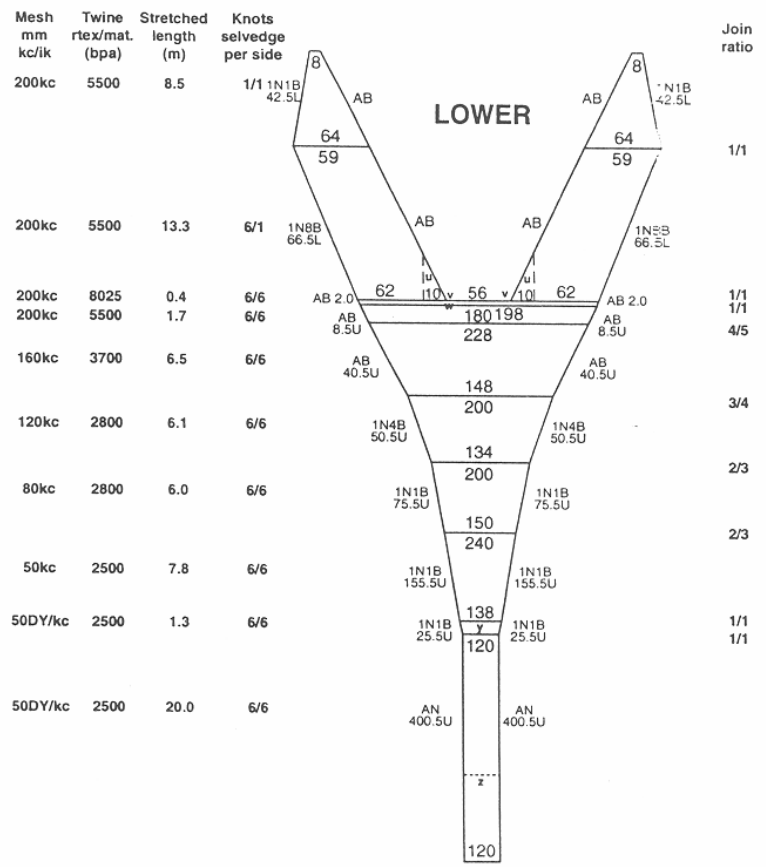
During the February survey information is collected on distribution and abundance of late herring larvae, used in the herring assessment. For hydrographical research the February survey provides a unique time series.

Coverage of the whole survey area was complete from every quarter for the years 1991-1996. In quarters 2 and 4 in 1997, however, the total effort was at a much lower level than in the six preceding years due to various national constraints, and since then only surveys in quarters 1 and 3 were continued on an international basis.

Figure 2.3 Construction of the 36/47 GOV Trawl

Construction of the 36/47 GOV trawl (adapted from drawings of the Institute des Peches Maritimes, Boulogne/Mer)





Headline : 36m (15.50 + 5.00 + 15.50) x 14mm ϕ wire (f/c) served (6/19 - 12/6/1 65.8kg/100m).
Fishingline : 47.20m (21.10 + 5.00 + 21.10) x 22mm ϕ combination wire 6 strand/steel core 54.6kg/100m).
Winglines : Upper 8.2m, Lower 8.2m x 20mm ϕ combination wire (6 strand/steel core 54.6kg /100m)

a - 7.1m x 14mm ϕ wire (6/19 - 12/6/1 - 65.8kg/100m)
b - 6.7m x 20mm ϕ combination wire (6 strand/steel core - 54.4kg/100m)
c - 5.55m x 20mm ϕ combination wire (6 strand/steel core - 54.4kg/100m)
d - length for length x 22mm ϕ nylon (3 strand - 26kg/100m)

u - Gussets 8025rtex
v - 4 meshes gathered at quarters

w - 200 198
x - 240 238
y - 138 120

z - Joining position for Liner

kc = knot centre to knot centre
ik = inside knot measurement
tpa = polyamide twine/twisted
bpa = polyamide twine/braided
dy = double yarn

Method of join used, sewing.
Type of knot, weavers knot.

NOTE TO NETMAKERS

The numbers of meshes shown for netting panel widths do NOT include selvedge meshes. Five meshes (six knots) per selvedge must be added where indicated. Conversely to obtain panel depths one row (1/2 mesh) must be subtracted from each panel as the joining row is included in the number of meshes deep. The total numbers of meshes (width and depth) for each individual panel are set out in GOV 36/47 Groundfish Survey Trawl Checklist (Page 2 of 5)

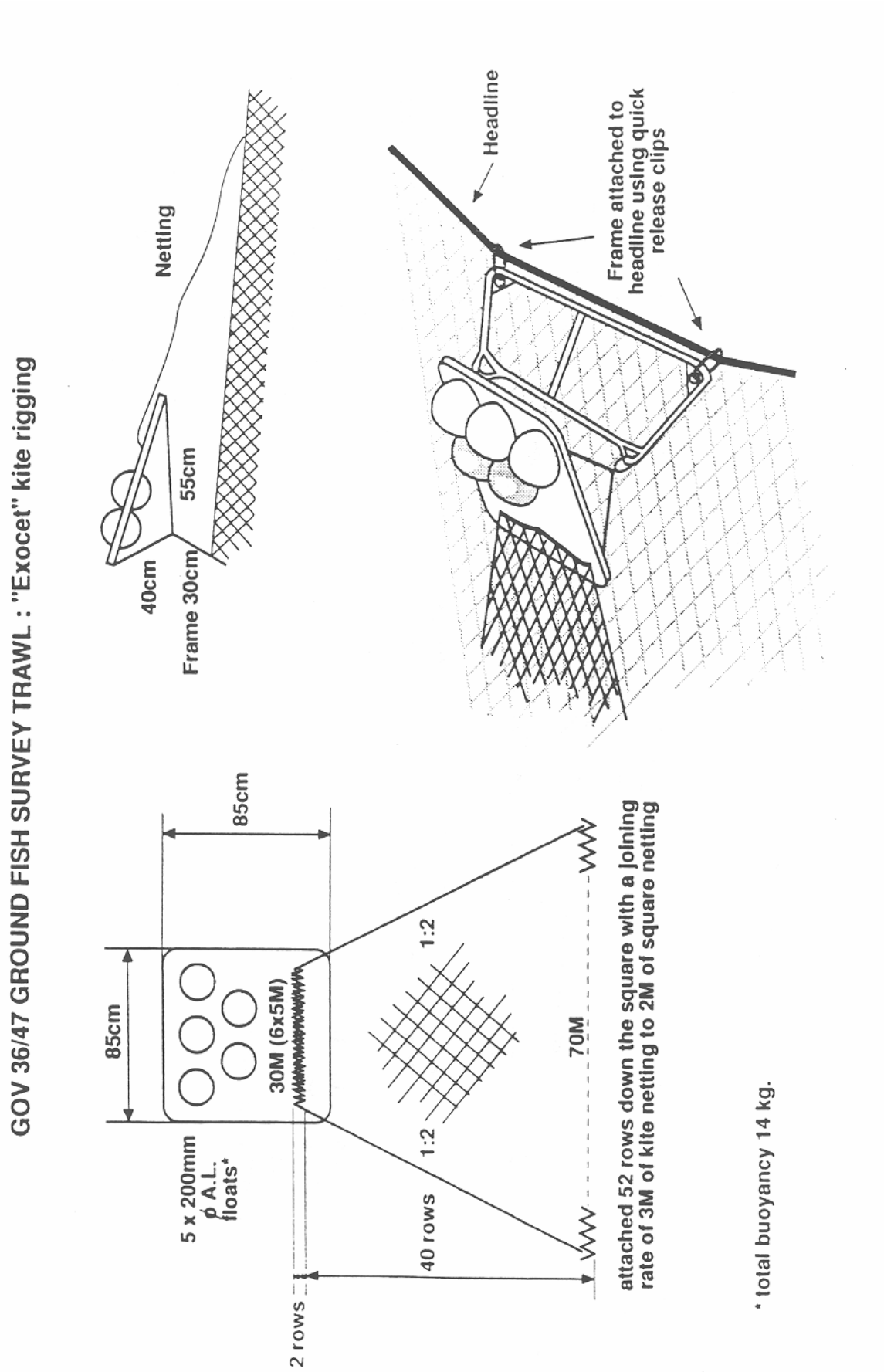


Figure 2.4 "Exocet" Kite for the 36/47 GOV Trawl

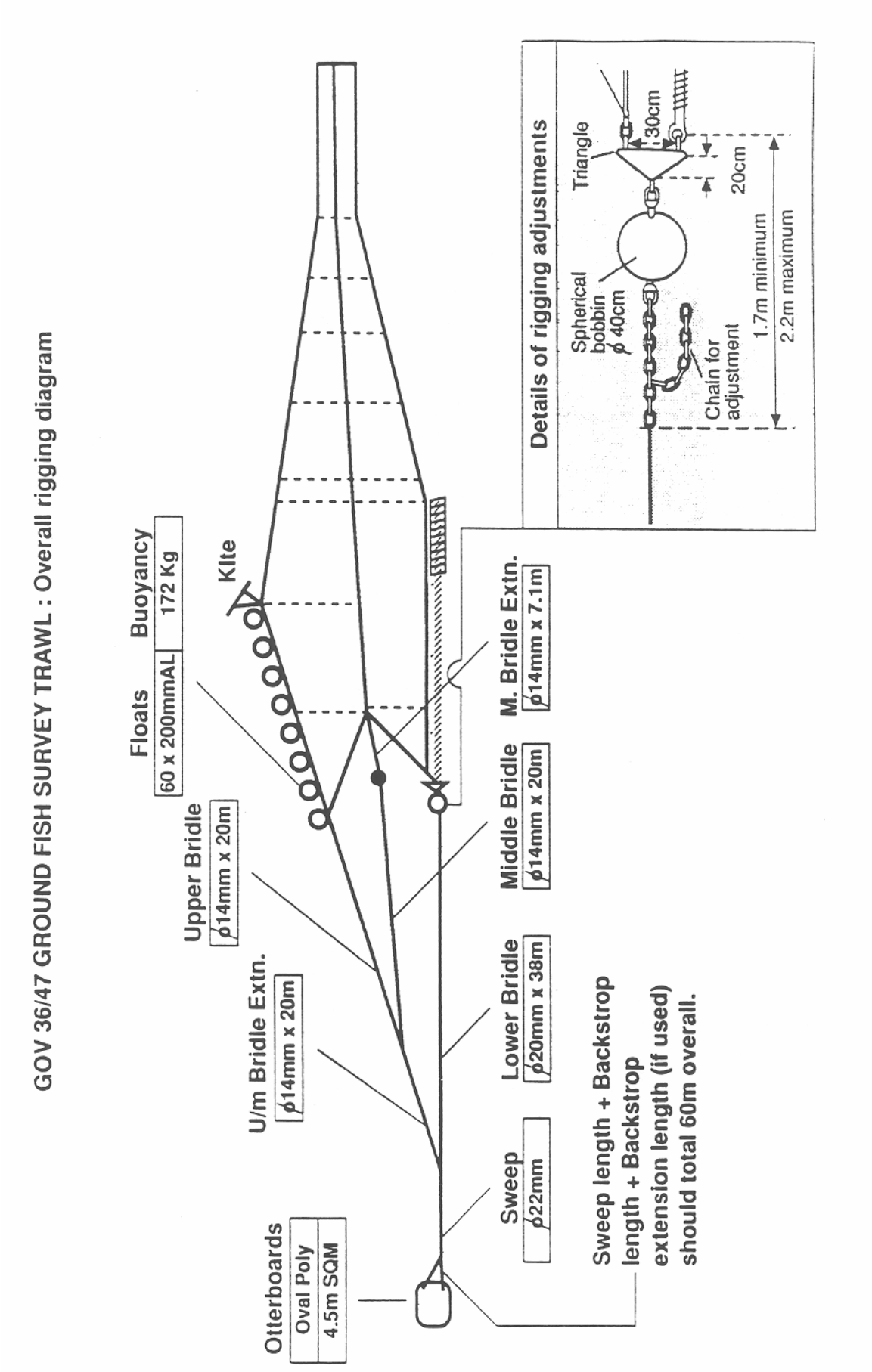


Figure 2.5 Rigging of the 36/47 GOV Trawl

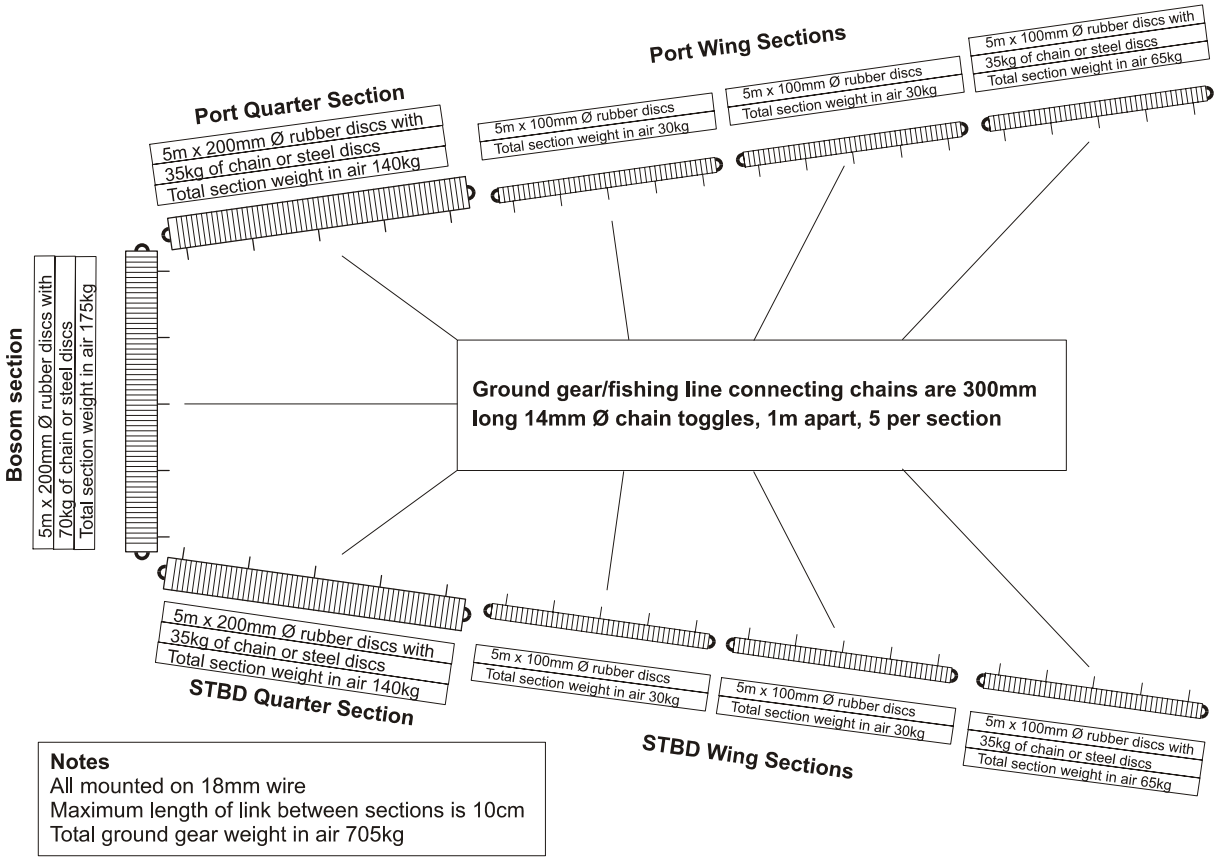


Figure 2.4 Standard groundrope for the 36/47 GOV Trawl

Figure 2.6 Standard groundrope for the 36/47 GOV Trawl

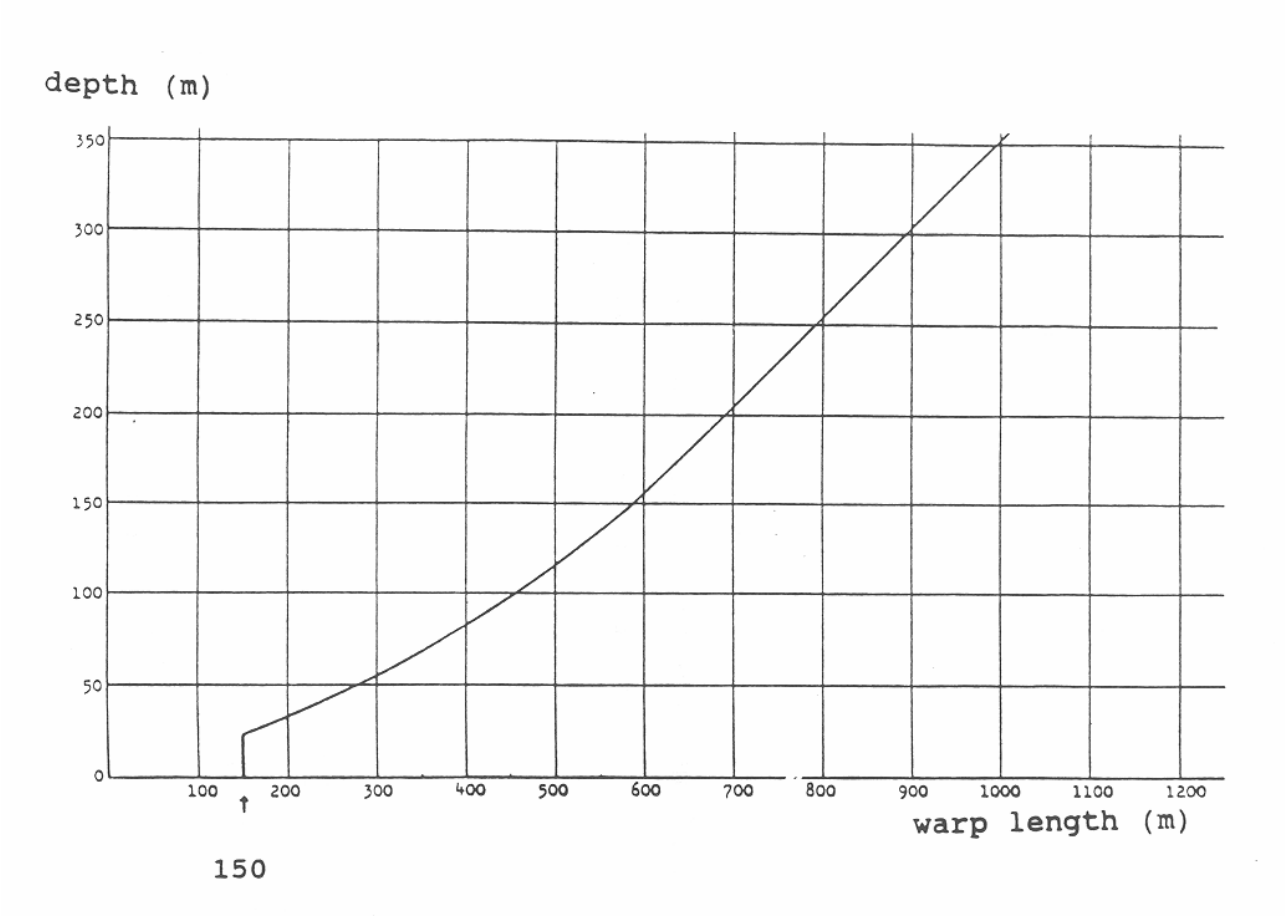


Figure 2.7 Warp/Depth ratios for the 36/47 GOV Trawl.

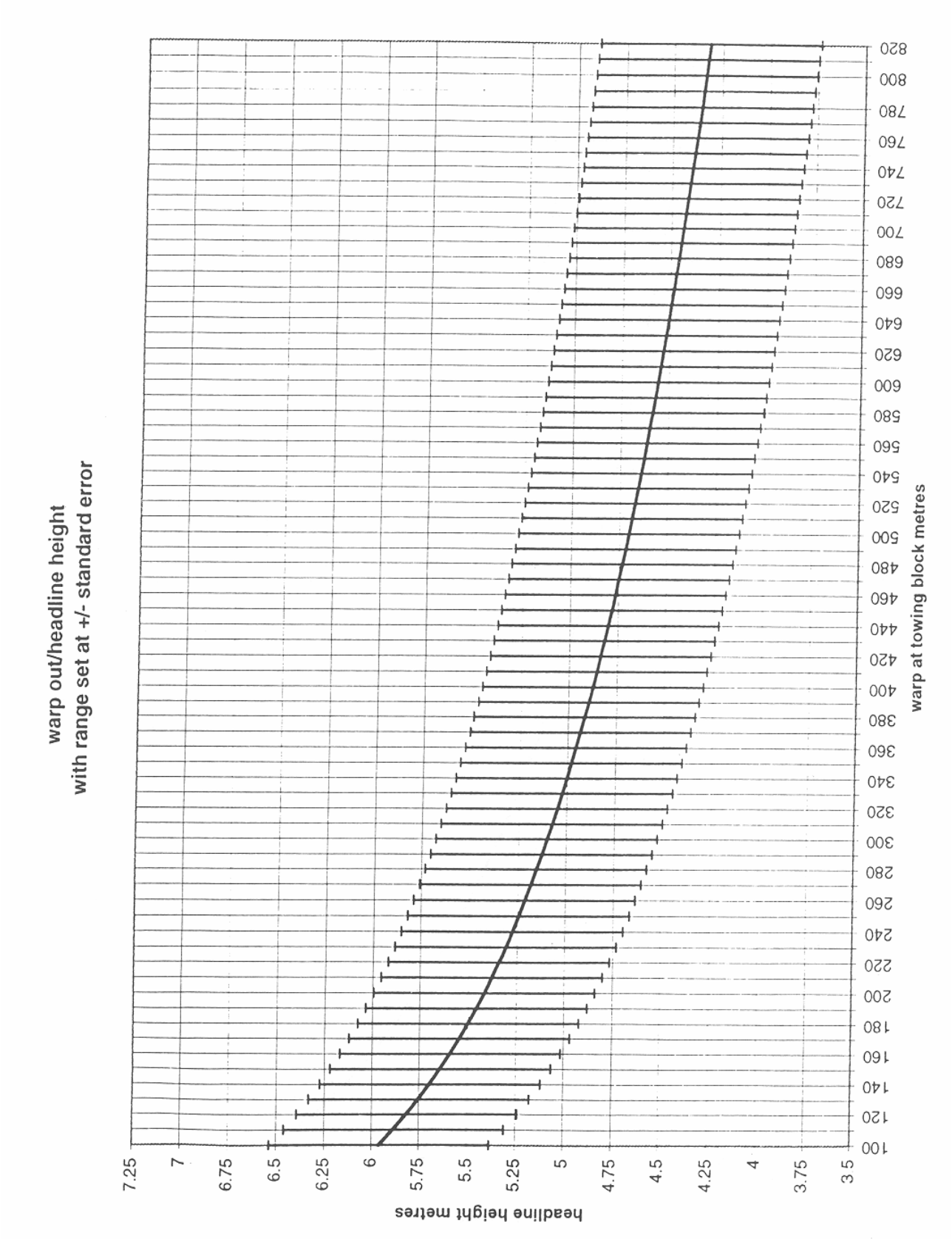


Figure 2.8 Expected warp out / headline height ratio.

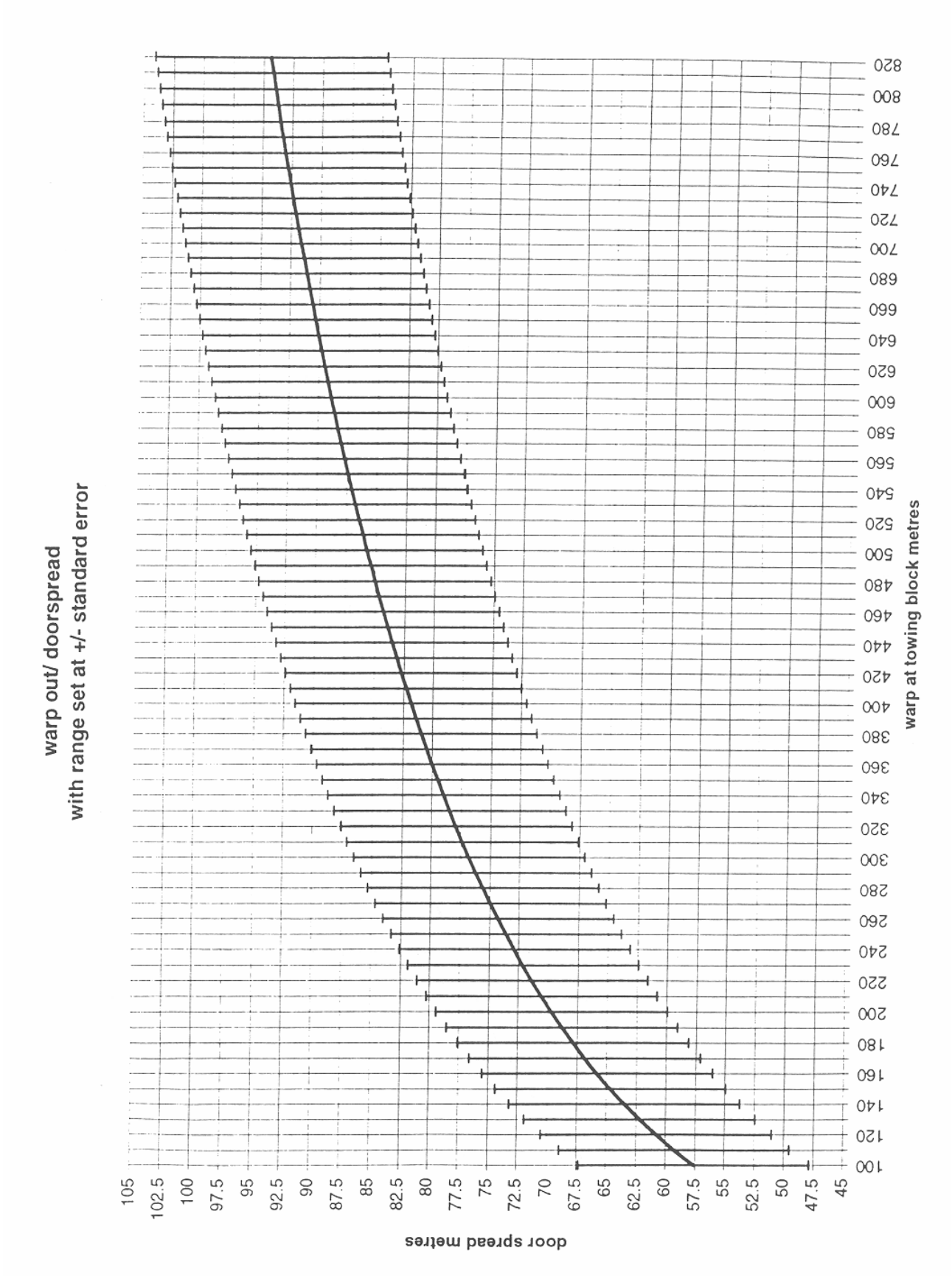


Figure 2.9 Expected warp out/door spread ratio.

3 SAMPLING OF GOV-TRAWL CATCHES

3.1 Length composition

Length distributions are recorded for all fish species caught. Length is defined as total length (measured from tip of snout to tip of caudal fin). Length is measured to 0.1cm below for shellfish, to 0.5 cm below for herring and sprat, and to 1 cm below for all other species. When measuring shellfish species, figures 3.1 to 3.4 should be consulted to ensure the correct carapace measurement is taken.

It is recommended that elasmobranch fishes should be measured and weighed by sex.

After sorting the catch into species or species/sex, we need to obtain a length distribution for each catch category that accurately represents the length distribution. Where the numbers of individuals are too large for them all to be measured (due to time constraints etc) a representative sub-sample is selected of at least 75 fish, although sampling a very limited length range could be adequately achieved with less. In the event that a truly representative sub-sample cannot be selected, it will be necessary to further sort the species into two or more size grades or categories. The following two examples are used to describe incidences when grading or categorisation may be required but are by no means exhaustive.

Example 1 - A catch element consists of 999 fish in the length range 18 - 26cm and one fish at 40cm. It is evident that a single sub-sample of 100 fish when raised up will give either 10 or zero fish at 40cm. The correct approach is to remove the one large fish and measure it separately, treating that sample as category 1, and take a sub-sample from the remaining 999 fish (category 2). When measured and raised this provides an accurate assessment of the numbers caught at each length for this element of the catch.

Example 2 - A catch element consists of 994 fish in the length range 18-26cm and 3 fish in the length range 10-12cm and 3 fish in the length range 38-40cm. It is evident that a single raised sub-sample of 100 fish could give anything between zero and 10 fish in the length ranges 10-12cm and 38-40cm. The correct approach is to remove the small and large fish and measure them as category 1, and then take a sub-sample from the remaining 994 fish (category 2). When measured and raised this provides an accurate assessment of the numbers caught in each length group for this element of the catch

In case of large catches (n > 1000) of any species, the minimum sample size given above should be doubled.

Fish should be identified to the species level. Only if this proves impossible may some be grouped by genus or larger taxonomic group (e.g. Pomatoschistus, Ammodytidae).

3.2 Sampling for Age, Sex and Maturity

Otolith samples are collected within 9 specified sampling areas as illustrated in Figure 6.2. For all species the same areas are used but care should be taken not to extract otoliths from fish that exhibit length deformities.

For the target species the following minimum sampling levels should be maintained for each sampling area:

herring	:	8 otoliths per $^1/_2$ cm group
sprat	:	16 otoliths per $^1/_2$ cm group 8.0-11.0cm
		12 otoliths per $^1/_2$ cm group >11.0cm
mackerel	:	8 otoliths per 1 cm group
cod	:	8 otoliths per 1 cm group
haddock	:	8 otoliths per 1 cm group
whiting	:	8 otoliths per 1 cm group
Norway pout	:	8 otoliths per 1 cm group
saithe	:	8 otoliths per 1 cm group

For the smallest size groups, that presumably contain only one age group, the number of otoliths per length class may be reduced. Conversely more otoliths per length are required for the larger length classes.

Participants are encouraged to collect age samples also from other commercially important species such as plaice and IIIa sole.

Sex and maturity data should be reported for all the target species for which age data are collected. Maturity stages should be reported according to the maturity scale given in Appendix VII and VIII.

Targets should be set to ensure that data are collected from the entire survey area.

3.3 Calculation of species abundance indices

When Quarter 1 data are submitted to ICES, the data are collated and abundance indices calculated. The data are combined from all surveys and expressed as number per hour per haul. Then, the average per rectangle is calculated. Next, depending on the combination of rectangles used to calculate the indices (Figure 6.4), the rectangles are combined and the mean catch per hour is calculated for a standard area, which is specific for each species. For herring, coastal rectangles used in the calculation are given a weight, depending on surface area and their depth (see Figure 6.5 for the weighting used for herring). For more information see ICES CM 1995/ASSESS:13, figure 2.3.1.

In Quarter 3, the countries involved in the surveys calculate the indices individually, using rectangle combinations defined by the institutes themselves.

Figure 3.1 Measurement and sexing of *Cancer pagurus*

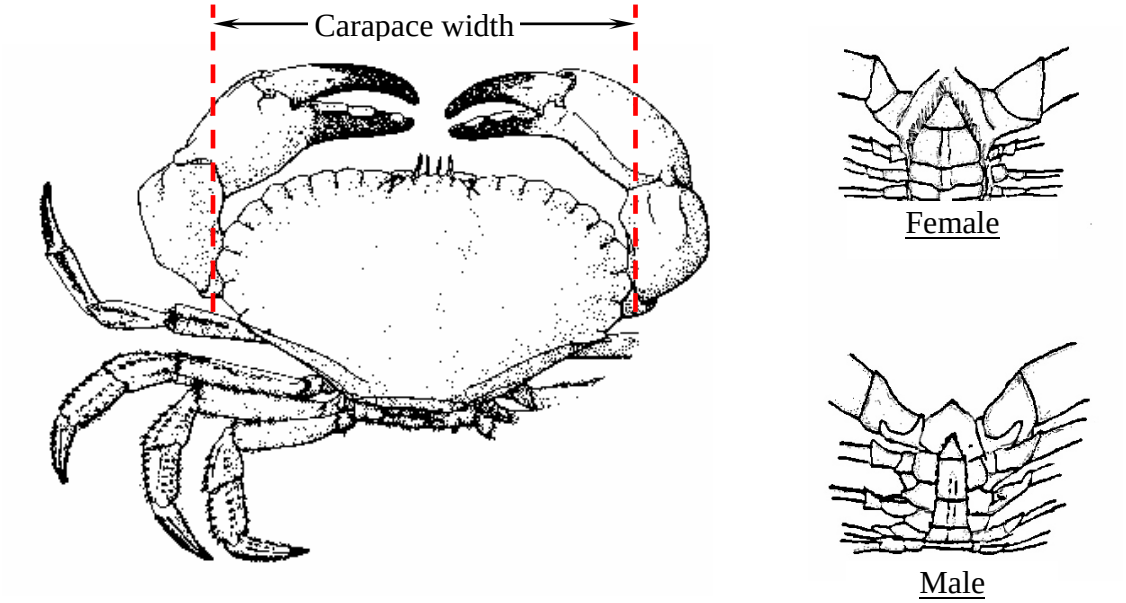


Figure 3.2 Measurement and sexing of *Maia squinado*

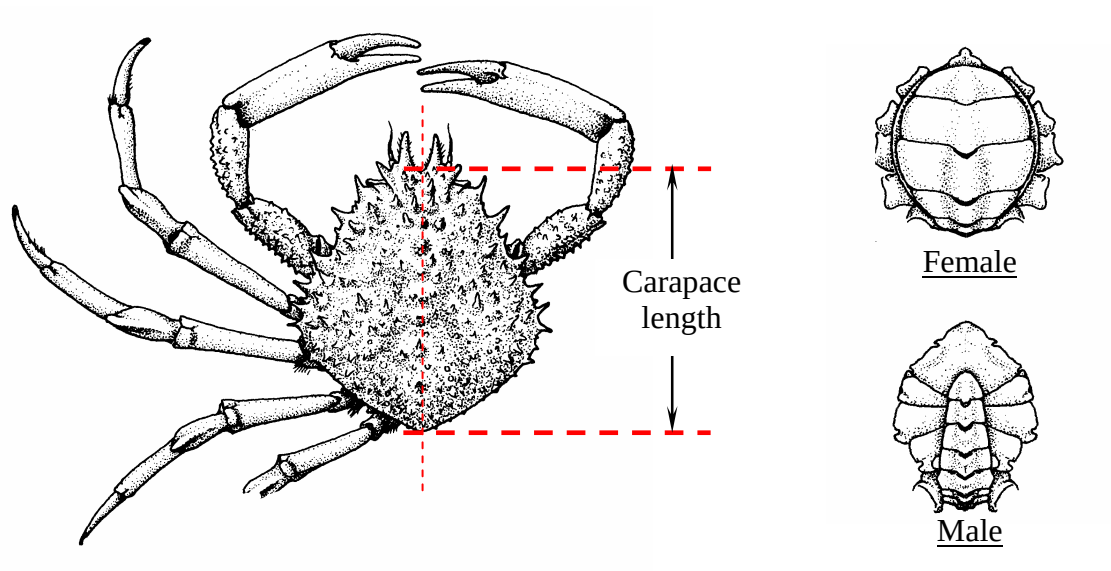


Figure 3.3 Measurement and sexing of *Nephrops norvegicus* and *Homarus gammarus*

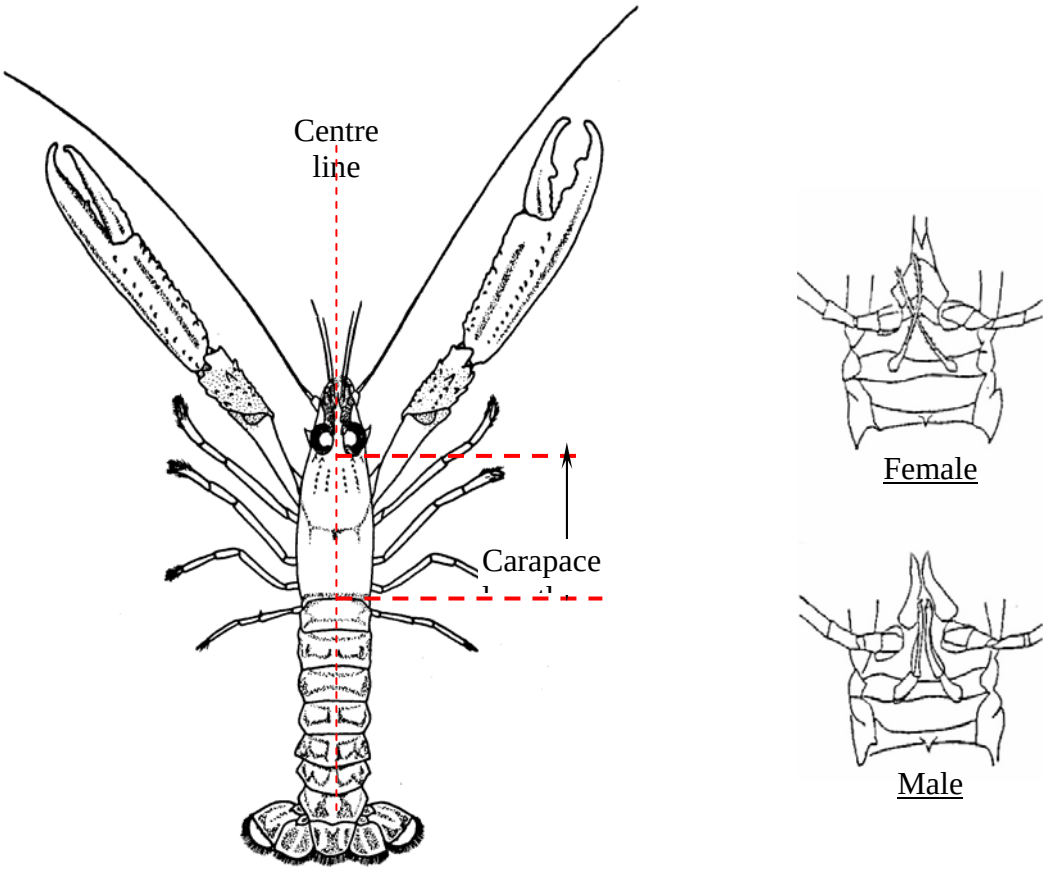
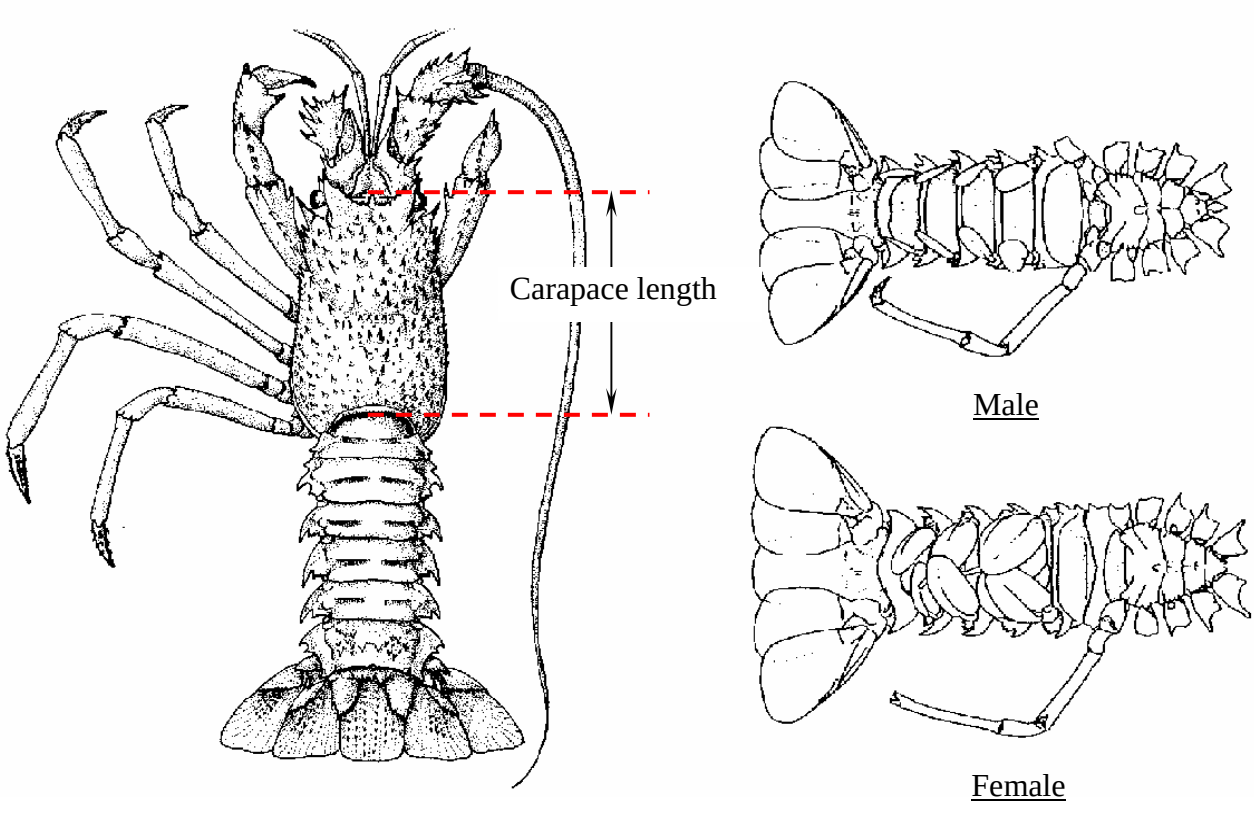


Figure 3.4 Measurement and sexing of Palinurus Spp



4 METHOT ISAAC KIDD NET

4.1 Construction and Rigging

The Methot Isaac Kidd (MIK) net is a midwater ring trawl and is the standard gear for the sampling of fish larvae during the International Bottom Trawl Survey in the first quarter.

The parts of the gear, as shown in Figures 4.1 and 4.2 are:

a) Ring of 2 meter diameter

b) Black net of 1.6 mm pore, 13 meter long, strengthened by nylon straps. In the last meter of the net a 500 mm net is inserted (b1)

c) Bolts for mounting the net on the ring

d) Saddle shaped weight of 25kg approx; weight dependent on weight of the 2m ring.

e) Pair of 10 meter long bridles to the gear

f) Pair of 3.0 meter long bridles to the weight

g) Bucket (Ø 11 cm) for collection of the plankton sample

h) Flow meter mounted on a string crossing the ring, positioned in the centre of the ring

4.2 Fishing Method

Because of the length of the bridles it is necessary to haul them through the block; thus a strong block is necessary, and the connection between bridle and hauling wire ought to be relatively small.

In order to monitor the distance of the gear to the bottom an echo sounder should be mounted, optionally wireless echo and/or depth sounder (e.g. SCANMAR) should be used. This should be placed in the lower part of the ring.

If no wireless sounder is available the transmitting cable could be relieved by use of a second, 9-10 meter long, pair of bridles as shown in Figure 4.3.

When the gear is put out the net should float freely, and the weight should be under water before the ring is lowered under water.

4.3 Sampling Procedure

Hauls should only be made during the period between 30 minutes past sunset to 30 minutes before sunrise (see table in section 2.3 for the definition of sunrise and sunset). If there is no cloud cover, i.e. the daylight period has been extended, and then fishing should not begin until 60 minutes after sunset and cease 60 minutes before sunrise.

Fishing speed is 3 knots through the water.

The haul profile is oblique to 5 meter above the bottom (i.e. measured from the lower part of the ring). Maximum depth of tow should, however, be 100 meter. If the haul duration of a single oblique haul is less than 10 minutes a double oblique haul must be made.

The wire is paid out at a speed of 25 meter per minute and retrieved at 15 m/min.

The flowmeter is read before and after each haul.

The duration and distance towed must be recorded.

The position of sampling is the shooting position.

On deck the hindmost part of the net (the 500 mm netting) is washed into the bucket.

4.4 Sample and Data Treatment

The samples should be preserved in either 4% formalin in fresh water or in 96% ethanol. Type of preservation should be indicated on the standard form (Figure 4.4).

It is recommended that lengths of larvae are measured after preservation. If measurements are made before preservation this should be indicated on the standard form (Figure 4.4).

Herring and sprat larvae should be identified, and their standard length (see Figure 4.5) measured to the millimetre below. If larvae are preserved in ethanol, approximately 30 minutes in fresh water will soften them, making measuring easier.

Catches of eel and volume of krill should also be indicated on the standard form. Optionally other species may be reported.

Preferably samples are processed and reported within one month after termination of the survey. The immediate reporting of herring and sprat catches (for the use of the Herring Assessment Working Group Meeting) should be made using the standard spreadsheet e-mailed to Peter Munk (pm@dfu.min.dk). Subsequently the standard forms (Figure 4.4) should be mailed to Peter Munk, Danish Institute for Fisheries DIFRES, Charlottenlund Castle, DK-2920 Charlottenlund, Denmark.

The data will be included in a database at DIFRES. A revised copy of the data will be available at the ICES Secretariat.

The standard areas for which the abundance of herring larvae is calculated is shown in Figure 6.6.

4.5 Calibration of the Flowmeter

The flowmeter used in the survey should be calibrated to revolutions per meter. One method is to tow the MIK (without the bucket) at a depth of about 10 meter for a known distance and make at least two measurements in opposite directions.

4.6 Allocation of Rectangles

At least 2 hauls per ship per rectangle are made within each standard rectangle and the distance between hauls within and between rectangles is at least 10 nm. In the Southern Bight abundance of herring larvae is very variable. Intensified sampling should therefore be carried out in this area.

If possible, more than 2 hauls per ship per rectangle should be made in the following rectangles: 30F1, 32F2, 32F3, 33F2, and 33F3.

Each year, the first quarter coordinator announces the allocation of rectangles to all participants.

During the survey the status of MIK-sampling should be reported to the coordinating vessel. If there is any risk that rectangles will be left unsampled then initiatives should be taken to reallocate sampling between participants.

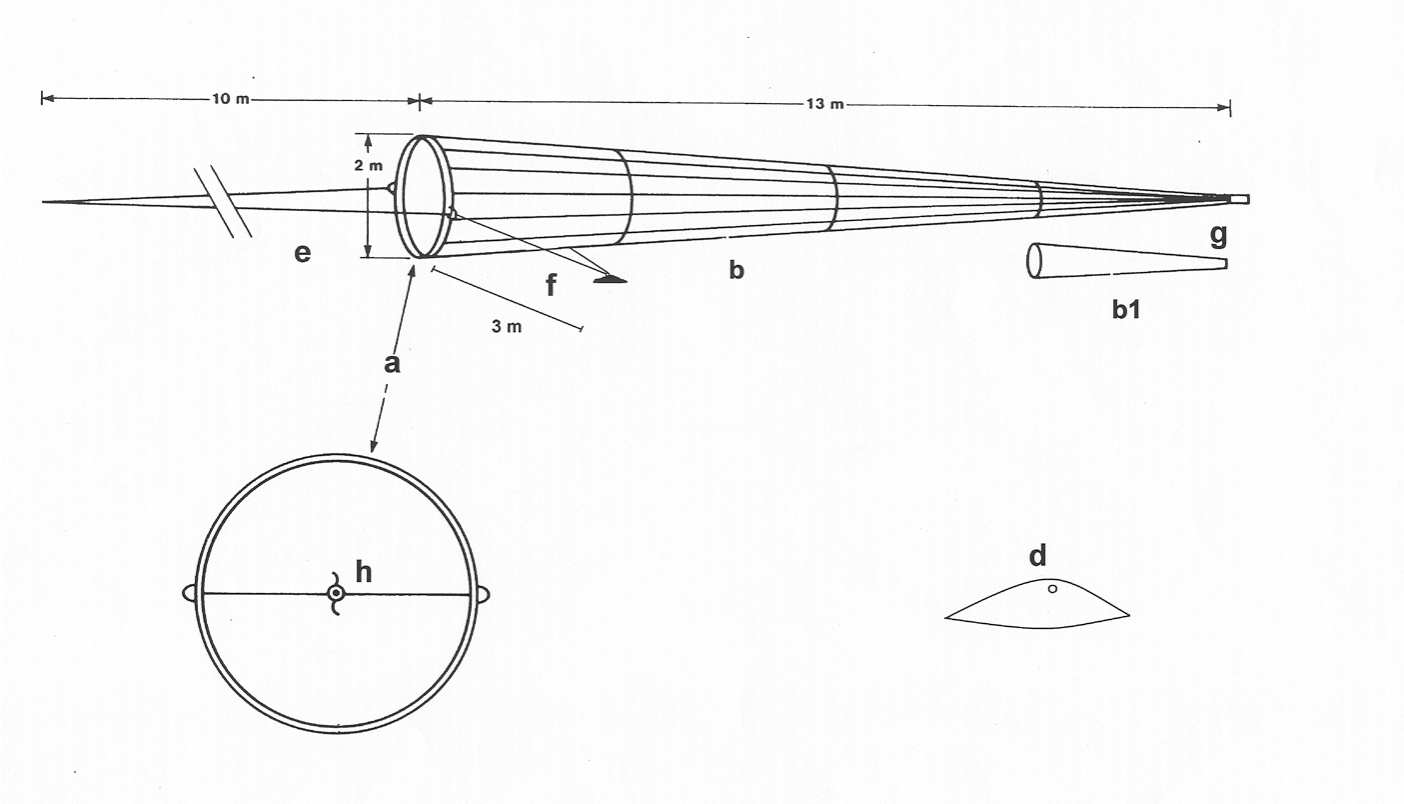


Figure 4.1 Construction and rigging of the MIK trawl. Letters refer to description in the text.

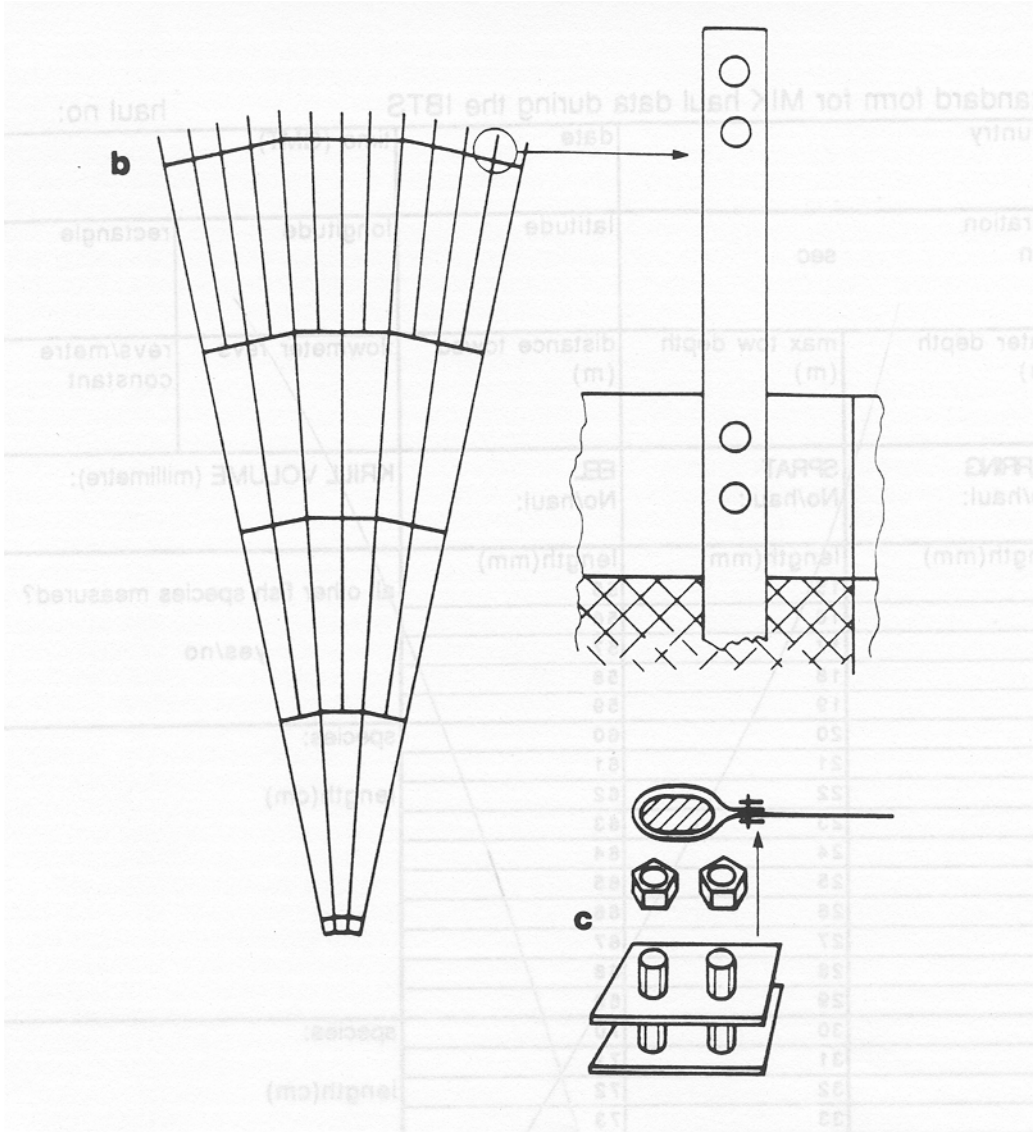


Figure 4.2 Unfolded net of the MIK midwater trawl and illustration of net attachment.

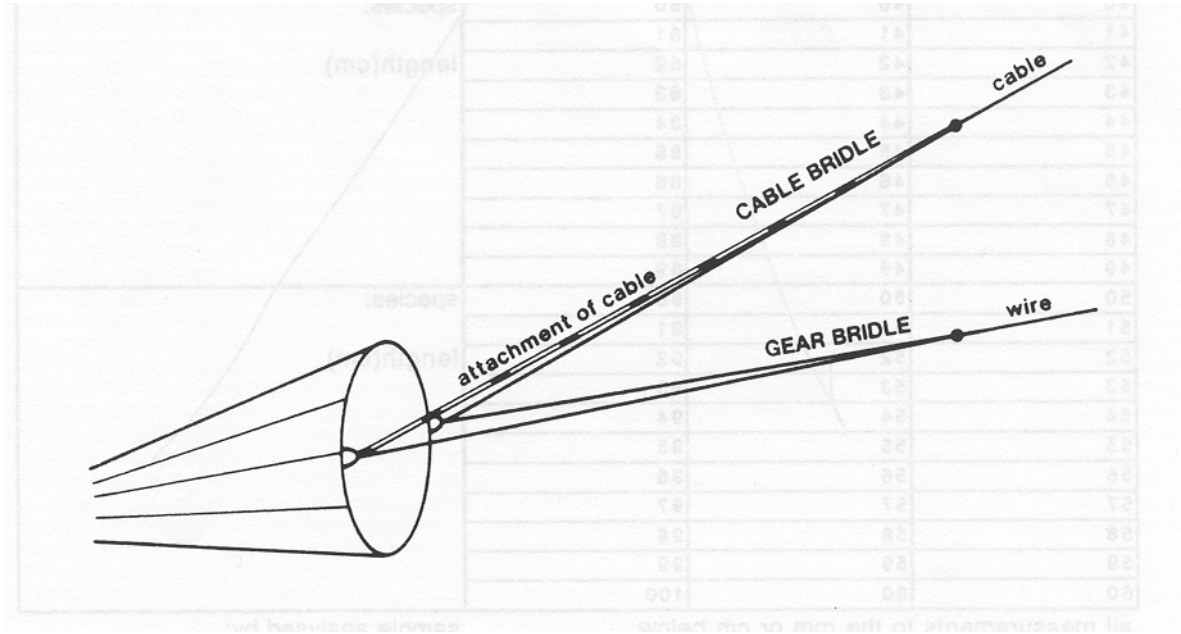


Figure 4.3 Proposed rigging of transmitting cable

Standard form for MIK haul data during the IBTS haul no:

country		date	time (GMT)	
duration min sec		latitude	longitude	rectangle
water depth (m)	max tow depth (m)	distance towed (m)	flowmeter revs	revs/metre constant
HERRING No/haul:	SPRAT No/haul:	EEL No/haul:	KRILL VOLUME (millilitre)	

length (mm)	length (mm)	length (mm)	
15	25	55	measured to millimetre below: yes / no
16	26	56	
17	27	57	preserved in ethanol: yes / no
18	28	58	
19	29	59	
20	30	60	species:
21	31	61	
22	32	62	length (cm)
23	33	63	
24	34	64	
25	35	65	
26	36	66	
27	37	67	
28	38	68	
29	39	69	
30	40	70	species:
31	41	71	
32	42	72	length (cm)
33	43	73	
34	44	74	
35	45	75	
36	46	76	
37	47	77	
38	48	78	
39	49	79	
40	50	80	species:
41	51	81	
42	52	82	length (cm)
43	53	83	
44	54	84	
45	55	85	
46	56	86	
47	57	87	
48	58	88	
49	59	89	
50	60	90	species:
51	61	91	
52	62	92	length (cm)
53	63	93	
54	64	94	
55	65	95	
56	66	96	
57	67	97	
58	68	98	
59	69	99	
60	70	100	

all measurements to the mm or cm below
see IBTS Manual for guidelines

sample analysed by:

Figure 4.4 Standard form for MIK haul data

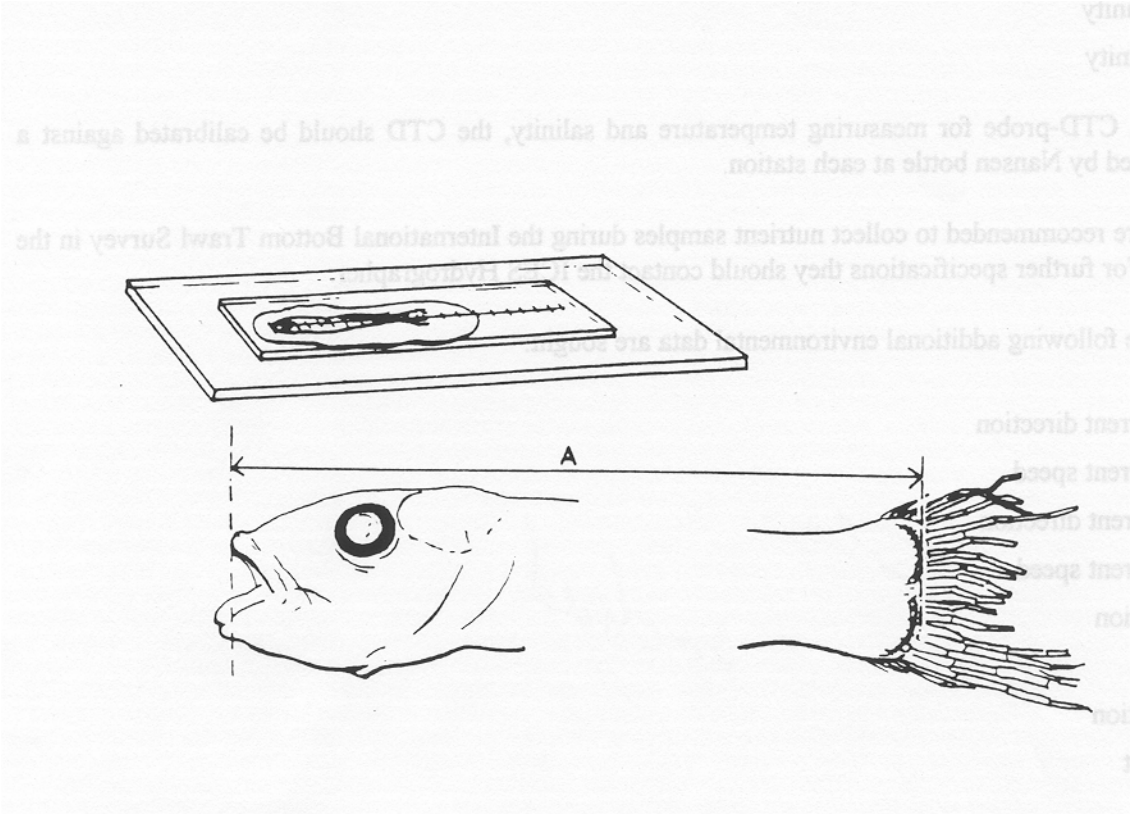


Figure 4.5 Measurement of standard length of herring and sprat larvae (to the millimetre below)

5 ENVIRONMENTAL DATA

After or during each haul with the GOV trawl, the following minimum hydrographical data are collected:

- surface temperature
- bottom temperature
- surface salinity
- bottom salinity

When using a CTD-probe for measuring temperature and salinity, an appropriate calibration should be undertaken.

Participants are recommended to collect nutrient samples during the International Bottom Trawl Survey in the first quarter. For further specifications they should contact the ICES Hydrographer.

Since 1992 the following additional environmental data are sought:

- surface current direction
- surface current speed
- bottom current direction
- bottom current speed
- wind direction
- wind speed
- swell direction
- swell height

The above parameters should be reported in the 'Haul Information file HH' (Appendix IX).

6 EXCHANGE SPECIFICATIONS FOR IBTS DATA

Three distinct types of computer records have been defined for standard storage of the IBTS data:

Type 1: HH - Record with detailed haul information (Appendix IX)
Type 2: HL -Length frequency data (Appendix X)
Type 3: CA - Sex-maturity-age-length keys (SMALK) (Appendix XI)

The summaries of the formats of these record types are given in the appendices given above, and detailed descriptions can also be found at the ICES web page: http://www.ices.dk/datacentre/datsu/selrep.asp.

When data are submitted to ICES it is important to give details of the data, such as the number of records of each record type, and the number of CA-records per species.

Provisional data obtained from the North Sea and Skagerrak/Kattegat should be submitted to the quarterly coordinator as soon as possible after completion of the cruise. Appendix XIII lists the length splits for the various target species. Final data should only be submitted to the ICES Secretariat after the national institute has checked the data (see section 6 for format) using official checking programs issued by ICES.

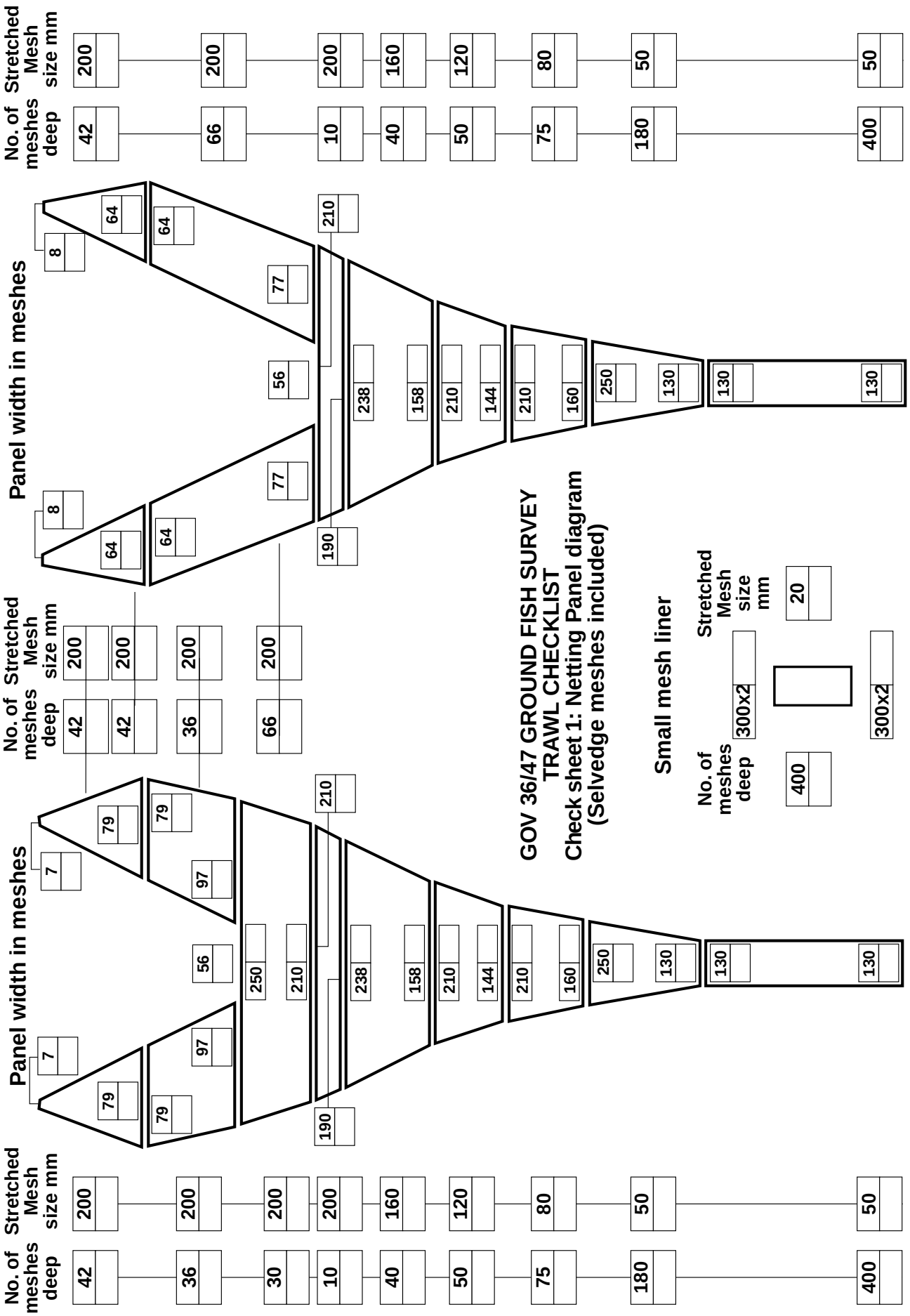
NB:

Details of environmental data should be submitted to the Hydrographic Service of ICES according to established procedures. The national hydrographic station number must be reported in Record Type 1 to enable the link to be made between haul data and environmental data.

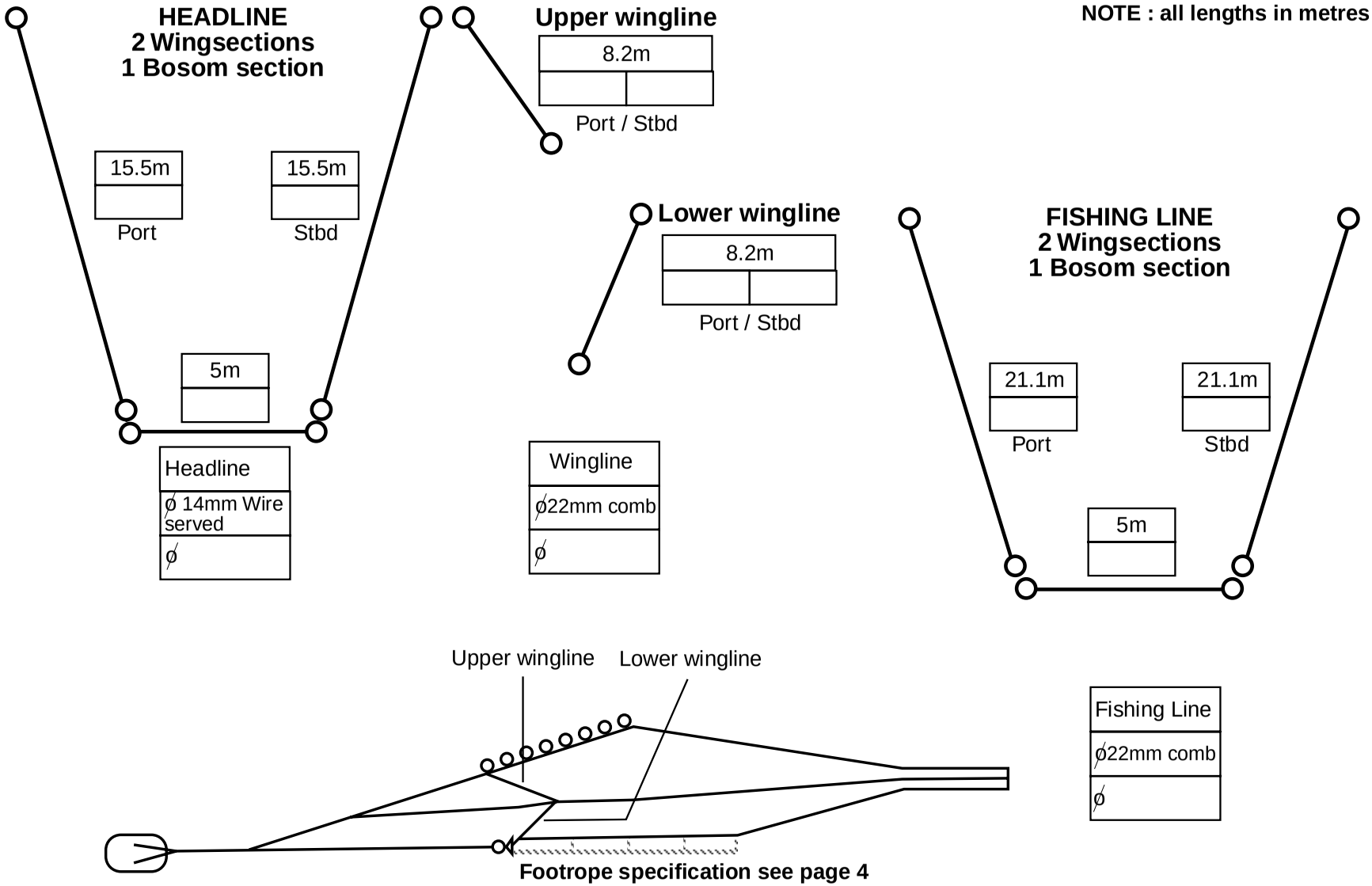
APPENDIX I - CHRONOLOGY OF THE INTERNATIONAL BOTTOM TRAWL SURVEY

1960-1961	Spring and autumn trawl surveys to map distribution of herring
1966	Annual surveys in the southern and central North Sea established to obtain recruitment indices for the combined North Sea herring stocks - the International Young Herring Survey (IYHS).
1969	Skagerrak and Kattegat included in survey area
1970's	Many different survey trawls being used by various institutes carrying out different surveys in the North Sea, Skagerrak and Kattegat, amongst them the Dutch Herring Trawl, GOV and Herring Trawl
1974	Northern North Sea included in survey area to collect data for gadoids
1975	Recommendation for participants in IYHS to use Isaacs-Kidd midwater trawl to fish for herring larvae at night
1976	Some participants start to fish ½ hour tows in order to reduce gear damage and increase numbers of hauls per day
1977	IYHS Working Group and Gadoid I-Group Working Group recommend that all participants change to ½ hour tow duration. Working Groups also recommend that from 1978 the GOV trawl be the standard gear for future surveys. At least 4 countries were to use this gear in 1978, with other participants changing over to the GOV at the earliest possible occasion
1981	Survey was renamed the International Young Fish Survey (IYFS)
1983	GOV accepted as the standard survey gear for the IYFS. All participating nations use the GOV for there standard survey grid
1984	ICES 'Working Group on Young Herring Surveys' and the 'Gadoid 1-Group Working Group' were combined to form the International Young Fish Survey (IYFS) Working Group.
1990	IYFS WG proposed to combine the IYFS and other national surveys into Quarterly Co-ordinated Surveys in the North Sea, Skagerrak and Kattegat, which were to be called the International Bottom Trawl Surveys (IBTS).
1991-1996	Quarterly surveys undertaken
1997	National financial constraints reduce co-ordinated surveys to quarter 1 and quarter 3 with target coverage of 2 hauls per ICES rectangle per survey.

APPENDIX II – IBTS STANDARD GEAR CHECK SHEET 1



GOV 36/47 GROUND FISH SURVEY TRAWL CHECKLIST
Check Sheet 2: Frame ropes daigram

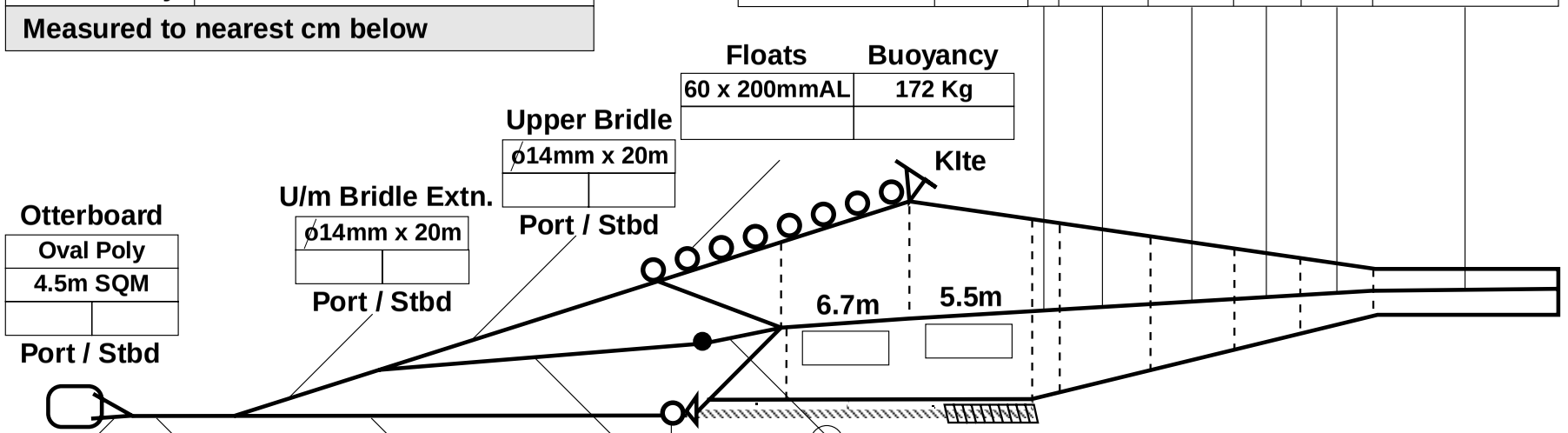


Footrope specification see page 4

GOV 36/47 GROUND FISH SURVEY TRAWL CHECKLIST
Check sheet 3: Overall rigging diagram

Vessel	
Cruise	
Date	
Checked by	
Checked by	
Measured to nearest cm below	

Ribline longer than netting (length for length)	YES						
	NO						

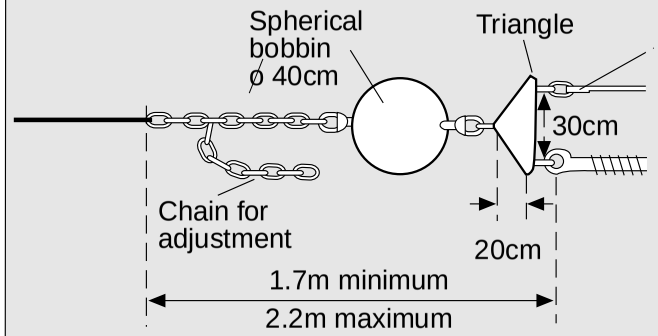


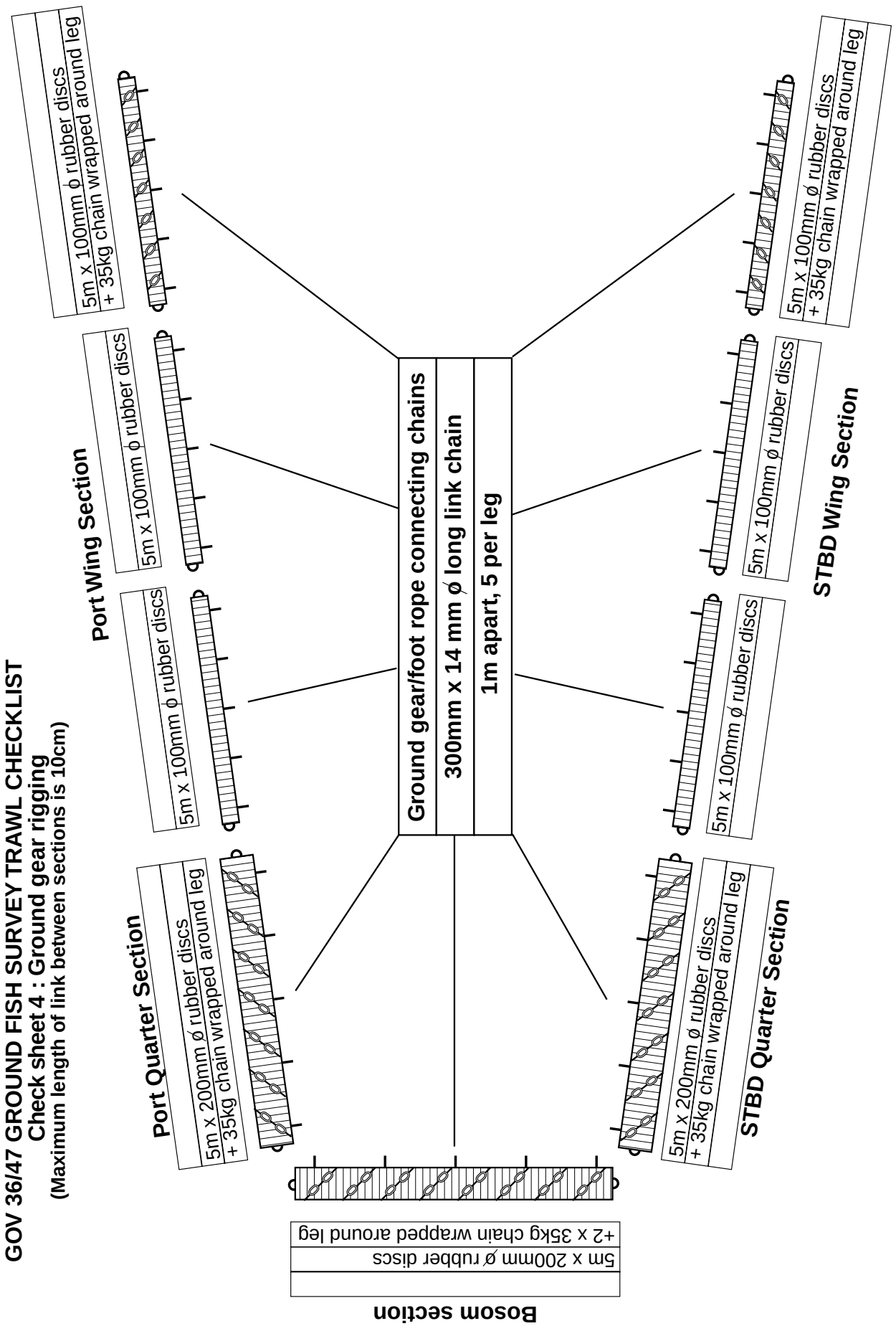
Sweep	Lower Bridle	Middle Bridle	M. Bridle Extn.
ø22mm	ø20mm x 38m	ø14mm x 20m	ø14mm x 7.1m
Port / Stbd	Port / Stbd	Port / Stbd	Port / Stbd

	Upper / Lower
Backstrop	
Port	
Stbd	
Backstrop Extn.	
Port	
Stbd	

Sweep length + Backstrop length + Backstrop extension length (if used) should total 60m overall.

Details of rigging adjustments




GOV 36/47 GROUND FISH SURVEY TRAWL CHECKLIST
Check sheet 4 : Ground gear rigging
(Maximum length of link between sections is 10cm)
Ground gear/foot rope connecting chains
300mm x 14 mm ø long link chain
1m apart, 5 per leg
Port Wing Section
5m x 100mm ϕ rubber discs
5m x 100mm ϕ rubber discs
+ 35kg chain wrapped around leg
Port Quarter Section
5m x 200mm ø rubber discs
+ 35kg chain wrapped around leg
STBD Wing Section
5m x 100mm ø rubber discs
5m x 100mm ø rubber discs
+ 35kg chain wrapped around leg
STBD Quarter Section
5m x 200mm ø rubber discs
+ 35kg chain wrapped around leg
Bosom section
5m x 200mm ø rubber discs
+2 x 35kg chain wrapped around leg

APPENDIX VI – IBTS CLEAR TOW DATA

Required information:
- Country
- Year
- Shoot position
- Haul position
- Accuracy
- Rectangle
- Gear
- Haul validity

Country: code as per standard 3-letter code (ICES exchange format)

Year: full format e.g. 1992

Shoot position: degrees decimal minutes if possible please

Haul position: idem

Accuracy: accuracy to which position data was recorded as decimal places, e.g.:

50 35.25	=	accuracy code 2
50 35.3	=	accuracy code 1
50 35	=	accuracy code 0 (data this coarse is not really any use)

Rectangle: ICES rectangle

Gear: as per code below

Description	Options
Gear type (3 characters)	GOV
Sweep length (metres)	60/110
Groundrope type (standard or bobbins)	S/B

Haul validity: V = valid, I = invalid

Acceptable file formats are:

Format	Extension
Excel	.XLS
Lotus 1-2-3	.WK?
Dbase3	.DBF
Comma separated	.CSV

APPENDIX VII – FINFISH MATURITY KEY

1. IMMATURE

Male	Testes very thin translucent ribbon lying along an unbranched blood vessel. No sign of development.
Female	Ovaries small, elongated, whitish, translucent. No sign of development.

2. MATURING

Male	Development has obviously started, colour is progressing towards creamy white and the testes are filling more and more of the body cavity but sperm cannot be extruded with only moderate pressure.
Female	Development has obviously started, eggs are becoming larger and the ovaries are filling more and more of the body cavity but eggs cannot be extruded with only moderate pressure.

3. SPAWNING

Male	Will extrude sperm under moderate pressure to advanced stage of extruding sperm freely with some sperm still in the gonad.
Female	Will extrude eggs under moderate pressure to advanced stage of extruding eggs freely with some eggs still in the gonad.

4. SPENT

Male	Testes shrunken with little sperm in the gonads but often some in the gonoducts which can be extruded under light pressure. Resting condition firm, not translucent, showing no development.
Female	Ovaries shrunken with few residual eggs and much slime. Resting condition, firm, not translucent, showing no development.

APPENDIX VIII - FOUR STAGE MATURITY KEY FOR SKATES AND RAYS (RAJIDAE)

STAGE	MALE	FEMALE
A	Immature: Claspers undeveloped, shorter than extreme tips of posterior margin of pelvic fin. Testes small and thread-shaped.	Immature: Ovaries small, gelatinous or granulated, but with no differentiated oocytes visible. Oviducts small and thread-shaped, width of shell gland not much greater than the width of the oviduct.
B	Maturing: Claspers longer than posterior margin of pelvic fin, their tips more structured, but the claspers are soft and flexible and the cartilaginous elements are not hardened. Testes enlarged, sperm ducts beginning to meander.	Maturing: Ovaries enlarged and with more transparent walls. Oocytes differentiated in various small sizes (<5mm). Oviducts small and thread-shaped, width of the shell gland greater than the width of the oviduct, but not hardened.
C	Mature: Claspers longer than posterior margin of pelvic fin, cartilaginous elements hardened and claspers stiff. Testes enlarged, sperm ducts meandering and tightly filled with sperm.	Mature: Ovaries large with enlarged oocytes (>5mm), with some very large, yolk-filled oocytes (ca. 10mm) also present. Uteri enlarged and wide, shell gland fully formed and hard.
D	Active: Claspers reddish and swollen, sperm present in clasper groove, or flows if pressure exerted on cloaca.	Active: Egg capsules beginning to form in shell gland and partially visible in uteri, or egg capsules fully formed and hardened and in oviducts/uteri.

APPENDIX IX – HAUL INFORMATION

Explanations of the various field names and data types can be found on the ICES web page:
http://www.ices.dk/datacentre/datsu/selrep.asp

HH

Start/Order	Field Name	Width	Mandatory	Data Type
1	RecordType	2	✓	char
2	Quarter	1	✓	int
3	Country	3	✓	char
4	Ship	4	✓	char
5	Gear	6	✓	char
6	SweepLngt	3		int
7	GearExp	2		char
8	DoorType	2		char
9	StNo	6	✓	char
10	HaulNo	3	✓	int
11	Year	4	✓	char
12	Month	2	✓	int
13	Day	2	✓	int
14	TimeShot	4		char
15	Stratum	4		char
16	HaulDur	3	✓	int
17	DayNight	2	✓	char
18	ShootLat	8	✓	decimal4
19	ShootLong	9	✓	decimal4
20	HaulLat	8	✓	decimal4
21	HaulLong	9	✓	decimal4
22	StatRec	4		char
23	Depth	4	✓	int
24	HaulVal	1	✓	char
25	HydroStNo	8	✓	char
26	StdSpecRecCode	1	✓	char
27	BycSpecRecCode	1	✓	char
28	DataType	2	✓	char
29	Netopening	4		decimal1
30	Rigging	2		char
31	Tickler	2		int
32	Distance	4		int
33	Warplngt	4		int
34	Warpdia	2		int
35	WarpDen	2		int
36	DoorSurface	4		decimal1
37	DoorWgt	4		int
38	DoorSpread	3		int
39	WingSpread	2		int
40	Buoyancy	4		int
41	KiteDim	3		decimal1
42	WgtGroundRope	4		int

43	TowDir	3		int
44	GroundSpeed	3		decimal1
45	SpeedWater	3		decimal1
46	SurCurDir	3		int
47	SurCurSpeed	4		decimal1
48	BotCurDir	3		int
49	BotCurSpeed	4		decimal1
50	WindDir	3		int
51	WindSpeed	3		int
52	SwellDir	3		int
53	SwellHeight	4		decimal1
54	SurTemp	4		decimal1
55	BotTemp	4		decimal1
56	SurSal	5		decimal2
57	BotSal	5		decimal2
58	ThermoCline	2		char
59	ThClineDepth	4		int

APPENDIX X – LENGTH FREQUENCY INFORMATION

HL

Start/Order	Field Name	Width	Mandatory	Data Type
1	RecordType	2	✓	char
2	Quarter	1	✓	int
3	Country	3	✓	char
4	Ship	4	✓	char
5	Gear	6	✓	char
6	SweepLngt	3		int
7	GearExp	2		char
8	DoorType	2		char
9	StNo	6	✓	char
10	HaulNo	3	✓	int
11	Year	4	✓	char
12	SpecCodeType	1	✓	char
13	SpecCode	10	✓	char
14	SpecVal	2	✓	char
15	Sex	2		char
16	TotalNo	7		decimal2
17	CatIdentifier	2	✓	int
18	NoMeas	3	✓	int
19	SubFactor	9	✓	decimal4
20	SubWgt	5		int
21	CatCatchWgt	8	✓	int
22	LngtCode	2	✓	char
23	LngtClass	3	✓	int
24	HLNoAtLngt	6	✓	int

APPENDIX XI – SMALK

CA

Start/Order	Field Name	Width	Mandatory	Data Type
1	RecordType	2	✓	char
2	Quarter	1	✓	int
3	Country	3	✓	char
4	Ship	4	✓	char
5	Gear	6	✓	char
6	SweepLngt	3		int
7	GearExp	2		char
8	DoorType	2		char
9	StNo	6	✓	char
10	HaulNo	3	✓	int
11	Year	4	✓	char
12	SpecCodeType	1	✓	char
13	SpecCode	10	✓	char
14	AreaType	2	✓	Char (Appendix XII)
15	AreaCode	4	✓	char
16	LngtCode	2	✓	char
17	LngtClass	3	✓	int
18	Sex	2	✓	char
19	Maturity	2	✓	char
20	PlusGr	2	✓	char
21	age	2		int
22	CANoAtLngt	3	✓	int
23	IndWgt	5		int

N.B. When sending information on herring in 1st Quarter, number of rings should be substituted for age.

APPENDIX XII – AREA TYPE CODES: SAMPLING AREAS AND STANDARD AREAS FOR THE CALCULATION OF ABUNDANCE INDICES

AREA TYPE CODES

0	=	ICES Statistical Rectangles	See CM 1977/Gen:3.
1	=	Four Statistical Rectangles	See Figure 6.1
2	=	Standard Roundfish Areas	See Figure 6.2
3	=	Herring Sampling Areas	See Figure 6.3

NB: There has been confusion in the definition of herring areas in the past and for some years no ALK's may have been collected for areas 14, 15 and 67, in which case these areas must be considered as subsets of 12, 13 and 63 respectively. The Skagerrak/ Kattegat areas have also not always been distinguished in which case the appropriate code should be 80. See Figure 6.3

APPENDIX XIII – LENGTH SPLITS USED TO PROVIDE PRELIMINARY NUMBERS AT AGE

Age	0-group			1-group			
Quarter	2	3	4	1	2	3	4
Cod	11	18	23	25	33	38	44
Haddock	12	17	20	20	27	30	32
Whiting	9	17	20	20	23	24	26
Norway pout	-	13	14	15	15	16	20
Herring	-	15.5	17.5	20.0	21.0	23.0	24.5
Sprat	-	-	10.0	10.0	10.5	13.0	14.0
Mackerel	-	17	24	25	25	30	31
Saithe	-	22	25	25	25	33	38
Plaice	-	10	12	-	-	19	21

NB: The lengths indicated are 'less than' lengths: 0-group cod in quarter 2 are fish <11 cm.

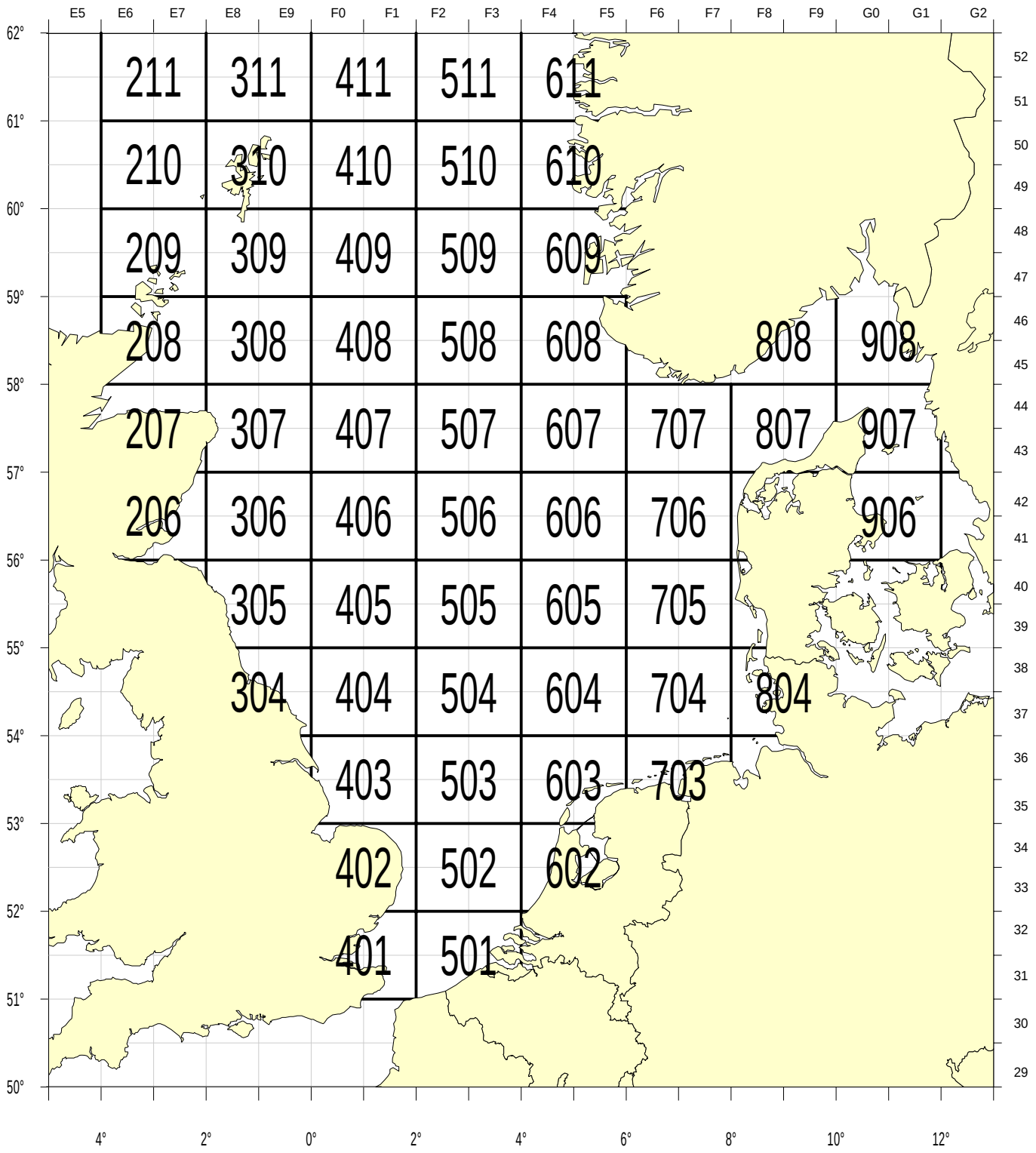


Figure 6.1 Four Statistical Rectangles: used for sampling roundfish otoliths up to and including 1979, for herring up to and including 1982.

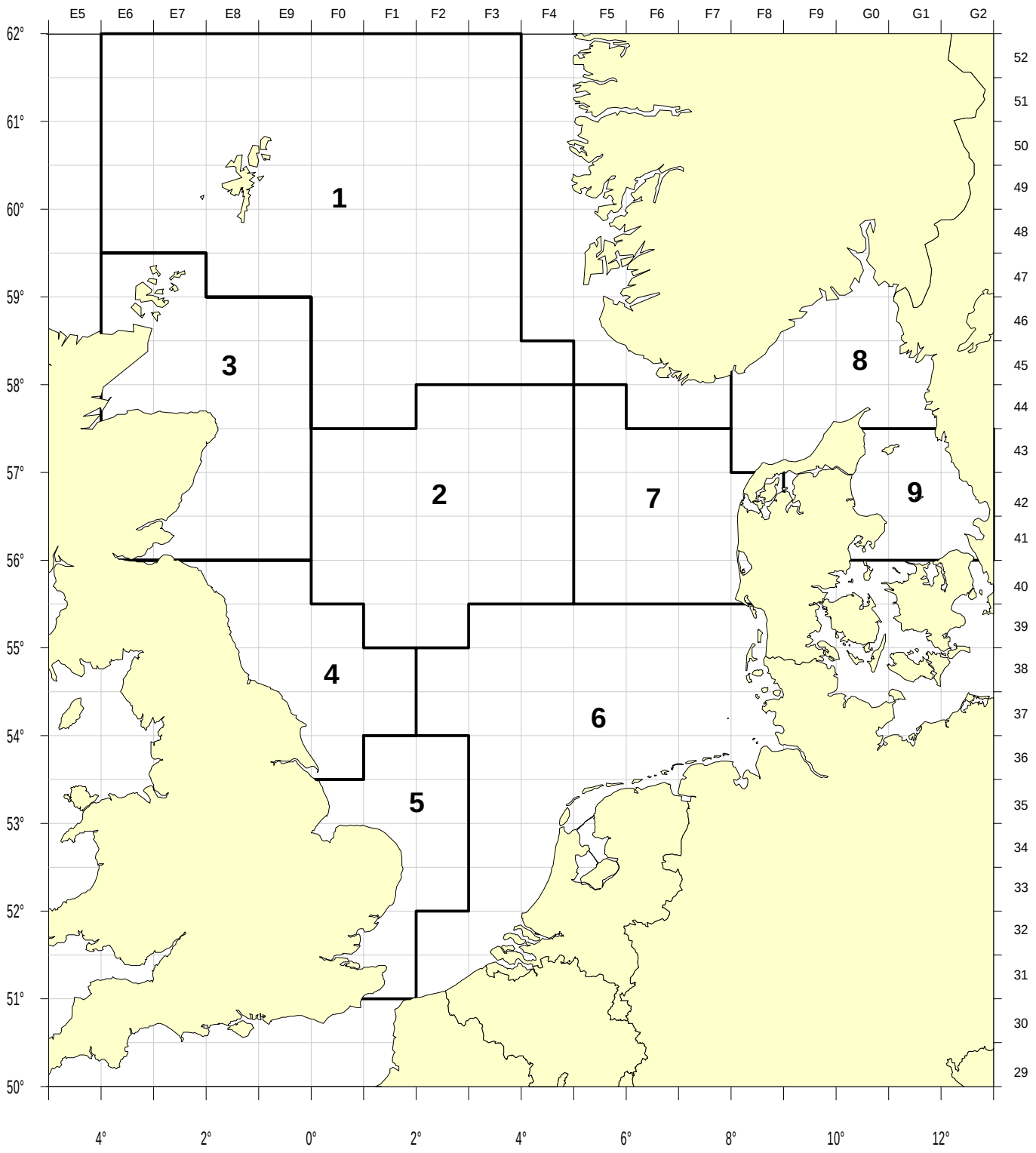


Figure 6.2 Standard Roundfish Areas: used for roundfish since 1980, for all standard species since 1991.

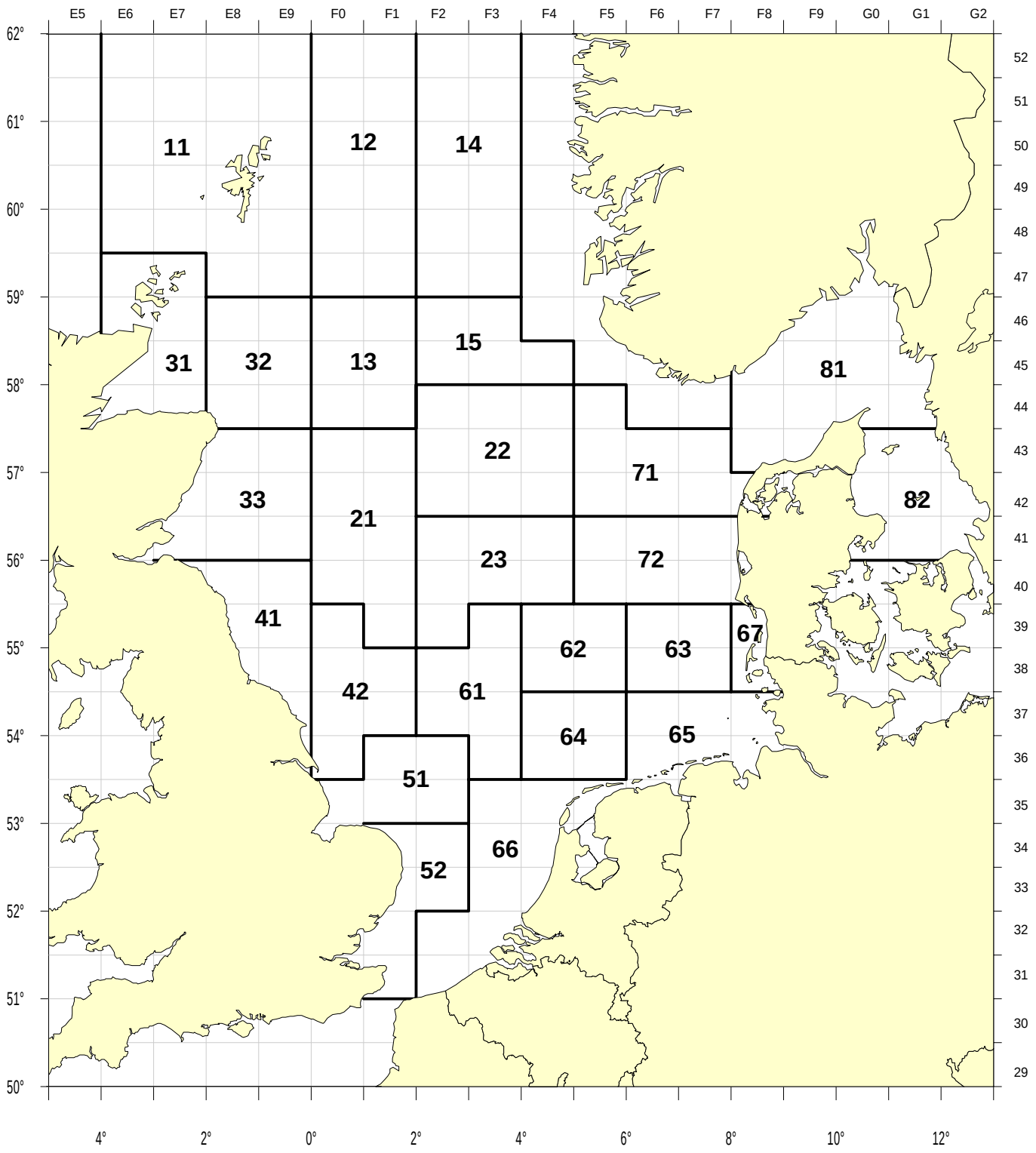


Figure 6.3 Herring Sampling Areas: used in the period 1983-1990.

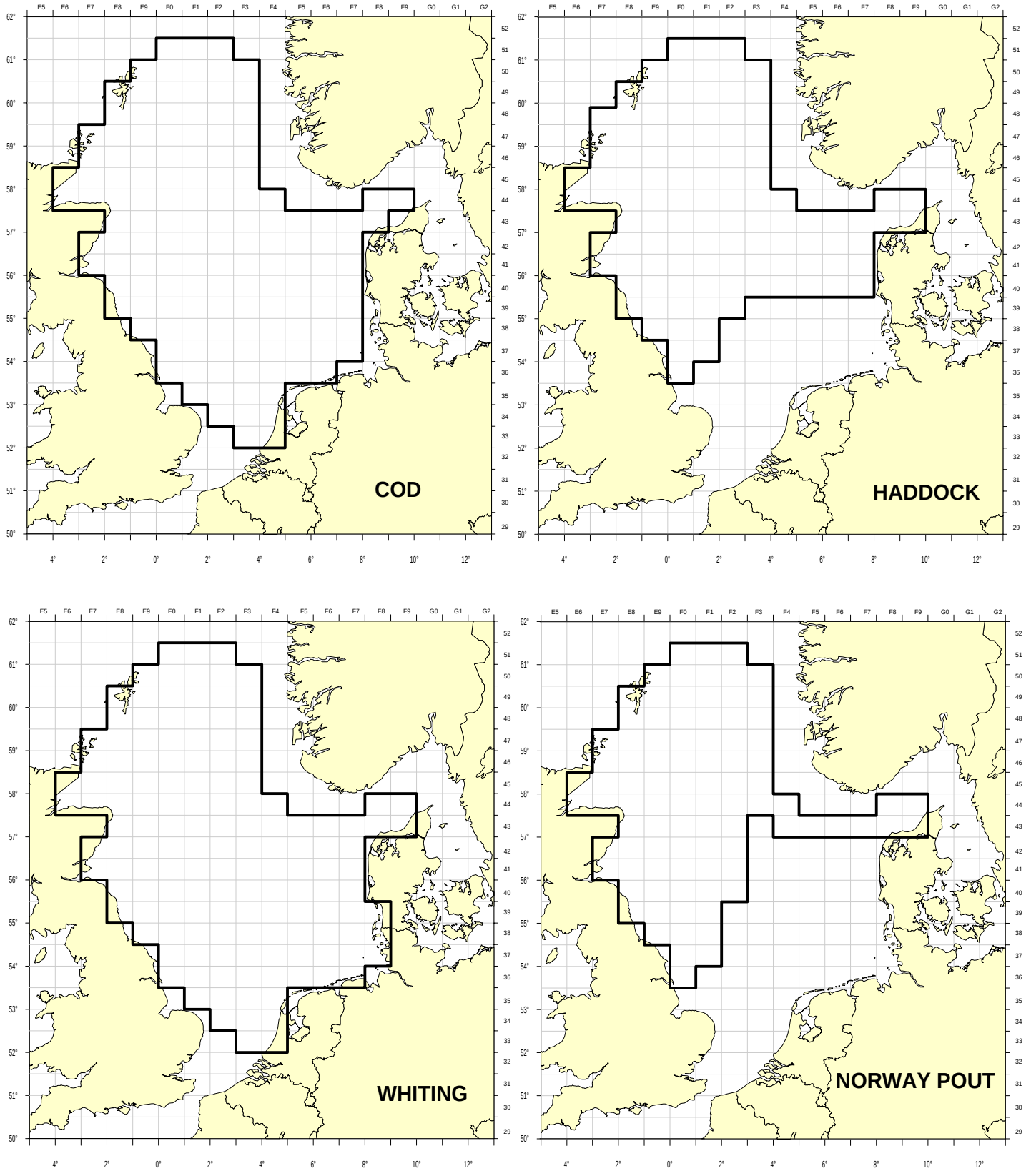


Figure 6.4 Standard areas for the calculation of the IBTS abundance indices in Quarter 1. Information obtained from DATRAS database at ICES.

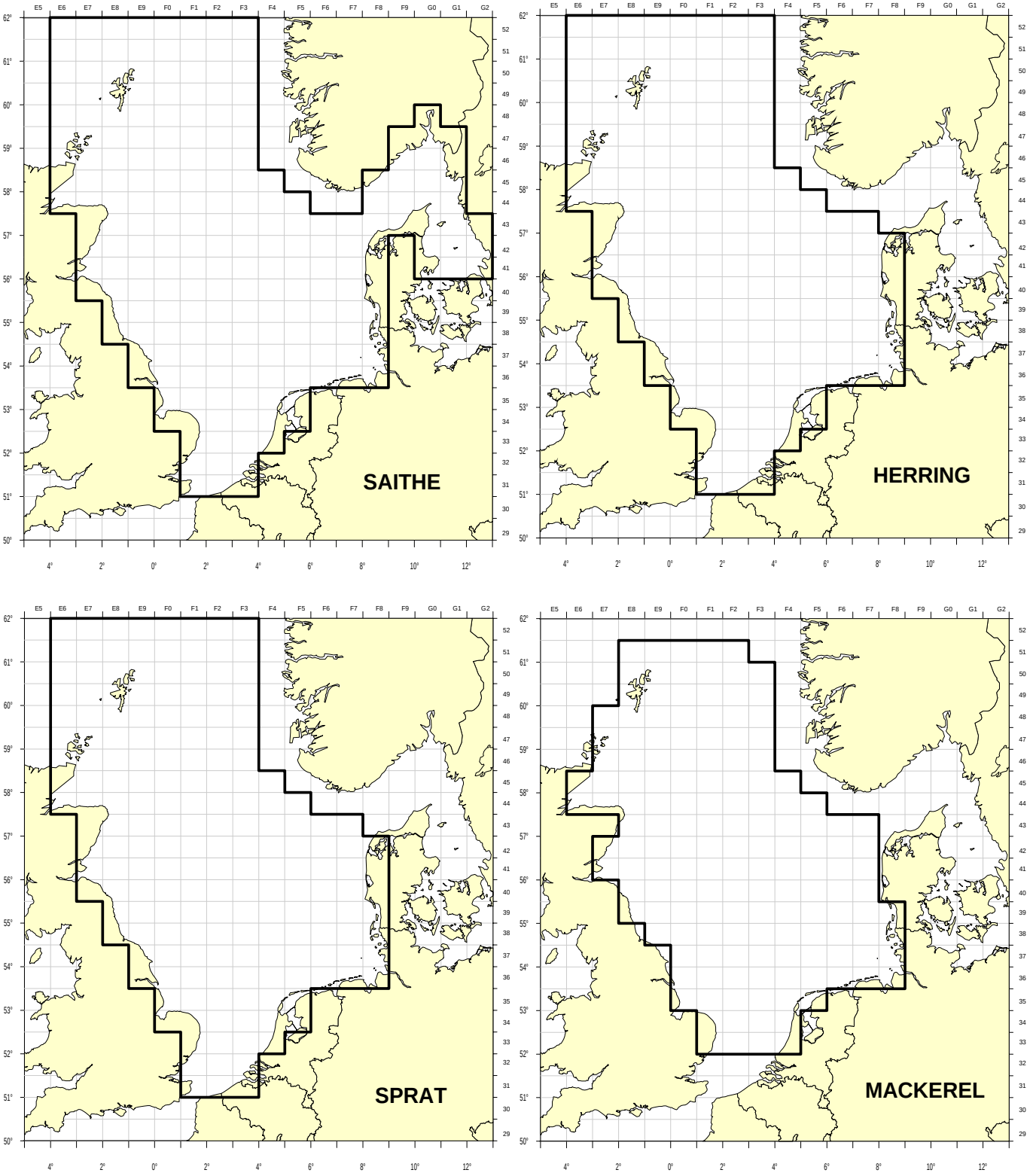


Figure 6.4 Continued

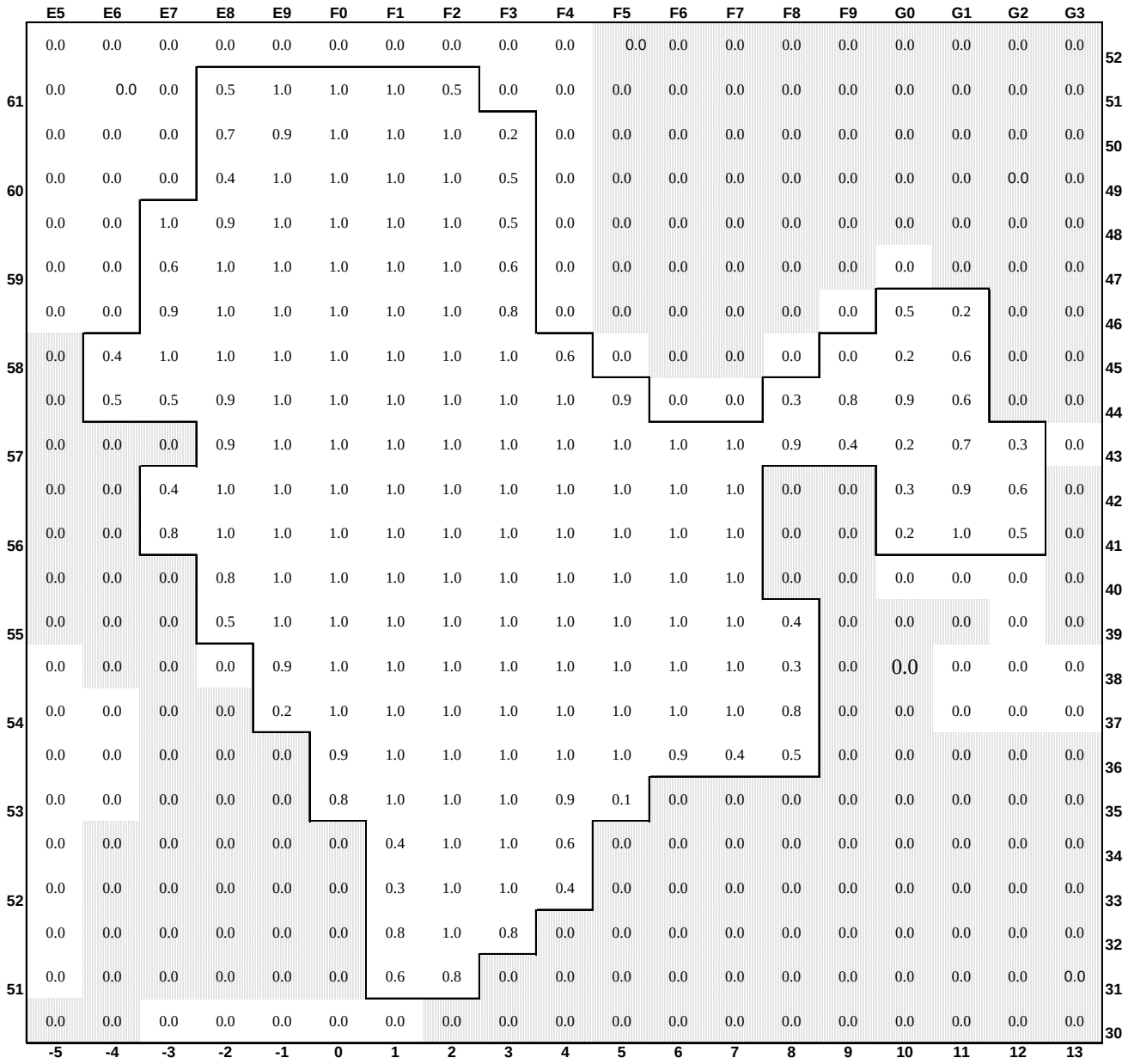


Figure 6.5 Rectangle weightings applied to calculate herring indices.

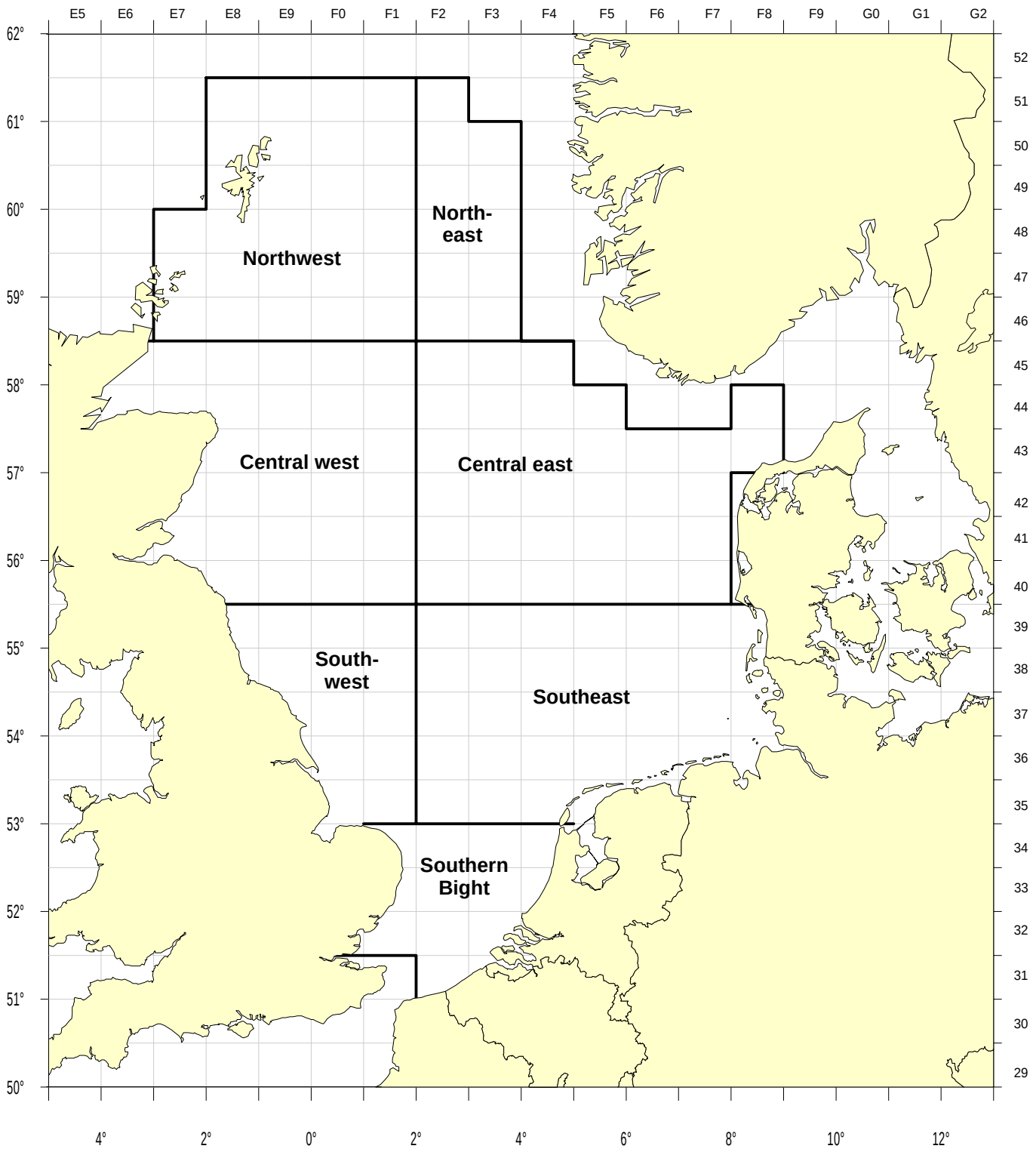


Figure 6.6 Subareas used for the calculation of abundance indices of herring larvae.