

ADDENDUM 2: IBTS MANUAL ON THE WESTERN AND SOUTHERN AREAS 2010

Manual for the International Bottom Trawl Surveys in the Western and Southern Areas

Revision III

Agreed during the meeting of the International
Bottom Trawl Survey Working Group
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1 Introduction

The International Bottom Trawl Survey Working Group is an expert group under ICES with the responsibility of coordinating demersal fishery surveys within large areas of the North Sea and NE Atlantic. The first survey to be annually coordinated was the International Young Fish Survey (IYFS), which was conducted in the North Sea and Skagerrak/Kattegat from 1966 onwards. A procedural manual was developed for the use by scientists involved in this survey.

In 1994 the IBTSWG assumed responsibility for coordinating Western and Southern division surveys, covering grounds from West of Scotland in the north, to the Gulf of Cádiz and Portugal in the south. Consequently in 1995 the IBTS manual was revised for a fifth time in order to clarify certain aspects of the surveys in the North Sea and Skagerrak/Kattegat and at the same time the opportunity was taken to review the manual and 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 other procedures required dedicated text. These specific procedures were provided in Appendix IX as a draft.

In the 1999 IBTS Working Group meeting in Lisbon, due to the considerable difficulties in merging the protocols used in the North Sea with those used in the Western and Southern divisions, it was decided that two manuals should be maintained: one relating to the North Sea and the other to the Western and Southern IBTS areas (i.e. NE Atlantic). It was also decided that this latter document should be based on the manual produced in the SESITS project (Evaluation of demersal resources of South-western Europe from standardized groundfish surveys - Study contract 96-029), which this document refers to as a first draft.

At the 2002 IBTS Working Group meeting in Dublin, the Manual for the International Bottom Trawl Surveys in the Western and Southern Areas was adopted as Revision II. Since then several further changes have been proposed and adopted within the area, including changes in survey designs, surveys discontinued and vessels being replaced, and therefore at the 2009 IBTS meeting, it was decided to undertake a further revision of the manual intersessionally to adopt the new version at the 2010 IBTSWG meeting in Lisbon.

2 Objectives

“IBTSWG coordinates fishery-independent multispecies bottom-trawl surveys within the ICES area. These surveys aim to provide ICES assessment and science groups with consistent and standardized data for examining spatial and temporal changes in (a) the distribution and relative abundance of fish and fish assemblages; and (b) of the biological parameters of commercial fish species for stock assessment purposes.

In terms of groundfish surveys coordinated by IBTS, the main objectives are:

- 1) To determine the distribution and relative abundance of prerecruits of the main commercial species and provide recruitment indices;
- 2) To monitor changes in the stocks of commercial fish species independently of commercial fishery data;
- 3) To monitor the distribution and relative abundance of all fish species and selected invertebrates;

- 4) To collect data for the determination of biological parameters for selected species;
- 5) To collect hydrographical and environmental information;

For a survey to be considered for coordination under IBTSWG it should fulfil the following criteria:

- a) To be carried out in the ICES areas IIIa, or IV-IX;
- b) a brief outline of the management need/context for the survey should be provided in the recommendations of the report of an ICES assessment or expert working group;
- c) to be an otter trawl survey [although noting that there may be other working groups better placed to coordinate some bottom-trawl surveys];
- d) the survey either has documented sampling methods and protocols (including gear descriptions) that conform to the standards encouraged by the IBTSWG, or that can be adapted after joining IBTSWG;
- e) the survey should aim to enhance rather than duplicate existing IBTS surveys and improve data collection for important stocks. For example, proposed surveys for inclusion within IBTSWG should (i) overlap and extend existing survey areas using a comparable gear, or (ii) operate on more specific grounds/times of year with a gear more appropriate to the target species;
- f) make their data publicly available through the DATRAS database at ICES, and implement the relevant data quality checking;
- g) attend and present data at the annual meetings of the IBTSWG;
- h) the sponsoring assessment/expert working group(s) should confirm as early as practicable (e.g. within a five to six year period for new surveys) that time-series or other data emanating from the survey is of value to their management of marine resources. Annual updates between the relevant working groups and IBTS is encouraged during this review period for newly adopted surveys.

2.1 History of the survey

In the 1999 IBTS Working Group meeting in Lisbon, due to the considerable difficulties in merging the protocols used in the North Sea with those used in the Western and Southern divisions, it was decided that two manuals should be maintained: one relating to the North Sea and the other to the Western and Southern IBTS areas (i.e. NE Atlantic). It was also decided that this latter document should be based on the manual produced in the SESITS project (Evaluation of demersal resources of South-western Europe from standardized groundfish surveys - Study contract 96-029), which this document refers to as a first draft.

At the 2002 IBTS Working Group meeting in Dublin, the Manual for the International Bottom Trawl Surveys in the Western and Southern Areas was adopted as Revision II. In this revision II the history of the changes of sampling design, gear and protocols in the different surveys was described individually in Section 6 since these changes, although discussed in the IBTSWG were not simultaneous for all surveys, this approach is kept in this manual trying to keep sections in the order established in the IBTS manual regarding general procedures and protocols but also offering an overview of the changes in individual surveys, these are covered in Section 7 together

with the description of vessels and gears (Summary Table 7.1), areas covered by each survey (Figure 7.1), and particularities in protocols.

Table 2.1 summarizes the surveys that are coordinated within the Northeastern Atlantic IBTS area, quarters in which the surveys are carried out, acronyms used along this manual, the table includes only ongoing surveys when this manual is issued, though some surveys have been discontinued during the history of the IBTS Northeastern Atlantic area (see individual surveys history in Section 7).

Table 2.1. Summary of surveys in the Northeastern Atlantic IBTS area.

Survey	Division	Acronym
Scottish Surveys		
Scottish Western Coast VIa Groundfish Survey - Quarter 1	VIa	SWCGFS6a
Rockall Survey ICES VIb (every second year) - Quarter 3,	VIb	SWCGFS6b
Scottish Western Coast VIa Groundfish Survey - Quarter 4	VIa	SWCGFS6a
Northern Ireland surveys		
Northern Ireland Groundfish Survey in the Irish Sea - Quarter 1	VIIa	NIGFS
Northern Ireland Groundfish Survey in the Irish Sea - Quarter 4	VIIa	NIGFS
Irish survey		
Irish Groundfish Surveys - Quarter 4	VIa - VIIbcgj	IGFS
English Survey		
English Western IBTS survey – Quarter 4	VIIa,e-h	Q4SWIBTS
French surveys		
Groundfish Survey in the Eastern Channel - Quarter 4	VIIId	FR-.CGFS
Groundfish Survey in the Celtic Sea and Bay of Biscay - Quarter 4	VIIIfghj, VIIIab	FR-EVHOE
Spanish surveys		
Spanish Groundfish Survey in the Porcupine bank - Quarter 3	VIIbck	SP-PorcGFS
Spanish Groundfish Survey in Northern Spanish Shelf - Quarter 4	VIIIc, IXaN	SP-NGFS
Spanish survey in the Gulf of Cadiz - Quarters 1 & 4	IXaS	SP-GCGFS
Portuguese surveys		
Portuguese Groundfish Survey in Portuguese shelf - Quarter 4	IXaMS	PGFS

2.2 Survey gear

In the IBTS manual revision VIII there is a complete protocol of GOV preparation and repair during the surveys, although this protocol is meant for the GOV it is considered as adequate for the different gears used in surveys included the IBTS Northeast-

ern Atlantic area (see Table 2.2 for a list of gears and their characteristics and figures in Section 7 to see the different gear designs used in the area). The checking sheets included in Appendix II to VIb of the IBTS Manual, are also considered a valuable procedure in ensuring the correct functioning of the gear, so check sheets adapted for the different gears should be considered.

Table 2.2. Sampling materials used in the groundfish surveys.

COUNTRY/SURVEY	IRELAND	UK/ SCOTLAND	UK/NORTH IRELAND	UK/ ENGLAND	FRANCE EVHOE	FRANCE CGFS	SPAIN IBERIAN COAST	SPANISH /PORCUPINE BANK	PORTUGAL
Research Institute	MI	MLA	AFBI	Cefas	Ifremer	Ifremer	IEO	IEO	IPIMAR
Sampling Material									
Research vessel	Celtic Explorer	Scotia	Corystes	Cefas Endeavour	Thalassa	Gwen-Drez	Cornide de Saavedra	Vizconde de Eza	Noruega
Type	Stern trawler		Double hulled	Stern Trawler	Stern Trawler	Stern Trawler	Stern Trawler	Stern Trawler	
GRT	2425	N/A	1289	1731	3022	1133	1133	1400	496
KW	4320	N/A	2000	N/A	2200	440	1650	1800	1100
Overall length (m)	65.5	68.6	52.5	74	72.7	23.5	67	53	47.5
Gear Type	GOV 36/47	GOV 36/47	Rock Hopper	GOV 36/47RV &RV34/45	GOV 36/47	GOV 36/47	BACA 44/60	BACA 40/52	NCT
Depth range (m)	20–600	20–400	20–120	20–150	30–400	20–150	30–700 (1)	150–800	30–500
Trawling speed (knots)	4	4	3	4	4	4	3	3.5	3.5
Doors weight (kg)	1450	1100	N/A	1440	1350	650	330	800	650
Doors surface (m ²)	5.3	4.5	N/A	4.5	4.5	3.58	1.8	4.5	3.75
Sweep length (m)	55/110	60	12.5	50/20	50RV 100	200	200	250	No
Diameter of Lower Bridle (mm)	22	20	18	14	22	20	No	18	16
Diameter of Upper Bridle (mm)	16	14	20	14	12	16	No	18	14
Diameter of Middle Bridle (mm)	16	14	No	14	12	No		No	14
Exocet Kite	No	Yes	No	No	No	No		No	No
Floats in Headline	10x280mm	20	No	10 x 280 mm	18	20	25	12	80
Floats in Winglines	66x200mm	20 + 20	No	3 x 280 mm 30 x 200mm	24 +24	32 + 32	15 + 15	50	80
Mean vertical opening (m)	4.3	4.6	3	4.8	4RV RV4.1	4.4	2.0	3.5	4.6

COUNTRY/SURVEY	IRELAND	UK/ SCOTLAND	UK/NORTH IRELAND	UK/ ENGLAND	FRANCE EVHOE	FRANCE CGFS	SPAIN IBERIAN COAST	SPANISH /PORCUPINE BANK	PORTUGAL
Mean doors spread (m)	110	82	37	75/61	76.9 112.7	76.9 112.7	107.1	120.4	44.4
Mean horizontal opening (m)	20	19.6	N/A	19.5/18.1	18.7 20.5	18.7 20.5	18.9	20	15
Groundrope	Rubber disks	Bobbins	Rubber disks	Rubber discs + chain / rubber and hopper discs	Rubber disks and Chains Rubber and metal disks	Rubber disks and Chains Rubber and metal disks	Synthetic wrapped wire core	Synthetic wrapped wire core double coat	Bobbins

The following flow diagram (Figure 2.2) can be used to describe the procedure for the preparation of the GOV trawl prior to the survey and each haul.

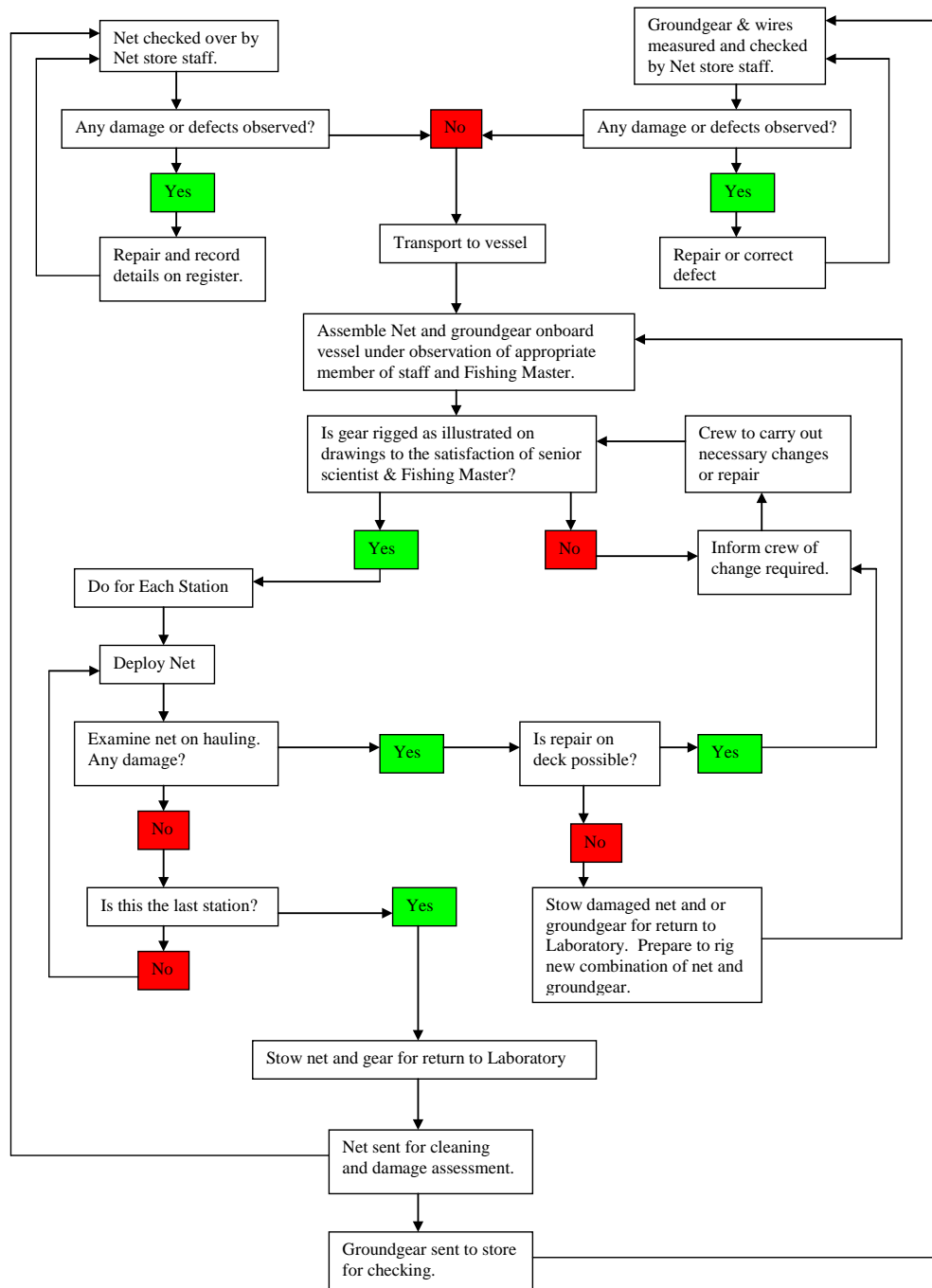


Figure 2.2. IBTS gear preparation flow diagram.

2.3 Technical description of the hauls

It is suggested that all nations undertaking standardized surveys allocate some of the survey time to carrying out additional hauls at the start of the survey with the specific aim of ensuring that all standard elements of the groundfish survey are working correctly. This should include:

- Gear deployment: is the gear rigged correctly and being deployed and retrieved appropriately by the crew? Is the deck machinery all functioning?
- Ground contact: do the groundgear and doors indicate that the net is on the bottom and fishing correctly?

- Trawl sensors and CTDs: are all electronic equipment functioning correctly, and collecting meaningful data?
- Catch processing: are all elements of catch processing and data inputting functioning?

Though there are good reasons for having these additional hauls in the main survey area, for practical reasons they should be undertaken near the port of departure. This would then allow additional staff (including a gear technologist) to be present to fully check the gear and electronics, and would also save time in case something requires further attention. The start time of the haul is defined as the moment when the vertical net-opening and doorspread are stable (due to problems in net monitoring equipment at the beginning of the time-series, Spanish surveys start the haul from the moment the winches are locked). 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 and stable gear deployment (See Section 2.4).

Haul duration varies from 30 minutes (Scotland, Ireland, Porcupine, England, France, North of Spain and Portugal) to 60 minutes (South of Spain - Gulf of Cádiz), whereas Northern Ireland surveys use a fixed trawl distance of 3 nautical miles. Hauls are carried out during daylight where possible (given as from 15 minutes before sunrise to 15 minutes after sunset), although Q1 and Q4 surveys in the northern parts of the survey area have some exceptions due to the shorter daylight times in their latitudes, in this case a uniform time distribution each year is advised. Night-time hauls need to be entered as such in DATRAS and should not be used as standard IBTS hauls for direct comparison with daylight hauls. Towing mean speed ranges from 3.0 knots (North of Spain and Gulf of Cadiz) to 3.5 knots (Porcupine and Portugal) and 4 knots (France, Scotland, Ireland and England).

Fish shoals located by sonar or echosounder should not influence fishing. Tows shorter than 15 minutes are considered invalid, with hauls from 15 to 45 minutes regarded as acceptable, assuming that there is no damage in the net.

2.4 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 and reported. The manual that is supplied with the monitoring equipment gives the correct way of attaching the units to the gear.

In order to ensure a valid tow, gear stability is crucial. **During the tow it is imperative that at least headline height and wing/door spread readings are monitored** continuously during a tow and if needed adjust the trawling conditions to return to accepted limits (e.g. by changing warp length, see individual surveys in Section 7 for accepted limits in different gears). If these readings are outside the recommended values for an unacceptable period of time it could mean that the gear has become fouled or damaged and should be hauled in.

Other crucial feature relating to the behaviour of the gear is 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.

It is recommended that the data stream, including all the Gear monitoring parameters that are recorded, should be saved to computer to allow (pre-filtered) mean/median

values to be calculated and entered into the individual institutes' databases and in DATRAS HH records. These values should be calculated from the time the gear has stabilized on the bottom to the time the gear is hauled. The following flow diagram (Figure 2.4) can be used to help in the process of using the SCANMAR software and units during a trawl haul.

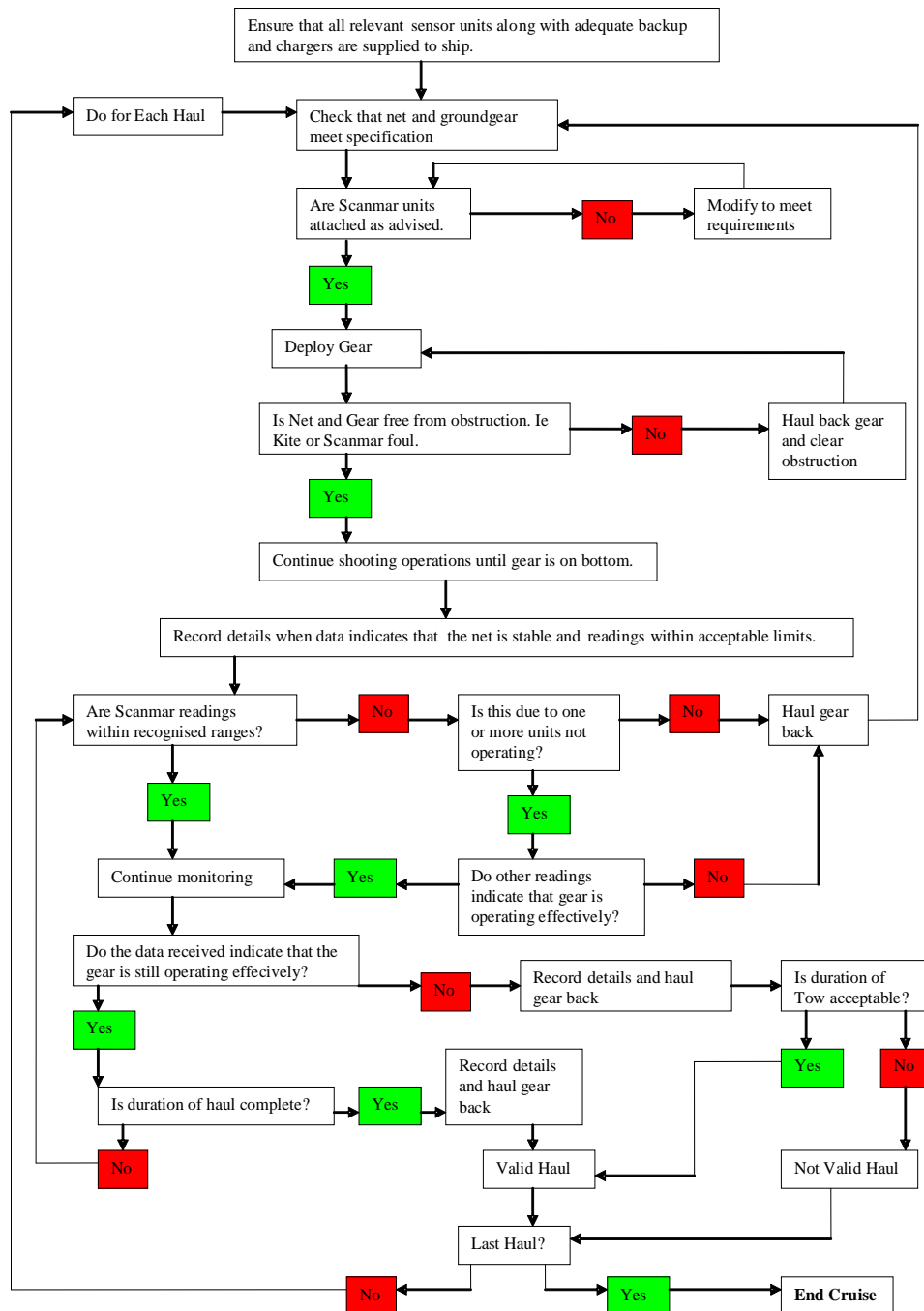


Figure 2.4. IBTS SCANMAR use flow diagram.

3 Sampling trawl catches

3.1 Catch sampling and sorting

It is recommended that the catch from all valid hauls be sorted fully where practicable. Wherever possible, the entire catch is sorted, with fish and shellfish species identified to the lowest taxonomic level possible. In the case of a large catch of one dominant species, or larger catches in which a small number of species/size categories of species are sufficiently abundant, these can be subsampled, appropriately, with the rest of the catch fully examined for 'rare' species and any exceptionally small or large individuals of the species that are subsampled. Only in exceptional circumstances should an entire catch be subsampled, and these data should be flagged accordingly when submitted to the DATRAS database.

Table 3.1. Summary of species for which biological information is collected per survey (see Surveys acronyms in Table 2.1).

SPECIES	SWCGFS	NIGFS	SPPGFS	IGFS	Q4SWIBTS	FR-CGFS	EVHOE	SPNGFS	PGFS	SPGCGFS
<i>Clupea harengus</i>	X			X	X					
<i>Conger conger</i>		X	X		X					
<i>Dicentrarchus labrax</i>		X		X	X					
<i>Gadus morhua</i>	X	X	X	X	X		X			
<i>Glyptocephalus cynoglossus</i>	X		X				X			
<i>Helicolenus datylopterus</i>			X							X
<i>Lepidorhombus boscii</i>			X	X	X			X	X*	X
<i>Lepidorhombus whiffiagonis</i>	X		X	X	X		X	X	X*	X
<i>Lophius budegassa</i>	X		X	X	X		X	X	X*	X
<i>Lophius piscatorius</i>	X		X	X	X		X	X	X*	X
<i>Melanogrammus aeglefinus</i>	X	X	X	X	X		X			
<i>Merlangius merlangus</i>	X	X	X	X	X		X			
<i>Merluccius merluccius</i>	X	X	X	X	X		X	X	X	X
<i>Micromessistius poutassou</i>				X				X	X	X
<i>Microstomus kitt</i>	X			X	X		X			
<i>Molva molva</i>	X	X	X		X		X			
<i>Mullus surmuletus</i>					X	X				
<i>Pleuronectes platessa</i>		X		X	X	X	X			
<i>Pollachius pollachius</i>		X		X			X			
<i>Pollachius virens</i>	X									
<i>Psetta maxima</i>	X	X			X					
<i>Scomber colias</i>									X	X
<i>Scomber scombrus</i>	X		X	X	X			X	X	X
<i>Scophthalmus rhombus</i>	X	X		X	X					
<i>Solea solea</i>				X	X		X			
<i>Sprattus sprattus</i>	X			X						
<i>Trachurus picturatus</i>									X	
<i>Trachurus trachurus</i>				X				X	X	X
<i>Trisopterus esmarki</i>	X			X						
<i>Leucoraja naevus</i>	X	X		X	X					
<i>Raja montagui</i>	X	X		X	X					

SPECIES	SWCGFS	NIGFS	SPPGFS	IGFS	Q4SWIBTS	FR-CGFS	EYHOE	SPNGFS	PGFS	SPGCGFS
<i>Raja clavata</i>	X	X		X	X					
<i>Raja microocellata</i>					X					
<i>Raja brachyura</i>		X		X	X					
<i>Dipturus batis</i>	X			X	X					
<i>Mustelus mustelus</i>	X			X						
<i>Mustelus asterias</i>	X			X						
<i>Squalus acanthias</i>		X		X	X					
<i>Nephrops norvegicus</i>			X	X	X		X	X	X*	X
<i>Parapenaeus longirostris</i>									X*	X
<i>Melicertus kerathurus</i>										X
<i>Loligo vulgaris</i>				X						X
<i>Sepia officinalis</i>				X				X		X
<i>Octopus vulgaris</i>								X		X
<i>Eledone cirrhosa</i>								X		X
<i>Eledone moschata</i>										X

* Not well sampled due to bottom-trawl net with rollers in the groundrope.

Apart from the commercial shellfish and cephalopod species listed in Tables 3.1 and 3.2, many countries now sample other benthic invertebrate species caught in the gear. Although the different gears used in the different surveys are not equally efficient and effective for catching benthos for quantitative sampling they can be used for some crude distribution information, remembering the limitations of the gears given the groundgear set up and the size of the meshes within the net make-up. These data can be collected as presence/absence or to more sophisticated means (weights/numbers). It is at the discretion of the institute collecting the data to decide what means is most appropriate. The following flow diagram (Figure 3.1) can be used as a guide to dealing with the catch.

Table 3.2. Shellfish and cephalopods to be recorded during surveys.

TSNCODE	COMMON NAME	SCIENTIFIC NAME	RECORDING	MEASUREMENT	UNIT
CRUSTACEANS					
98682	Golden crab	<i>Cancer bellaninus</i>	Male/Female	Carapace width	mm below
98681	Edible crab	<i>Cancer pagurus</i>	Male/Female	Carapace width	mm below
98908	Deep-water red crab	<i>Geryon affinis</i>	Male/Female	Carapace width	mm below
97315	European lobster	<i>Homarus gammarus</i>	Male/Female	Carapace length	mm below
97657	Crawfish/spiny lobster	<i>Palinurus elephas</i>	Male/Female	Carapace length	mm below
552966	Pink spiny lobster	<i>Palinurus mauritanicus</i>	Male/Female	Carapace length	mm below
199961	Spider crab	<i>Maja (Maia) squinado</i>	Male/Female	Carapace length	mm below
97317	Norway lobster	<i>Nephrops norvegicus</i>	Male/Female	Carapace length	mm below
97943	Stone crab	<i>Lithodes maja</i>	Male/Female	Carapace length	mm below
BIVALVES					
79683	Edible scallop	<i>Pecten maximus</i>	Sexes combined	-	-
79716	Queen scallops	<i>Aequipecten opercularis</i>	Sexes combined	-	-
79885	Common oyster	<i>Ostrea edulis</i>	Sexes combined	-	-
CEPHALOPODS					
82363	Cuttlefish	<i>Sepia officinalis</i>	Sexes combined	Mantle length	cm below
82362	Cuttlefish	<i>Sepia elegans</i>	Sexes combined	Mantle length	cm below
82364	Cuttlefish	<i>Sepia orbignyana</i>	Sexes combined	Mantle length	cm below
-	Squids	<i>Teuthoidea*</i>	Sexes combined	Mantle length	cm below
82646	Lesser octopus	<i>Eledone cirrhosa</i>	Sexes combined	-	-
82603	Octopus	<i>Octopus vulgaris</i>	Sexes combined	-	-
-	Bobtail squids etc.*	<i>Sepiolo/Rossia/Sepietta</i>	Sexes combined	-	-

* To species level where possible, though juveniles may need to be aggregated.

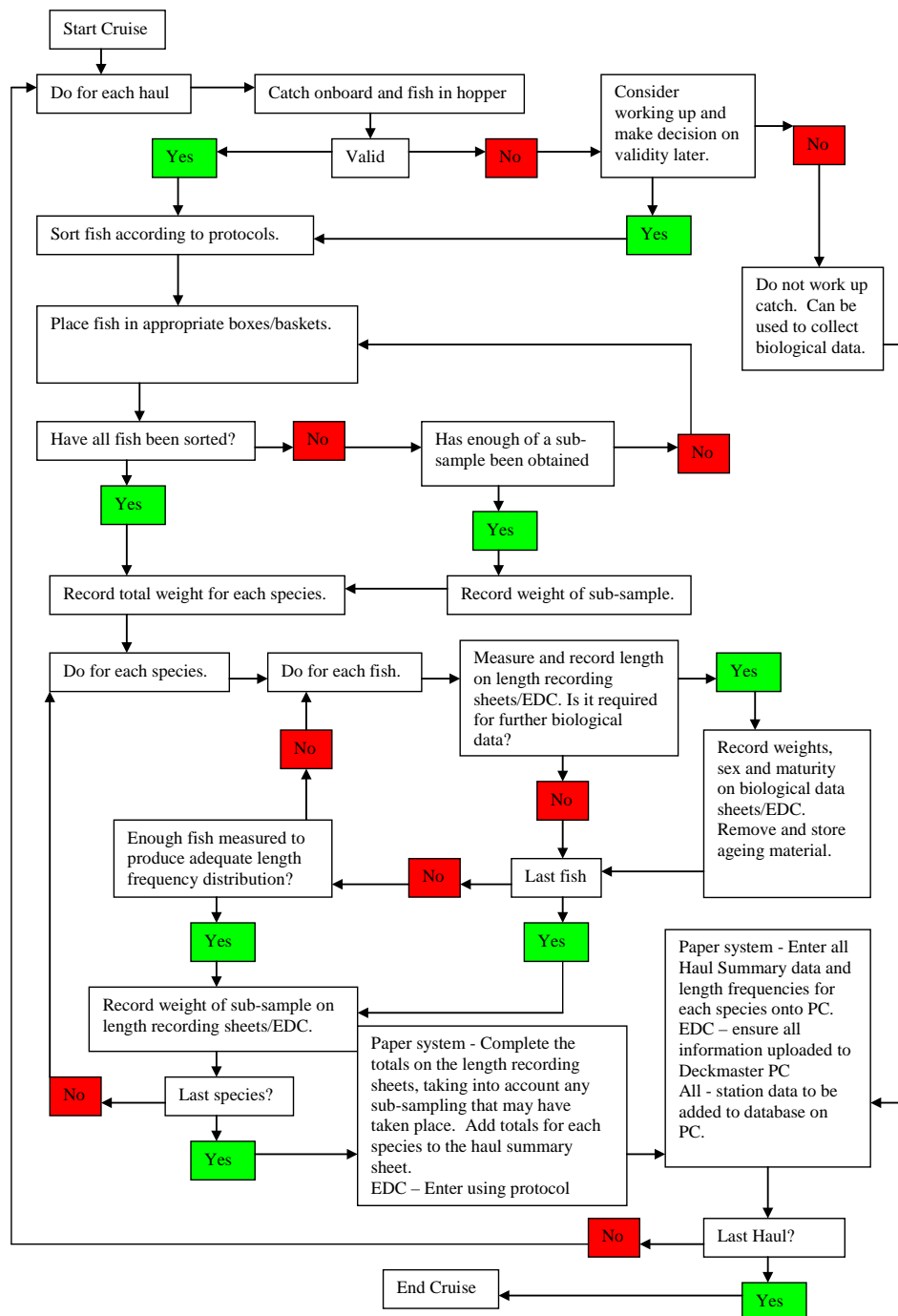


Figure 3.1. IBTS catch processing flow diagram.

3.2 Length composition

Length distributions are recorded for all fish species caught and selected shellfish. Length is (except for those species described in Sections 3.3 and 3.4) defined as total length, which is measured from the tip of snout to tip of the end of the caudal fin. Length is measured to the 0.5 cm below for herring, sprat, sardine and anchovy, and to 1 cm below for all other fish, cuttlefish and squid species. Crustaceans are measured to 0.1 cm below. When measuring shellfish species, Figures 3.4.1 to 3.4.5 should be consulted to ensure the correct carapace measurement is taken.

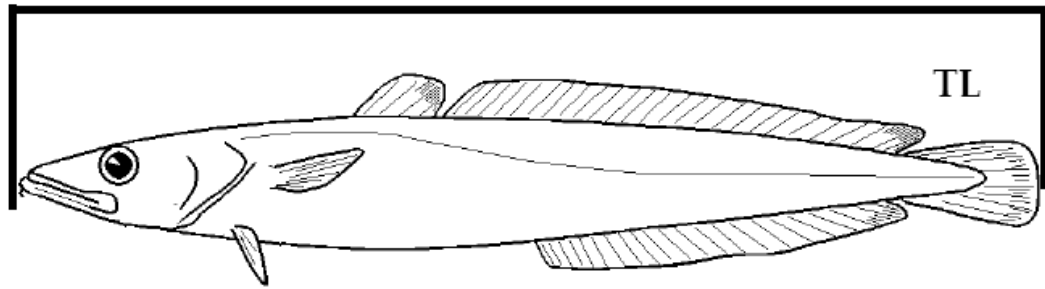


Figure 3.2. Diagram showing how to measure total length for groundfish species except those shown in Section 3.3.

It is recommended that elasmobranch fish 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 subsample is selected of at least 75 fish, although sampling a very limited length range could be adequately achieved with a smaller sample. In the event that a truly representative subsample cannot be selected, it may 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 categorization 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 subsample 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 subsample 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 subsample 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 subsample 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 (e.g. sand gobies *Pomatoschistus* spp.) or larger taxonomic group (e.g. sandeels *Ammodytidae*).

3.3 Measurement types for deep-water species

Due to the great variety of body shapes of deep - water fish species and the fragility of their tails and fins some species are not measured to total length.

The majority of species encountered during the deep-water surveys are measured to the centimeter below using total length as the length qualifier (TL) (see diagram in Figure 3.2). There are however some exceptions. Listed below are the species groupings that are not measured using total length complete with details of the length measurement collected for each.

Smoothheads and Searside (Alepocephalidae and Searsidae)

SL-Standard Length. Measurement taken from the tip of snout/anterior point of head to the end of the fleshy caudal peduncle. Not to be confused with TL which includes the caudal fin rays. All smoothheads and searsids are measured to the nearest whole cm below.

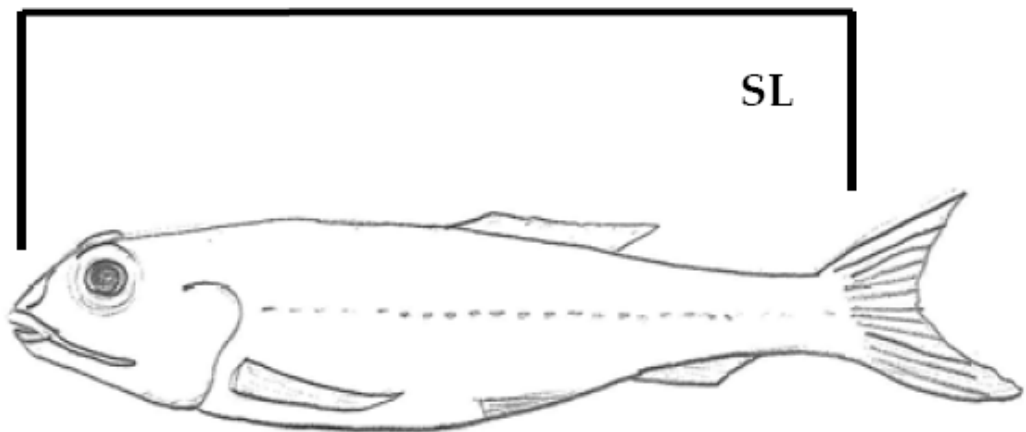


Figure 3.3.1. Measurement of Searside and Alepocephalidae fish.

Grenadiers (Macrouridae)- PAFL – Pre Anal Fin Length

Measurement taken from the tip of the snout to the first anal fin ray. (See Figure 3.3.2). All grenadiers are measured to the nearest 0.5 cm below.

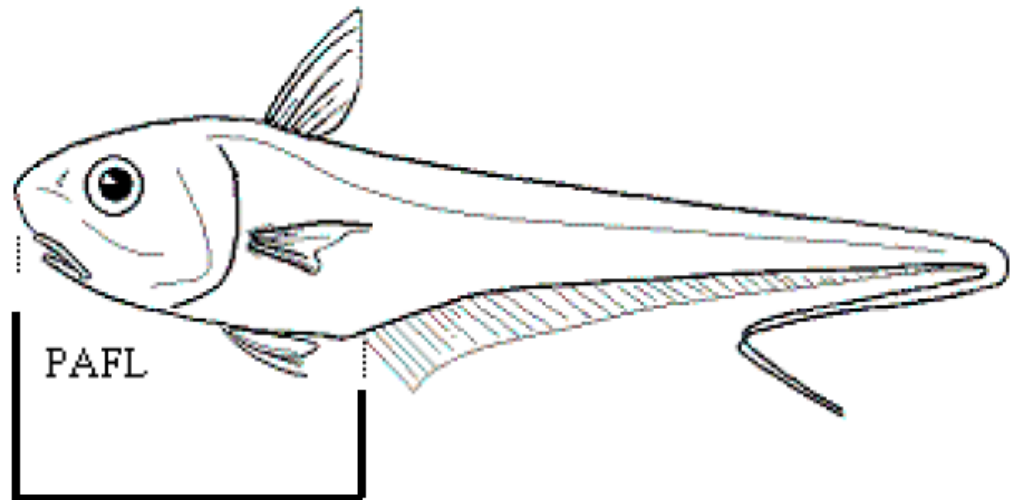


Figure 3.3.2. Measurement of grenadiers (Macrourid fish).

Chimaeridae (Rabbitfish) – PSCFL – Pre Supra Caudal Fin Length

Applies to all Rabbitfish except Rhinochimaeridae. (see Figure 3.3.3). Measured from the tip of the snout to the point just before the start of the supra caudal fin.

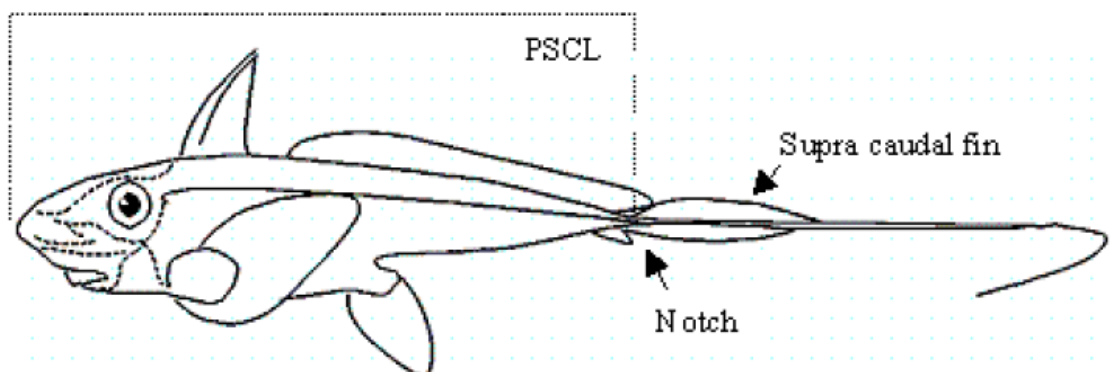


Figure 3.3.3. Measurement of rabbitfish (except Rhinochimarids).

3.4 Measurement types for crustaceans and cephalopods

Figures 3.2 to 3.6 show the different measurements procedures for commercially important crustaceans measured to the mm below and cephalopods measured to the cm below.

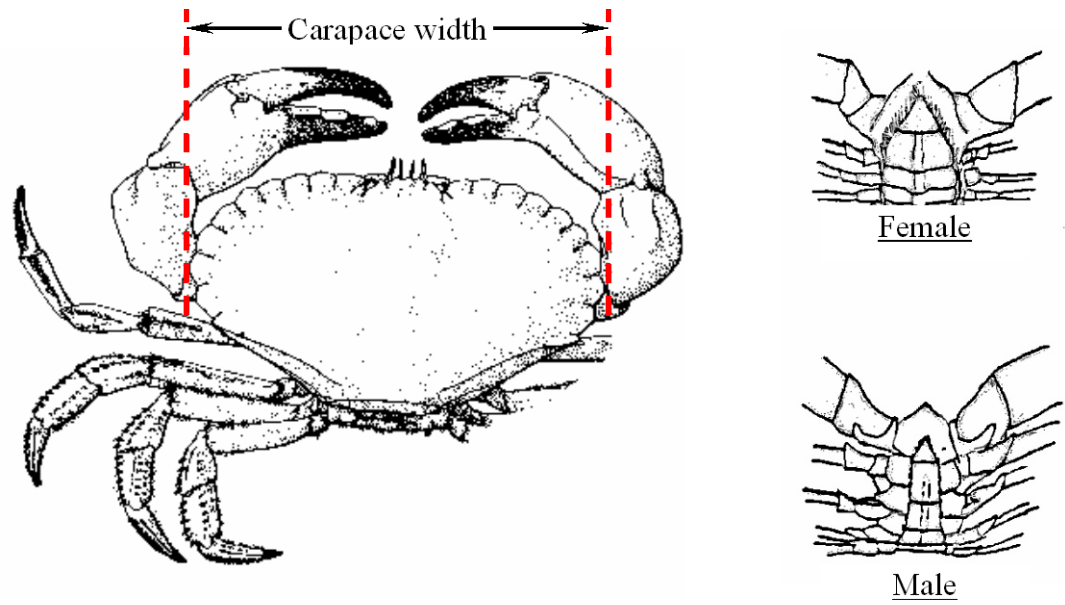


Figure 3.4.1. Measurement and sexing of *Cancer pagurus* to be measured to the lower mm.

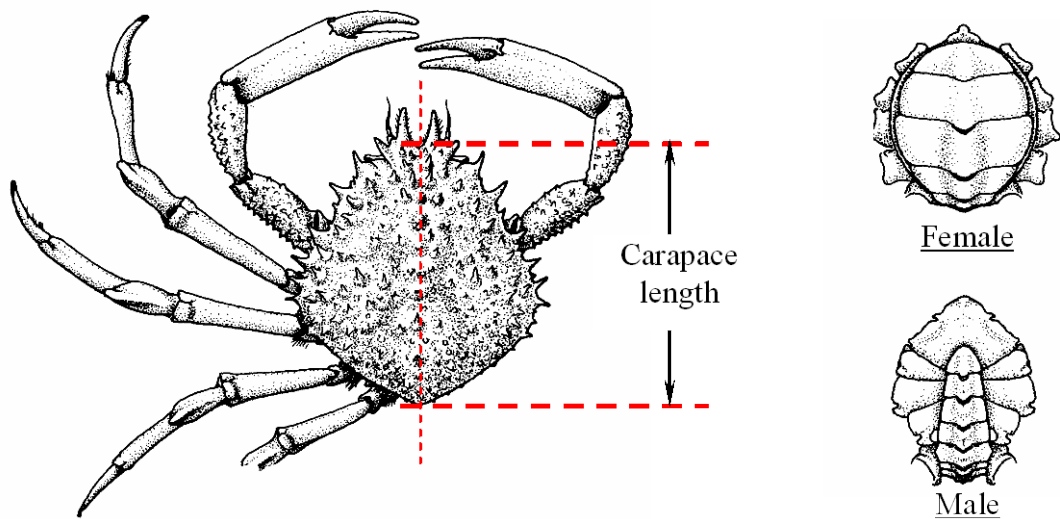


Figure 3.4.2. Measurement and sexing of *Maia squinado* to be measured to the lower mm.

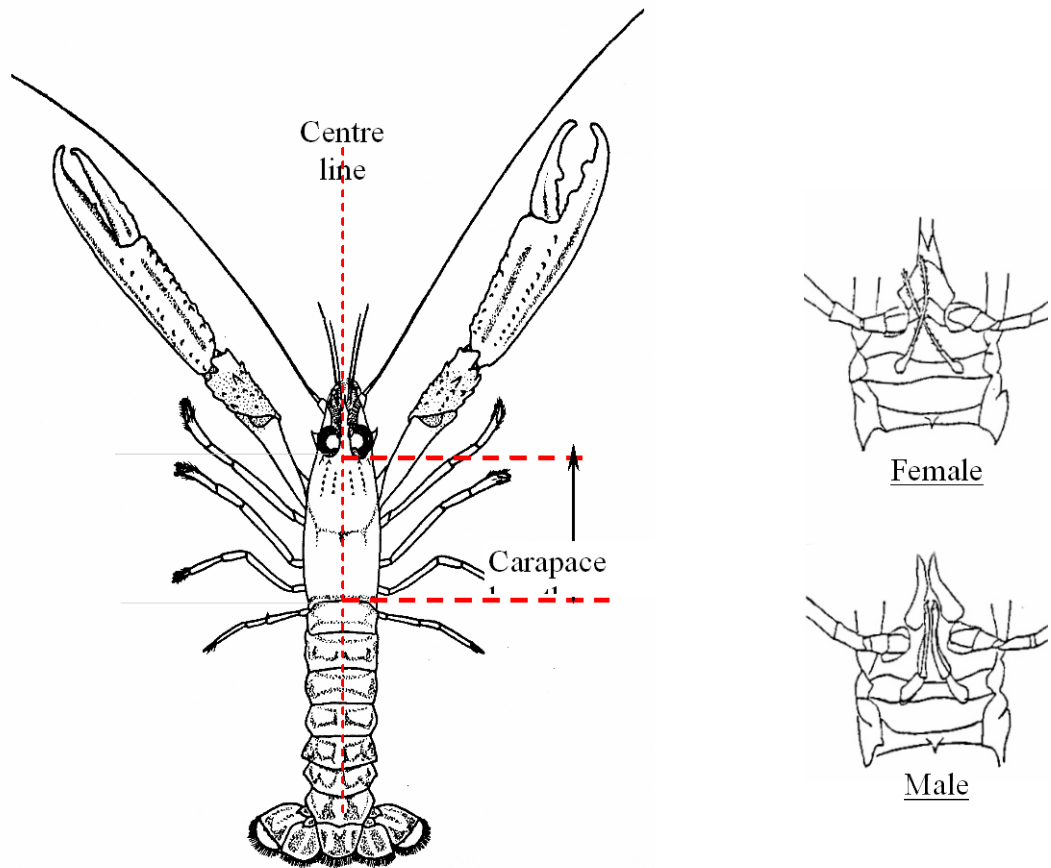


Figure 3.4.3. Measurement and sexing of *Nephrops norvegicus* to be measured to the lower mm.

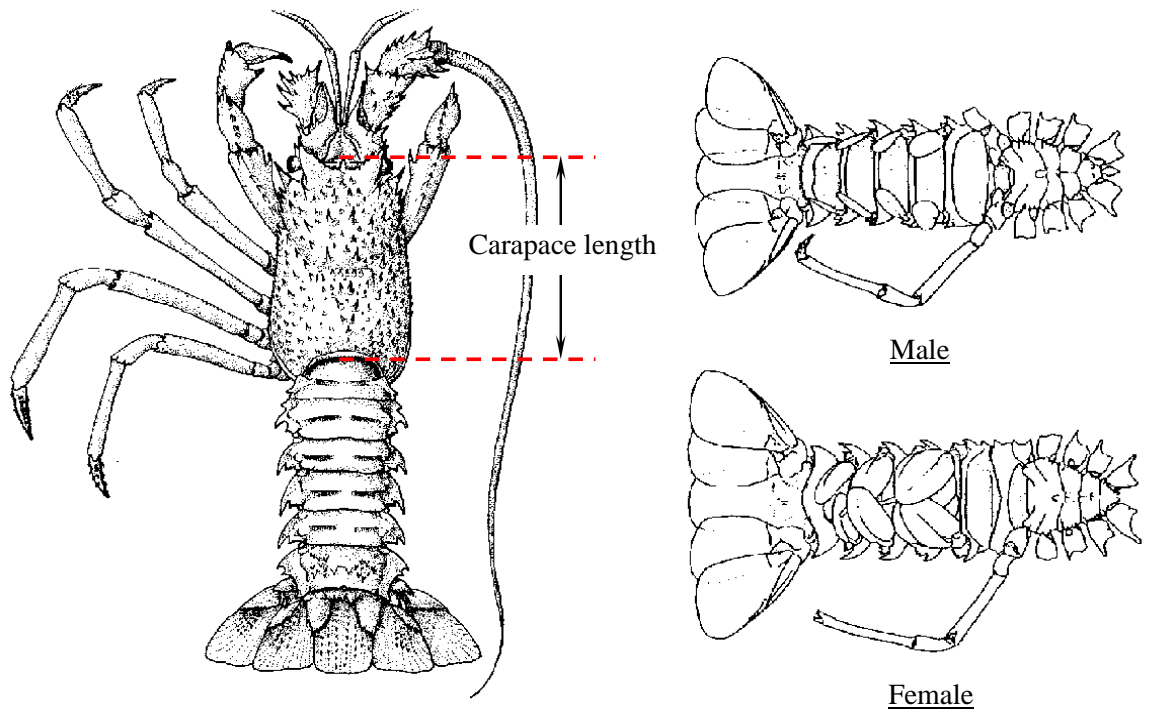


Figure 3.4.4. Measurement and sexing of *Palinurus* sp. and *Homarus gammarus* to be measured to the lower mm.

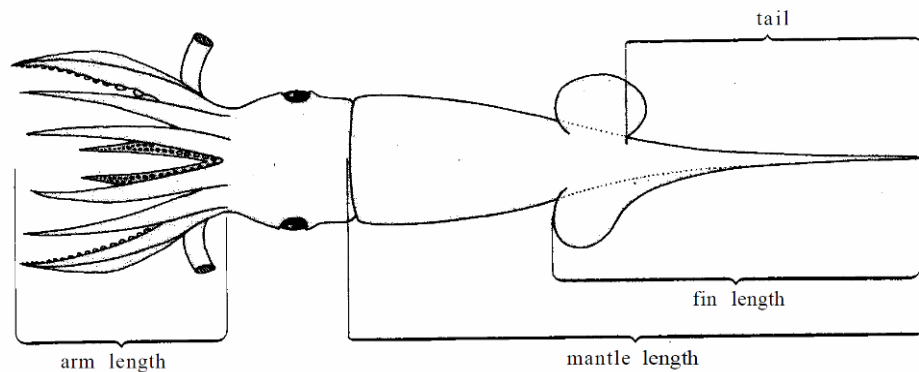


Figure 3.4.6. Measurement of Cephalopods mantle length to be measured to lower cm.

3.5 Sampling for age, sex and maturity

Given the large area covered by the surveys in the Northeastern Atlantic area, and the number of countries participating in the IBTS surveys, the list of species considered as target commercial species vary between surveys and countries, Table 3.1 summarizes the list of species considered as *target species* in each survey and that are sampled for age/sex/maturity. Nevertheless, and given the varying and increasing requirements of the EU / Data Collection Framework (DCF), an updated list of species, target numbers and number achieved by species can be found in the latest IBTSWG report.

Some general recommendations in Age, Sex and Maturity samplings are:

- 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.
- Targets should be set to ensure that data are collected from the entire survey area.
- Sex, maturity and weight data should be reported for all the target species for which age data are collected. Maturity stages should be reported according to the maturity scales given in the appropriated workshop for each target species updated annually in the IBTSWG reports.
- Participants are encouraged to collect age samples also from other commercially important species and any other species deemed important to the DCF.

4 Indices estimation

4.1 Computation of abundance indices at-age

Computation of global Survey abundance indices taken from EVHOE manual and IPROST PROJECT, the algorithms summarized here are considered to be a valid summary for indices in the Northeastern Atlantic area, with the exception of those surveys where the design is not area stratified, but based on other basis as ICES Rectangles (e.g. FRCGFS or Scottish Surveys, though stratification by depth using fish assemblages and commercial species distribution is under study) or combinations of depth stratification with substrate type (Northern Ireland).

a. First phase, computation of average numbers at length and associated variances

Estimation of average numbers at length j for a group of h strata (stratified mean \overline{E}_j) and its variance $V(\overline{E}_j)$) is computed according to the random sampling strategy already described for computation of global indices:

For each length class j :

$$\overline{E}_j = \frac{1}{A} * \sum_h A_h * \overline{E}_{jh} \quad (1)$$

$$V(\overline{E}_j) = \frac{1}{A^2} * \sum_h \left(\frac{A_h^2 * V(\overline{E}_{jh})}{N_h} \right) \quad (2)$$

where:

$A_h =$ area of stratum h

$A =$ total area of the group of strata st

$\overline{E}_{jh} =$ mean number per haul in length j for stratum h

$N_h =$ number of hauls in stratum h

$V(\overline{E}_{jh}) =$ variance of the mean number in length class j for stratum h

b. Second phase, building the age-length key, computation of the proportions at-age i per length class j and associated variances

For each length class j the proportion of age i and its variance is computed:

$$p_{ij} = \frac{n_{ij}}{n_j} \quad (3)$$

$$V(p_{ij}) = \frac{p_{ij}(1-p_{ij})}{n_j} \quad (4)$$

Error! Bookmark not defined.where:

$n_{ij} =$ number of otoliths of age i in the length class j

$n_j =$ total number of otolith in the length class j

c. Third phase, computation of mean numbers at-age and the associated variances

The mean numbers at-age is given by:

$$\overline{E}_i = \sum_j \overline{E}_j * p_{ij}$$

The associated variance:

$$V(\bar{E}_i) = \sum_j \left[V(\bar{E}_j) p_{ij}^2 + \bar{E}_j^2 V(p_{ij}) + V(p_{ij}) V(\bar{E}_j) \right] \quad (5)$$

These computations are done by sex and the total age composition is given for each age i by:

$$\bar{E}t_i = \bar{E}m_i + \bar{E}f_i$$

Its variance:

$$V(\bar{E}t_i) = V(\bar{E}m_i) + V(\bar{E}f_i) \quad (6)$$

The sampling being independent on sex the covariance is not considered.

5 Environmental data

5.1 Hydrographic data

After each fishing haul with trawl, the following minimum hydrographical data are collected: surface temperature, bottom temperature, surface salinity and bottom salinity. When using a CTD-probe for measuring temperature and salinity, an appropriate calibration should be undertaken.

Some laboratories use a net-mounted mini CTD for collecting surface and bottom temperature and salinity at all fishing stations, although CTD casts are still useful to provide vertical profiles. Some laboratories undertake CTD casts for every fishing station, although given the restrictive daylight in quarters 1 and 4; some laboratories only undertake CTD casts before the first station and after the last station each day.

The sampling design should aim to resolve the following processes:

- Coastal Upwelling
- Ekman divergence near the capes
- Fluxes over the shelf, slope currents and circulation in the off-slope area
- Mesoscale features

CTD sampling station distribution satisfies the requirements of high resolution sampling along tracks to separate mesoscale features. The required separation between sampling points is of 10 - 15 km and the distance of tracks off-the-shelf break no more than 30-40 km. In order to detect the upwelling phenomenon, in regions where the shelf is narrow (less than 15 km), at least two sampling points will be performed from the coast to the shelf break. Homogeneous distribution of CTD stations at both sides of the most prominent capes are also conducted to investigate Ekman divergence processes. To evaluate the slope currents, at least three CTD casts are done in the following manner: one over the shelf, the second over the shelf break (200 m depth) and the third off-the-shelf break. Equal separation distance among stations is convenient.

CTD stations outside the continental shelf are conducted during Spanish surveys in perpendicular profiles to the coast, with a minimum of two casts in the open ocean. Whenever possible, information relative to the estimation of primary production is also collected. According to this, to exploit to the full the cruise, it is recommended the CTD system has a fluorometer and oxygen sensor, as well as deployment of at least one Niskin bottle (1.5 l) attached to the CTD cable at a depth of 40 m.

To avoid the aliasing or subsample effect and to improve the data analysis, CTD sampling stations are homogeneously distributed all over the study area, avoiding leaving large extensions uncovered. CTD casts sampled at stations over the shelf area cover the whole water column, from surface to bottom. When stations and CTD casts are over the slope area samples are conducted at least till 400 m depth.

Since 1992 the following additional environmental data are sought although not collected in all surveys: surface current direction, surface current speed, bottom current direction, bottom current speed, wind direction, windspeed, swell direction, swell height.

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

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.

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 I)
- Type 2: HL -Length frequency data (Appendix II)
- Type 3: CA - Sex-maturity-age-length keys (SMALK; Appendix III)

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.

Hydrological data: CTD casts performed and the Cruise Summary Report (i.e. Roscop files) should be submitted to ICES as soon as possible after the end of the Cruise.

7 Individual survey protocols

This section presents a sort summary of the particularities and specific protocols from each of the surveys carried out in the Northeastern Atlantic area of IBTS. Table 7.1 and Figures 7.1 and 7.2 summarize the geographic sectors and the area covered by each of the IBTS Surveys.

Table 7.1. Area of the geographic sectors used in the IBTS SW Areas.

COUNTRY	SURVEY	GEOGRAPHIC SECTOR	
		NAME	AREA (SQUARE KM)
UK - Scotia	SWC-GFS6a – Q1 & Q3 SWC-GFS6b		(1)
Ireland	IGFS	North West (VIa)	167673
		West (VIIb)	105065
		Celtic Sea (VIIfgj)	280742
Spain (Irish waters)	SPPGFS	Porc-N	25040
		Porc-S	20840
UK - Northern Ireland	NIGFS – Q1 & Q3		(2)
UK - England	Western IBTS survey Q1		(1/2)
France	FR-CGFS Eastern Channel		(3)
France	FR-EVHOE Celtic Sea	CN	35115
		CC	54535
		CS	68871
France	FR-EVHOE Bay of Biscay	GN	56820
		GS	14470
Spain	SP-NGFS – Cantabrian Sea	AB	2460
		PA	4614
		EP	5352
Spain	SP-NGFS – Galician shelf	FE	7774
		MF	4139
Portugal	PGFS	PN	11245
		PW	5837
		PS	7296
Spain	SP-GCGFS – Q1 & Q4	CA	7224
		Total (4)	885112

(1) Surveys not based in a stratified sampling design, abundances are based on a sampling by ICES Rectangles.

(2) Stratification based on depth and substrate type, area not used to stratify the indices.

(3) Stratification design is being reviewed to produce estimates more useful for the assessment WGs (ICES, 2009, 2010).

(4) Total refers only to the surveys using the areas in indices estimation and design, not overall area.

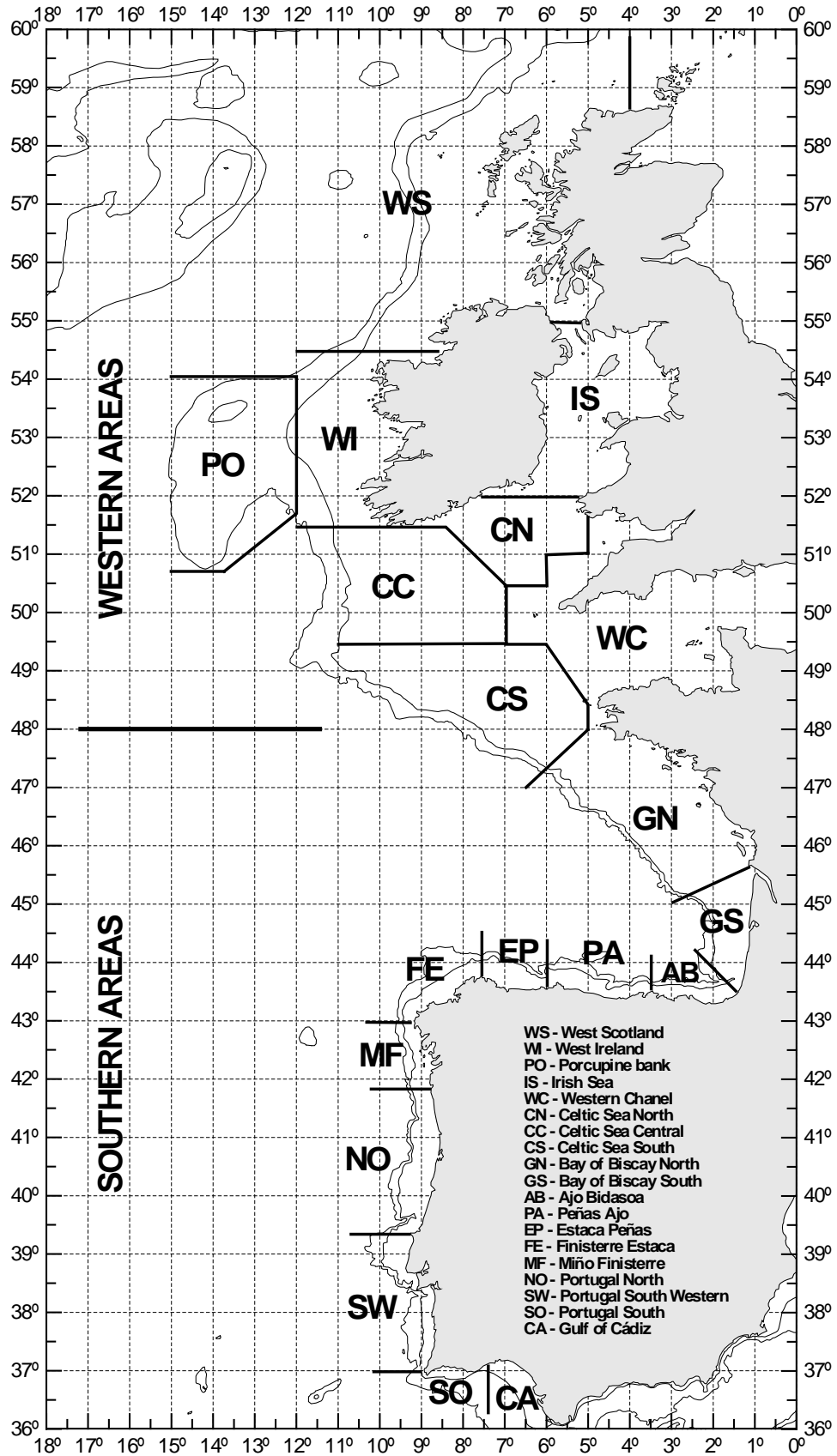


Figure 7.1. Coverage of the bottom-trawl surveys included in the Western and Southern areas and general geographic stratification used.

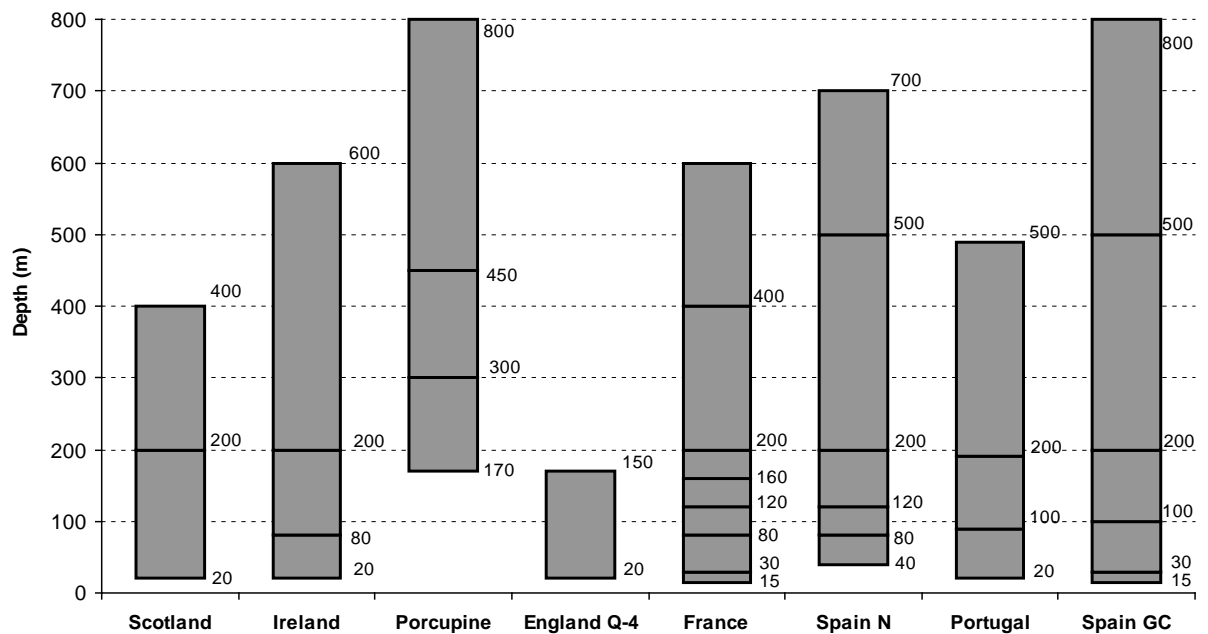


Figure 7.2. Bathymetric stratification used by each area / survey (Spain N: Northern Spanish shelf; GC: Gulf of Cádiz) See Figure 7.1 and Table 7.1 to see the area covered by each survey.

7.1 Scottish western Coast Groundfish Survey (Division VIa) and Scottish Rockall survey (Division VIb)

7.1.1 Sampling design nowadays

The Scottish West Coast Surveys use a similar ICES rectangle based sampling strategy to that used in the North Sea. Trawl stations are selected at one tow per rectangle based on a library of clear tows. There is no explicit return to the same trawling position every year, although this is generally the case. Since 1999 the potential of using a depth rather than rectangle based stratification has been under investigation. To this end, and where possible, those rectangles which display substantial internal depth variation have been sampled twice at different depths. The recent inclusion of samples collected between 200 and 500m would suggest that depth stratification should be initiated as soon as possible.

Scottish Rockall Survey is a survey of a relatively small area, in the order of eight ICES rectangles. Trawl stations are on known clear tows and vary between 2 and 8 per rectangle depending on the proportion of the area inside 250m. Initially survey was undertaken biennially, but in the last years it is undertaken annually.

7.1.2 Vessel and gear

The gear deployed on all the Scottish surveys is the 36/47 GOV trawl fitted with heavy groundgear 'C' and a 20 mm internal liner (see Figure 7.7.2 with the GOV used in EVOHE survey, similar to the one used on Scottish surveys but with a different groundgear). The vessel undertaking this survey changed to *Scotia III* in March 1999 from the previous *Scotia*. The gear includes a full suite of SCANMAR sensors; headline height, wing and door spread and speed through the water. (See Table 2.2 for technical details referring the gear and the vessel).

7.1.3 Technical description of the hauls

See general description for the haul protocols.

7.1.4 Database

Trawl surveillance data are recorded by PC using in-house software. Only summary data are routinely archived. All biological and haul data are stored in a SQL database system using NT servers. Data are transferred to DATRAS after processing.

7.1.5 History of the survey: changes in sampling design and protocols

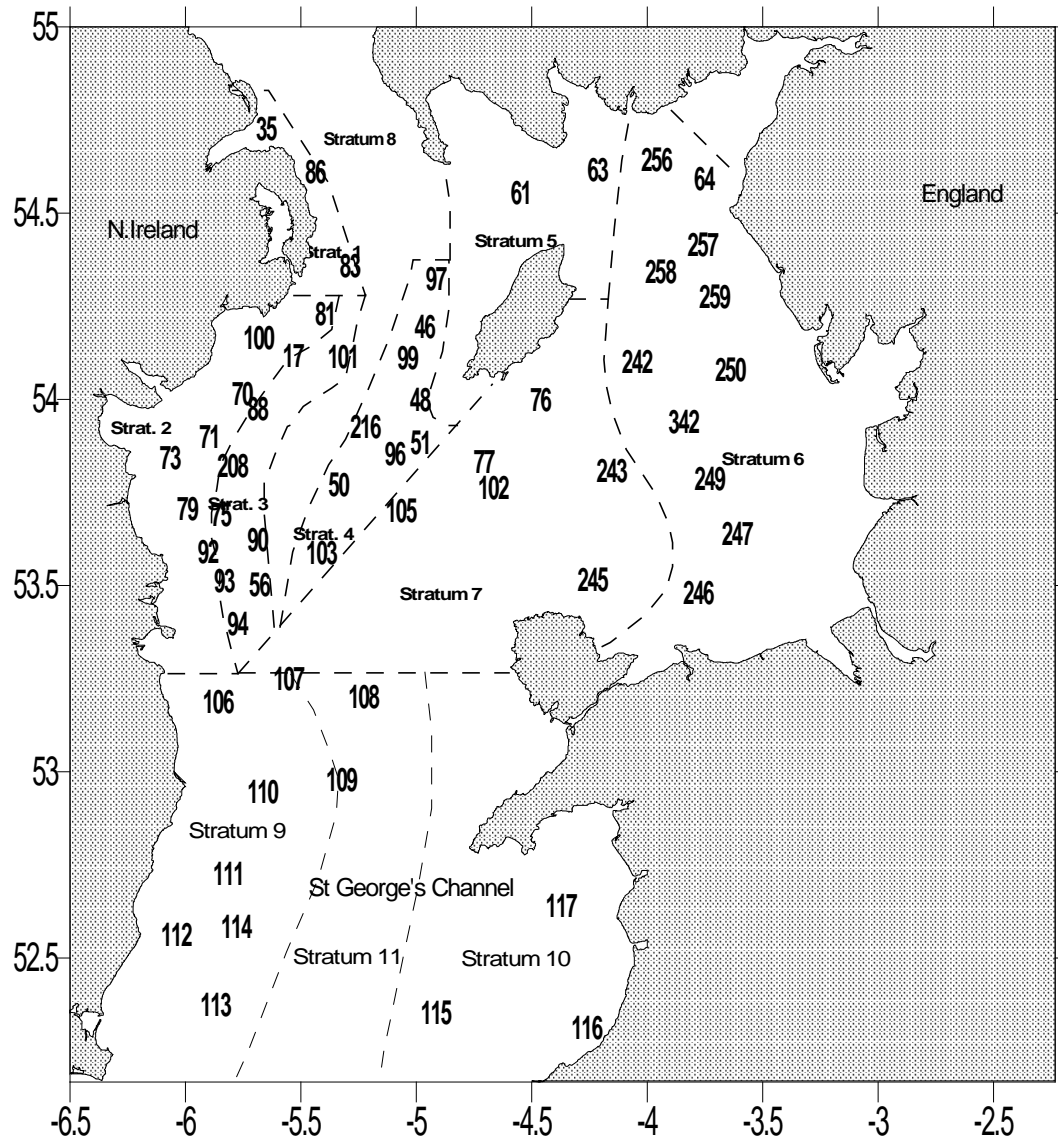
No details available.

7.2 Northern Ireland Groundfish Survey in the Irish Sea (Division VIIa)

The survey covers the Irish Sea area and St George's Channel in ICES Division VIIa, surveying all depths in the area. The surveys are carried twice every year in quarters 1 and 4, although the 1st quarter survey was not considered for co-funding in 2007 Data Collection Regulation (see SGRN 2007) and this has been extended to 2009 DCF, posing some problems to the continuity of 1st quarter time-series.

7.2.1 Sampling design nowadays

The sampling design is stratified with fixed-position stations (Figure 7.2.1). Stratification is by depth and seabed type. The primary objective is to achieve a 3.0 nautical mile tow between settlement of the net on the seabed and lifting off the seabed, in a time as close to 60 minutes. This is to achieve a consistent balance between speed of the net over the ground and flow-rate of water through the net. Stations in the St George's Channel are 1 nautical mile at 3 knots and as close to 20 minutes. Number of stations is 46 in northern Irish Sea and 15 in St George's Channel. Tows are fished during daylight hours only.



- Key to strata:
1. Irish Coast (N), <100m, Mixed sediments
 2. Irish Coast, < 50m, sand and finer sediments
 3. Irish Coast, 50 - 100m, Muddy sediments
 4. W and SW Isle of Man, 50 - 100m, mud and muddy sand
 5. N Isle of Man, <50m, gravel sediments
 6. Eastern Irish Sea, <50m, sand and finer sediments
 7. S. Isle of Man, <100m, gravel sediments
 8. Deep western channel and North Channel >100m
 9. St George's Channel west; sandy/mixed sediments; <100m
 10. St George's Channel east; sandy/mixed sediments; <100m
 11. St George's Channel central; >100m; various hard and soft sediments.

Figure 7.2.1. Stratification used in Northern Ireland surveys.

7.2.2 Vessel and gear

Presently the surveys are now carried out on the RV "Corystes", a 52.5 m double hulled research vessel with Diesel-Electric engine.

The fishing gear is a rock-hopper otter trawl (Figure 7.2.1) with a 17m footrope fitted with 250mm non-rotating rubber discs. The gear has a mean vertical opening of 3m. The door spread varies from around 25m at 20m depth to 40m at 80m depth. A 20mm

(inside mesh) codend is fitted. SCANMAR sensors are fitted to the gear and trawl parameters are recorded. A warp length appropriate to the depth of water is to be used usually 3 to 3.5 times the depth.

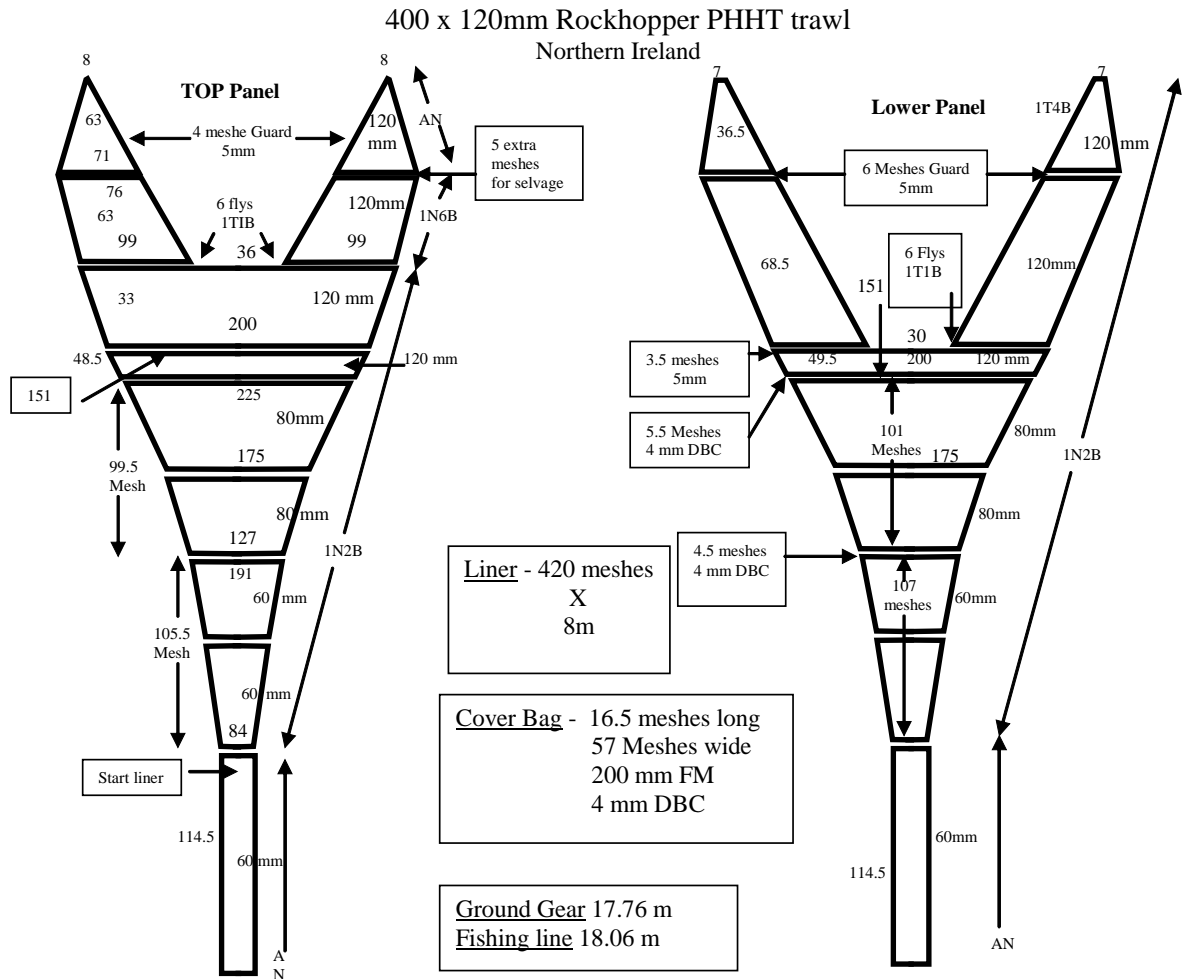


Figure 7.2.1. Scheme of the rock-hopper PHHT trawl gear used in North-Ireland surveys.

7.2.3 Database

Northern Ireland surveys station and catch data are archived on board using an Oracle database developed during 2001 and 2002. Until recently biological data were entered on shore using a separate Oracle database, biological data are now entered using the new SQL database, which was developed in 2009.

7.3 Irish groundfish survey (Divisions VIa-VIIb&j; IGFS)

Prior to 2003, Irish groundfish survey data were collected by the Marine Institute (MI) from two commercial vessel charters covering ICES areas VIa, VIIb&j, and one research vessel survey within ICES areas VIIa&g. Given certain limitations aboard different commercial charters, a decision was made to instigate a new time-series with the arrival in 2003 of a new 65m research vessel, the R.V. Celtic Explorer. This new time-series became the Irish Groundfish Survey (IGFS) covers divisions: VIa South, VIIbcg, and also some overlap with the Spanish Porcupine Survey in eastern VIIc. The survey is carried out in 4th quarter with the VIa area being covered in Early October and the remaining areas in VII being carried out over two legs in one during October and November.

7.3.1 Sampling design nowadays

At present, the IGFS uses a semi-random depth stratified design. Stations are selected from historical clear survey tow data combined with additional information from the fishing community and national multibeam survey work. Initially data from the first year of the current survey was combined with two years of the preceding survey's data to post stratify the IGFS area. Depth and latitude were used as explanatory variables to initially group catches and define strata. Following (De'ath, 2001) Multivariate Regression Tree analysis (MRT) using Manhattan distances suggested clustering broadly in line with ICES divisions in terms of latitude with the addition of depth boundaries at 30m, 80 m and 120m.

The shallow 30m strata would have resulted in very few samples annually. Also, at that time the sweeps on the GOV were doubled from 55m to 110m at haul depths over 75m as per recommendations in the IBTS manual. Therefore the 75m was taken as the boundary for the coastal strata so that gear would be consistent within a strata and sufficient samples should be available annually for realistic precision estimation.

Haul allocation uses a buffered, semi-random design such as that described by (Kingsley *et al.*, 2004), where the number of stations per strata is proportional to the area, resulting in a final design with 17 strata (Figure 7.3.1). Depth boundaries are 0–80m, 81–120m, 121–200m, 201–600m corresponding to Coastal, Medium, Deep and Slope respectively. In total 170 stations are allocated annually with 75% of these being selected at random from the historical survey tow positions. A further 25% are selected at random from a 5nm grid and clear ground is sought within 10nm of the allocated point from historical data, commercial data supplied to the Marine Institute as well as multibeam data from the ongoing National Seabed Survey program.

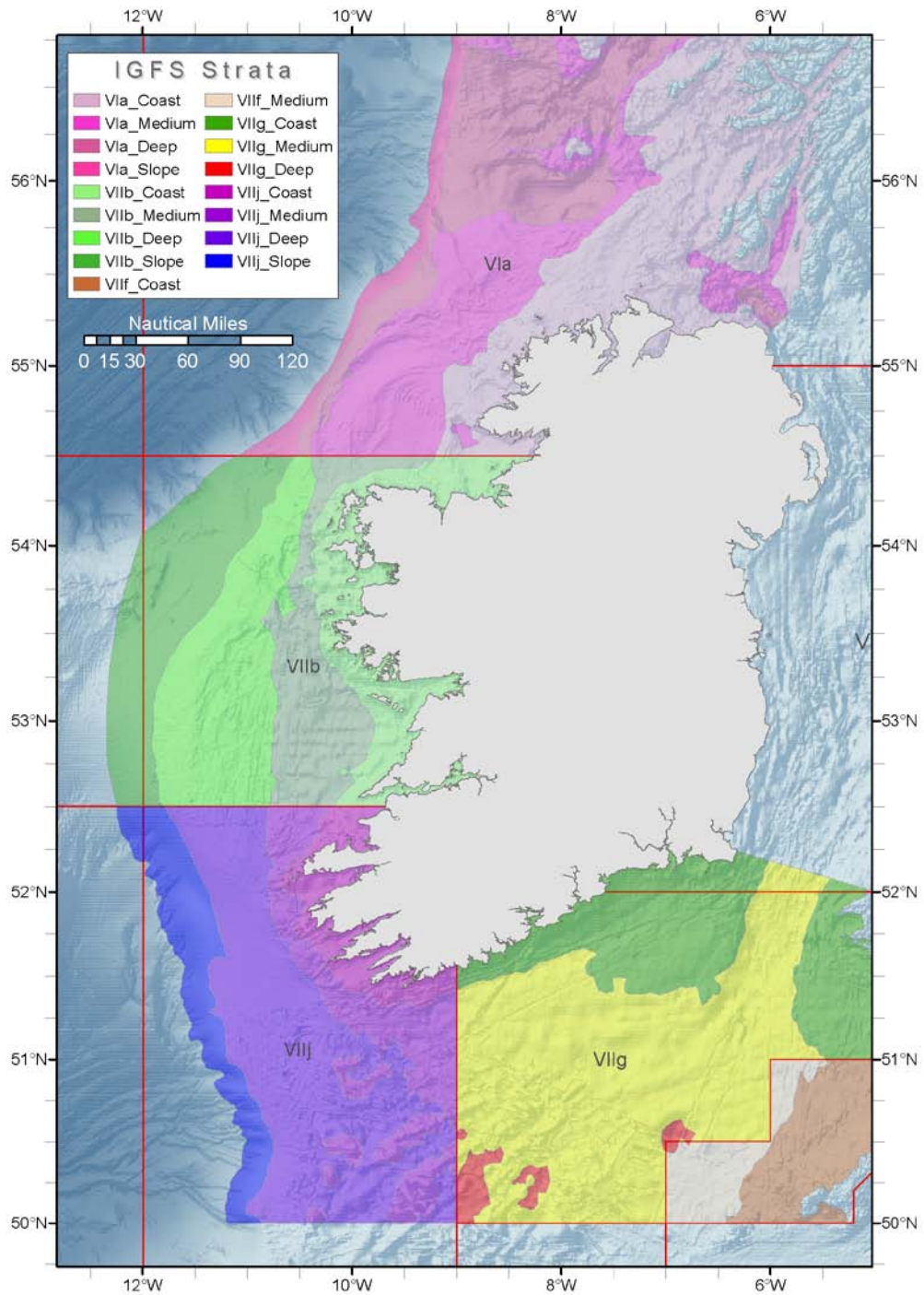


Figure 7.3.1. Map of IGFS strata from 2009. Coastal strata (20m-80m) was modified from 20m-75m as per IBTS for IGFS09, and new areas calculated. The new strata will be used to post stratify the IGFS for calculation of precision. Medium strata= 81m-120m; Deep strata=121m-200m; Slope strata=201m-600m.

Areas of the different substrata have been re-estimated after the changes in depth limits used for IGFS-2009 and are presented in Table 7.1.

7.3.2 Vessel and gear

The IGFS is carried out on board the RV “Celtic Explorer”, a vessel with 65 m and 4320 KW. The gear used is the GOV 36/47, similar to the one used in other Northeastern Atlantic areas for the IBTS and in the North Sea (See Figure 7.5.2 for the GOV used in EVHOE survey), two differences in groundgear have been adopted since IGFS 2004, and should be borne in mind when interpreting indices:

- 1) Groundgear “A” (200mm disks in centre) is the one used in most of the area, but the low catches of target species such as cod prompted adjustment of the GOV toggle chains from IGFS04 onwards to a single link, as well as lack of technical information to support the evolution or requirement for such a gap.
- 2) Given the IGFS was a new time-series a modified groundgear “D” (16” disks in centre) was developed by the MI and MARLAB and implemented since IGFS04 in area VIa exclusively. As with rig A, operated outside VIa, the footrope is attached to the fishing-line by a single link. In all other aspects the trawls are rigged and operated as per the guidelines set out in the IBTS manual.

In line with the IBTS recommendations, sweeps are lengthened to maintain trawl geometry in deeper water, from 55m up to depths of 80m to 110m in deeper water.

7.3.3 Technical description of the hauls

Once the gear is on board, the aim is to sort everything to species level. Nevertheless in cases where catch is particularly large, and one or more tows for the day would have to be dropped to process it, the catch will be run through the fish sorting room with portions being kept aside at regular intervals to ensure a reliable sample is achieved from throughout the original catch. Alternatively, where there is significant bulk of simply 2–3 related species which are error prone to separate quickly, these can be treated initially as a mixture (single species grouping) and a precise ratio identified from a subsample of this mixture used to back calculate the original total catch weights.

Outside these two rare scenarios described here, all species are separated in the catch and weighed. All fish, elasmobranchs, commercial cephalopods and some invertebrates are also subsampled and measured to produce a length frequency by species for each haul. Age and maturity data are also acquired for many commercially managed stocks and this list is available and updated in the survey summaries in the IBTS annual reports.

7.3.4 Data base storage

All catch weight data are entered directly into an Access database while sorting the catch. Data for each sample is then also entered directly onto database via electronic measuring boards. Catch and individual sample data are then combined and compared after each tow for quality assurance. All catch data for the day is then loaded to a central SQLServer 2008 Survey database which also contains all other positional and gear parameter meta-data for the tows. Navigation and gear monitoring information are also logged directly from the SCANMAR and navigation devices using the Spanish program Pescawin.

7.3.5 Survey history: changes in sampling design and protocols

- Historically the Irish groundfish survey area covered the Irish Sea (VIIa), the west of Scotland (56.5N) down to 50N in the Celtic Sea and out to the 200m contour along the continental shelf. Prior to 2003, Irish groundfish survey data were collected by the Marine Institute (MI) from two commercial vessel charters covering ICES areas VIa, VIIb&j, and one research vessel survey within ICES areas VIIa&g.
- Given certain limitations aboard different commercial charters, a decision was made to instigate a new time-series with the arrival in 2003 of a new 65m research vessel, the R.V. Celtic Explorer. Starting in 2003, the IGFS amalgamated the historical survey areas into a single six week survey totalling 170 stations. This new time-series became the Irish Groundfish Survey (IGFS).
- Analysis in the Celtic Sea area by Ifremer using additional ground type variables resulted in some modification of the French EVHOE survey design (Poulard and Mahé, 2004). It was agreed that similar minor modifications would be standardized also across the Irish Survey area and the 75m contour was adjusted to 80m and for simplicity this is now the depth at which sweeps are changed also.
- There was increasing survey vessel effort in the Irish Sea at that time and therefore the opportunity was discussed and agreed at IBTS to reallocate IGFS resources from VIIa to the Atlantic area and northern Celtic Sea in 2005. A number of stocks of interest to assessment working groups such as monkfish (*Lophius piscatorius*), megrim (*Lepidorhombus whiffiagonis*) and hake (*Merluccius merluccius*) were known to be distributed beyond the then existing 200m range of the survey. In order to more adequately survey these stocks and avoid interrupting the ongoing time-series, the effort transferred from VIIa was entirely allocated to a new strata beyond the shelf edge, extending the survey down the slope from 200m to the 600m contour (Figure 7.3.1.). Consequently, a time-series for new deeper strata is being built in parallel, but independently, and will be incorporated when appropriate.

7.4 Spanish Groundfish Survey in the Porcupine bank (Divisions VIIb,k) (SPPGFS)

The SPPGFS covers ICES Division VIIb,k corresponding to the Porcupine Bank and adjacent area in western Irish waters from longitude 12° W to 15° W and from latitude 51° N to 54° N, covering depths between 180 and 800 m at the end of the third quarter (September) beginnings of 4th quarter.

7.4.1 Sampling design nowadays

The whole area (45880 Km²) has been separated in two geographical sectors and three depth strata (less than 300 m shallower haul ca. 180 m, 300–450 m and 450–800 m), resulting in 5 strata, given that there are no grounds shallower than 300 m in the southern geographical sector (Figure 7.4.1). The aim is to carry out 80 hauls per year, using a sampling design random stratified with allocation proportional to the strata area following a buffered random sampling procedure (as proposed by Kingsley *et al.*, 2004) to avoid the selection of adjacent 5×5 nm rectangles, and a minimum of two stations per stratum. The aim is to perform annually altogether 80 fishing stations.

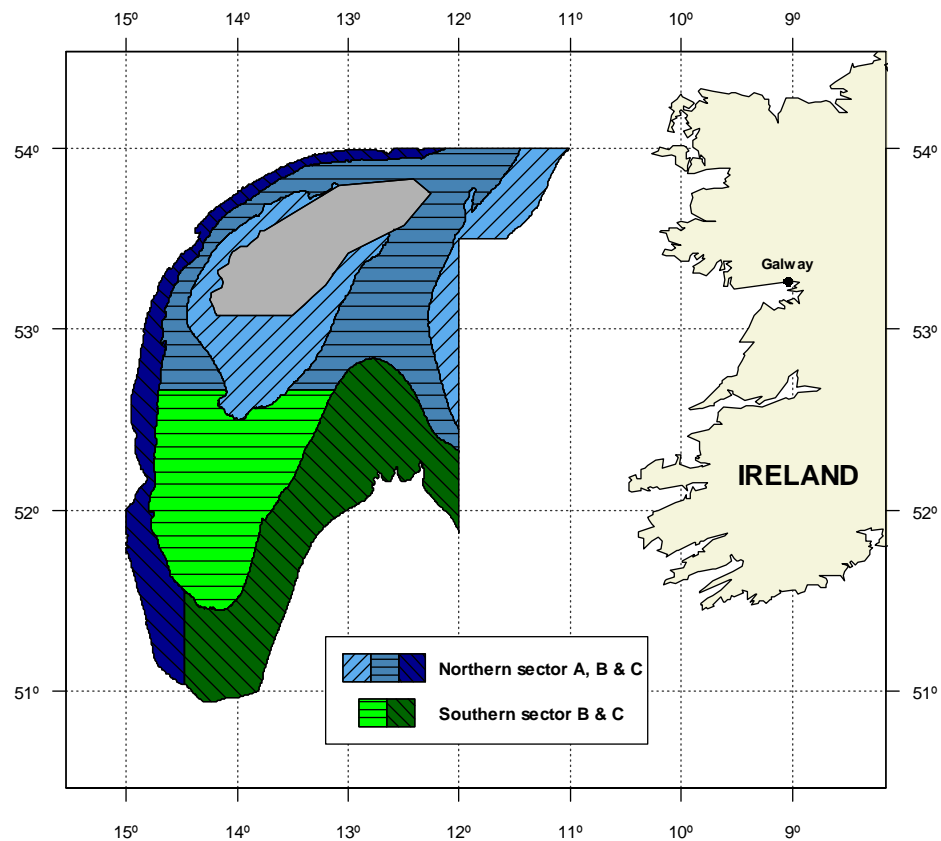
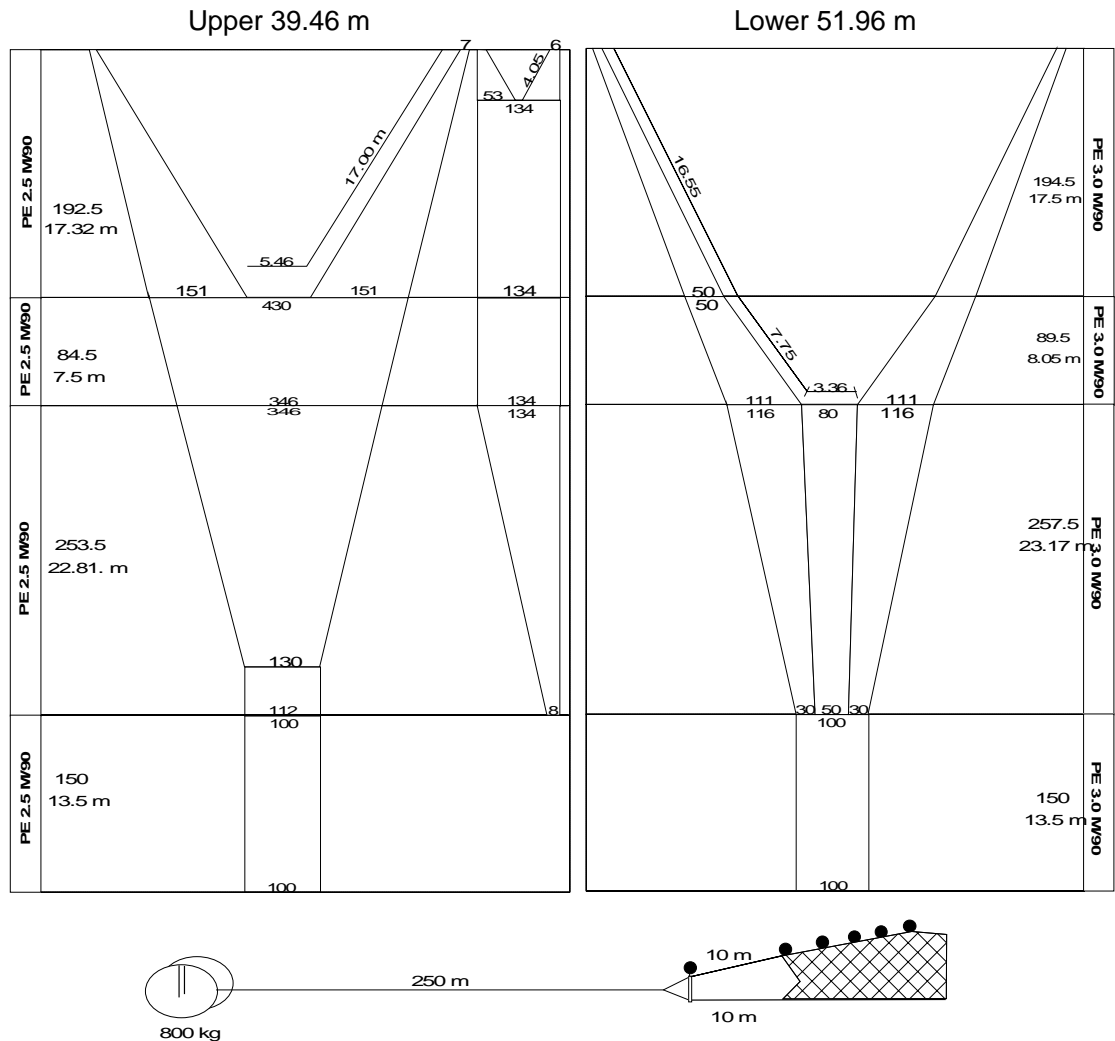


Figure 7.4.1. Stratification used in the Porcupine Spanish surveys. In each geographical strata bathymetric strata are: a) less than 300 m, b) 301–450 m and c) 451–800 m.

7.4.2 Vessel and gear

The Spanish Ground Fish Survey in the Porcupine bank is carried out on the RV “Vizconde de Eza”. This vessel is a stern trawler of 53 m length and 13.5 m wide with gross tonnage of 1400 t. Fishing gear used is a Porcupine boca 40/52 with 39.46 m footrope and a 51.96 headline (Figure 7.4.2). Doors are oval with 800 kg and 4.5 m² surface. Diameter of warp used is 20 mm, of sweeps is 55 mm and the groundrope 98 mm with a double synthetic coat. Codend mesh size is 20 mm.

Porcupine boca specifications and costs



(*) On the lateral columns (left for upper and lateral panels, right for the lower panel) first figure corresponds to the number of meshes or knots and the second one to the length (m)

Floats: 11 (280 mm) on the headline every 50 cm + 34 (200 mm) on the wings every 50 cm + 16 (200 mm) on the wings every 100 cm + 1 additional float (200 mm) at each butterfly or danleno (which one is the correct technical word?).

Sweeps: 250 m, combination rope with 6 strings Eurosteel (Stainless steel core), 55 mm Ø. (630 kg/250 m)

Groundrope: 26 mm Ø, with double nylon coat and 50 kg of 12 mm chains.

Bridles: Upper 10 m 14 mm Ø; Lower 10 m 18 mm Ø with a single nylon coat.

Figure 7.4.2. Scheme of the Porcupine boca 40/52 trawl gear used in the Porcupine survey.

7.4.3 Technical description of the hauls

Hauls last 30 minutes from the end of shooting the gear and the warp (locking the winches) to the start of pulling back the gear. The length of warp shot is based on a power relationship with the depth ($warp = 4.329 \times Depth^{0.929}$). Trawl speed is 3.5 kn. Mean vertical opening is 2.93 (± 0.03) m, wing-spread is 25.0 (± 1.4) m and door spread is 133.7 (± 1.2) m. Simrad ITI sensors for vertical opening and doors spread, depth and temperature are used regularly, changing door sensors to wings occasionally to check the horizontal opening.

7.4.4 Data base storage

Data are stored on board and logged on a software package specifically created for this purpose (CAMP: files in dBase III format). Vessel performance during the hauls (GPS position, speed, depth, haul track, sampler used, gear behaviour, activity as shooting, trawling or pulling back, etc) is logged directly using a software developed specifically for scientific bottom-trawl surveys, called PescaWin, that allows logging all these data during the haul manoeuvres.

Once in land, data from the IBTS Surveys are transferred to the general IEO Data Base Application SIRENO. Both software input procedures, CAMP and SIRENO, include data checking and data quality controls through filters implemented in the software tools used, these include:

- 1) Haul position vs. geographical sector allocation and depths ranges vs. strata allocation,
- 2) Differences between speed vs. expected tow distance and positions.
- 3) Catch weight vs. estimated weight of the sampled length distribution using L-W regressions when available.

Since Spanish data uploaded in DATRAS are limited to length distributions by sex and information related with species routinely provided to the assessment Working Groups. Errors detected in the last years have not been corrected into the data already uploaded in DATRAS. But given that a revised upload of all the data will be required to overcome some problems in the format originally proposed, and detected after the first uploadings, the revised upload will include all the corrections detected during the controls performed in the last years.

7.4.5 Survey history: changes in sampling design and protocols

- In 2001 the IEO started the series of bottom-trawl surveys in the Porcupine bank to overcome the previous lack of sampling in this area, included in the IBTS Western Area, original stratification was based on data on commercial catches sampled by observers in the previous years, the stratification had three depth strata (less than 200 m, 200–400 m and 400–800 m, combined with two geographical sectors one in the outer part (W-NW) of the bank and the other in the inner part surrounding the Porcupine Seabight (E-SW).
- In 2003 a new stratification was adopted following the results of the two first surveys in the area (Velasco and Serrano, 2003), the original strata were changed to: less than 300 m, 300–450 m, 450–800 m. The new stratification fitted better the distribution of the bottom-trawl faunal assemblages in the area.

7.5 English western IBTS survey – Quarter 4 (Divisions VIIa,e-h) (Q4SWIBTS)

7.5.1 Sampling design nowadays

Since 2004, the survey has used two trawls, a 36/47 GOV trawl with groundgear A on fine ground stations in the Celtic Sea and northern Irish Sea, and a modified 34/45 GOV trawl with rock-hopper groundgear on hard ground stations around the Cornish Peninsula.

The survey samples on a fixed survey grid, with stations identified in an alphanumeric format to identify those strata for which the depths, latitudes, sediments and

demersal communities are relatively similar (Figure 7.5.1). Given that severe weather can prevent safe gear deployments from the current vessel, the station grid includes some stations that can be fished when there is time, with the survey aiming to fish as many of the main stations as possible.

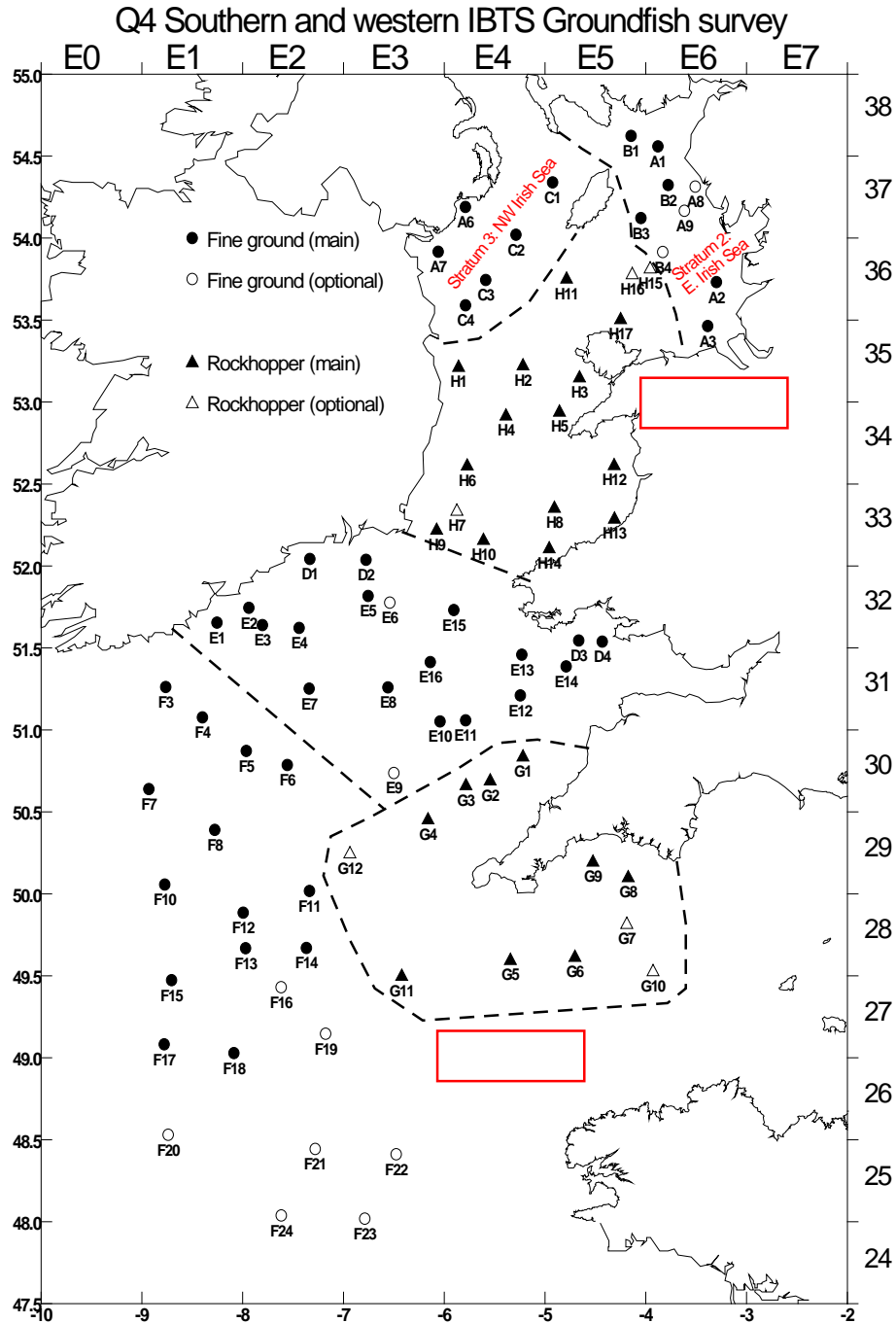


Figure 7.5.1. Survey grid for English westerly IBTS survey in Q4.

7.5.2 Vessel and gear

The English survey in the area is carried out on the RV “Cefas Endeavour”, a stern trawler 74 m in length with a gross tonnage of 1731 t. Two fishing gears are used, both modified GOV trawls,

On fine ground stations, a 36/47 GOV trawl is used with groundgear A. Although broadly comparable to that described in the North Sea IBTS Manual VIII revision (ICES, 2010) there are a few modifications, as described below:

- a) The toggle chains connecting the groundgear to the fishing lines are set to 10 cm (and not 30 cm),
- b) The kite is not used, and additional floats used to compensate for this, with 10 x 28 cm plastic floats in the headline, and 30 x 20 cm aluminium and three 28 cm plastic floats in each wingline,
- c) The net is now made from polyethylene (although nylon nets were used at the start of survey series), with a lifting bag (200 mm mesh size, double 4 mm twine) covering the codend to minimize damage when lifting and emptying the codend,
- d) Tearing strips are included between the belly panels to minimize the extent of any damage.

These modifications were required to minimize damage to the trawlnet on some grounds, and to facilitate the deployment and retrieval of the trawl (noting that RV Cefas Endeavour does not have a ramp).

On hard ground stations, a modified 34/45 GOV trawl is used on a rock-hopper groundgear (groundgear D). The modifications from the 'standard' GOV are as follows:

- a) The central sections are reduced from 5 m to 3 m, with meshes hung in this area by 1/3 and not 1/2,
- b) The kite is not used, and additional floats used to compensate for this, with 10 x 28 cm plastic floats in the headline, and 30 x 20 cm aluminium and three 28 cm plastic floats in each wingline,
- c) The net is made from polyethylene (although nylon nets were used at the start of survey series), with a lifting bag (200 mm mesh size, double 4 mm twine) covering the codend to minimize damage when lifting and emptying the codend,
- d) Tearing strips are included between the belly panels to minimize the extent of any damage,
- e) Only two bridles are used (a 40 m upper bridle, a 38 m lower bridle, with a bumper chain (set to ca. 2 m),
- f) Rockhoppers (groundgear D, see Figure 7.5.2) are used, and the central section of the groundgear is reduced from 5 m to 3 m. Ground gear D comprises a central section of 16" discs with one 8" spacer and four sections along each wing (5 m section in the bunt with 16" disc and two 8" spacers; two 5 m section with 14" discs and three 8" spacers; and a 5 m wing-end section with 12" discs and three 8" spacers),
- g) The sweeps are reduced from 50 m to 20 m, with a 2 m length of heavy chain included between the sweeps and the bridles, and a third swivel added to the end of each sweep,

Given that the fishing line is ca. 45.2 m long, and the groundgear 43 m long, a short length of chain (25–75 cm long) is used to connect the groundgear to the fish plate, so as to avoid too much slack.

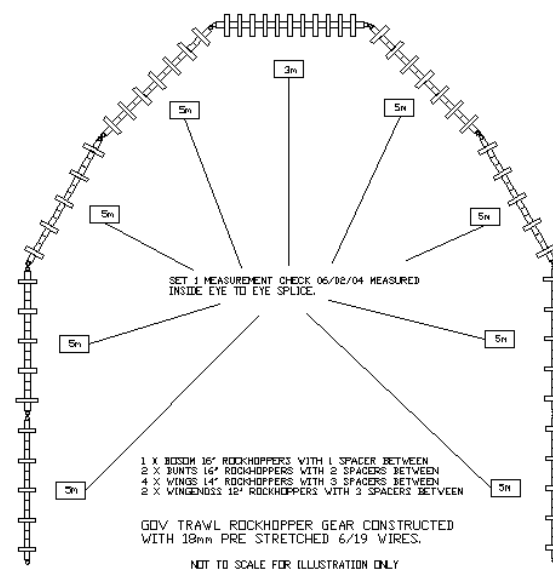


Figure 7.5.2. Ground gear D, as designed for use on the English western IBTS survey (see Harley & Ellis, 2007) for further information.

7.5.3 Technical description of the hauls

The tows are straight tows, 30 minutes long and are carried during daylight at a towing speed of 4 knots (but see below). Gear parameters (headline height, door spread and wing spread and symmetry) are monitored by SCANMAR and the parameters are recorded. Additionally, a number of navigational parameters were also monitored. Warp out is 4:1, although this may be reduced slightly in deeper waters, in order to maintain net geometry.

Sensors that indicate water speed through the net are used to make minor changes to towing speed. In those parts of the survey grid that are subject to very strong tides (e.g. St George's Channel), towing speed may be reduced slightly (e.g. to 3.6–3.9 knots) in order to reduce water flow through the net.

Although a fixed station grid, in order to maintain optimal net geometry, trawling may be taken in various directions on the tow, where grounds are known to be free of obstructions.

Catch processing is as described in Section 3.

7.5.4 Database

At the moment, the English survey database is held on an INGRES database, designed in-house by Cefas. Forms containing station details, catch records, length data and biological information are created and stored on this system. The system runs on a VMS operating system and is in the process of being rewritten due to VMS not being supported from 2003. A description of the new database will be included when available.

7.5.5 Survey history: changes in sampling design and protocols

- A previous survey operated in the Celtic Sea (the southern part of the current grid) up to 2003 in quarter 1, trawling at fixed stations using a Portuguese high headline trawl (PHHT) with a tickler chain used on fine

grounds, but not on coarser grounds. For further details of this survey see Warnes and Jones (1995) and Tidd and Warnes (2006).

- The English Q4 western IBTS survey was initiated in 2002 and trialled a boca trawl, although this gear was susceptible to gear damage on some of the coarser grounds in the Celtic Sea. In 2003, the survey was conducted on the RV *Cefas Endeavour* where a modified rock-hopper GOV was trialled, although the configuration of the rock-hopper discs was changed for subsequent years.
- Since 2004, the survey has used two gears – a 36/47 GOV trawl with groundgear A on fine ground stations in the Celtic Sea and northern Irish Sea, and a modified 34/45 GOV trawl with groundgear D (see Harley and Ellis, 2007) on hard ground stations around the Cornish Peninsula and in St George’s Channel. Since 2006, the nets have been constructed from polyethylene (instead of nylon).
- Given the lack of a ramp on the vessel, deployment and retrieval of the gear cannot be undertaken safely in poor sea conditions, and in 2006 severe weather restricted the amount of sampling that could be undertaken in the Celtic Sea.

7.6 French Channel Ground Fish Survey (Divisions VIIId and IVc)

The French Channel Ground Fish Survey (CGFS) covers the Channel area extending from the south of the North Sea in ICES Division IVc and the Eastern Channel in division VIIId. It is carried yearly since 1988 during October on board the RV “Gwen Drez”.

7.6.1 Sampling design nowadays

The survey extends from the Eastern English Channel to the south of the North Sea, which corresponds to ICES Divisions VIIId and IVc. The study area is divided into rectangles of 15' latitude and 15' longitude (the “CGFS grid”, Figure 2) using a systematic sampling strategy, based on standard rectangles as the one used on the North Sea. One or two 30 minutes hauls are performed within each rectangle of the CGFS grid (two in the coastal zone and one offshore (see Figure 7.6.1) The fishing hauls are chosen using professional fishing plans or found by prospecting. The fishing method is standardized: sampling stations have been each year at similar locations.

Nevertheless in the last years there has been concern on the internal consistency of the abundance indices estimates along the cohorts (see IBTSWG report 2009 and 2010). Therefore different methods are being explored and this sampling design may be revised.

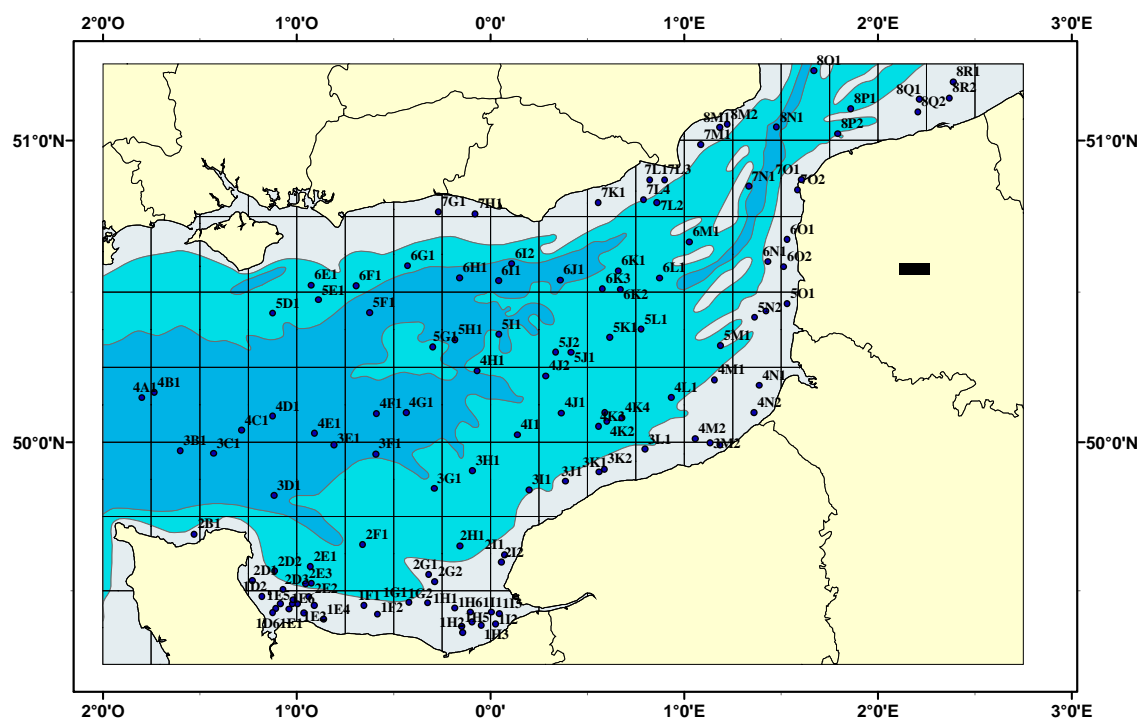


Figure 7.6.1. Area covered and ICES rectangles used in the stratification used in the French Channel groundfish Survey.

7.6.2 Vessel and gear

CGF Survey is carried out on board the RV "Gwen Drez", a stern trawler with 24.5 m and a load displacement of 249 t and 440 Kw.

Regarding the gear, a GOV gear as the one used in EVHOE surveys (see Figures 7.8.2 and 7.8.3), a probe is attached to the headrope to measure temperature and salinity in all hauls.

7.6.3 Technical description of the hauls

Hauls last 30 minutes following the usual protocols within the IBTS and catch is processed and data collected according to general protocols (see Table 3.1 regarding samples and species targeted and collected).

7.6.4 Data base storage

All information is stored in a database in MS Access format, reported to DATRAS.

7.7 French Groundfish Survey in the Celtic Sea and Bay of Biscay (Divisions VII fghj; VIII ab; EVHOE)

The EVHOE survey covers the Celtic Sea with ICES Divisions VII fghj, and the French part of the Bay of Biscay in divisions VIII ab. The surveys are conducted from 15 to 600 m depths, usually it is conducted in the fourth quarter, starting at the end of the October.

7.7.1 Sampling design nowadays

The stratification scheme adopted defines a geographic stratification that separates the Bay of Biscay in 2 areas and the Celtic Sea in 3 areas according to the Figure 7.7.1., and six depth strata (Table 7.7.1 and Figure 7.2).

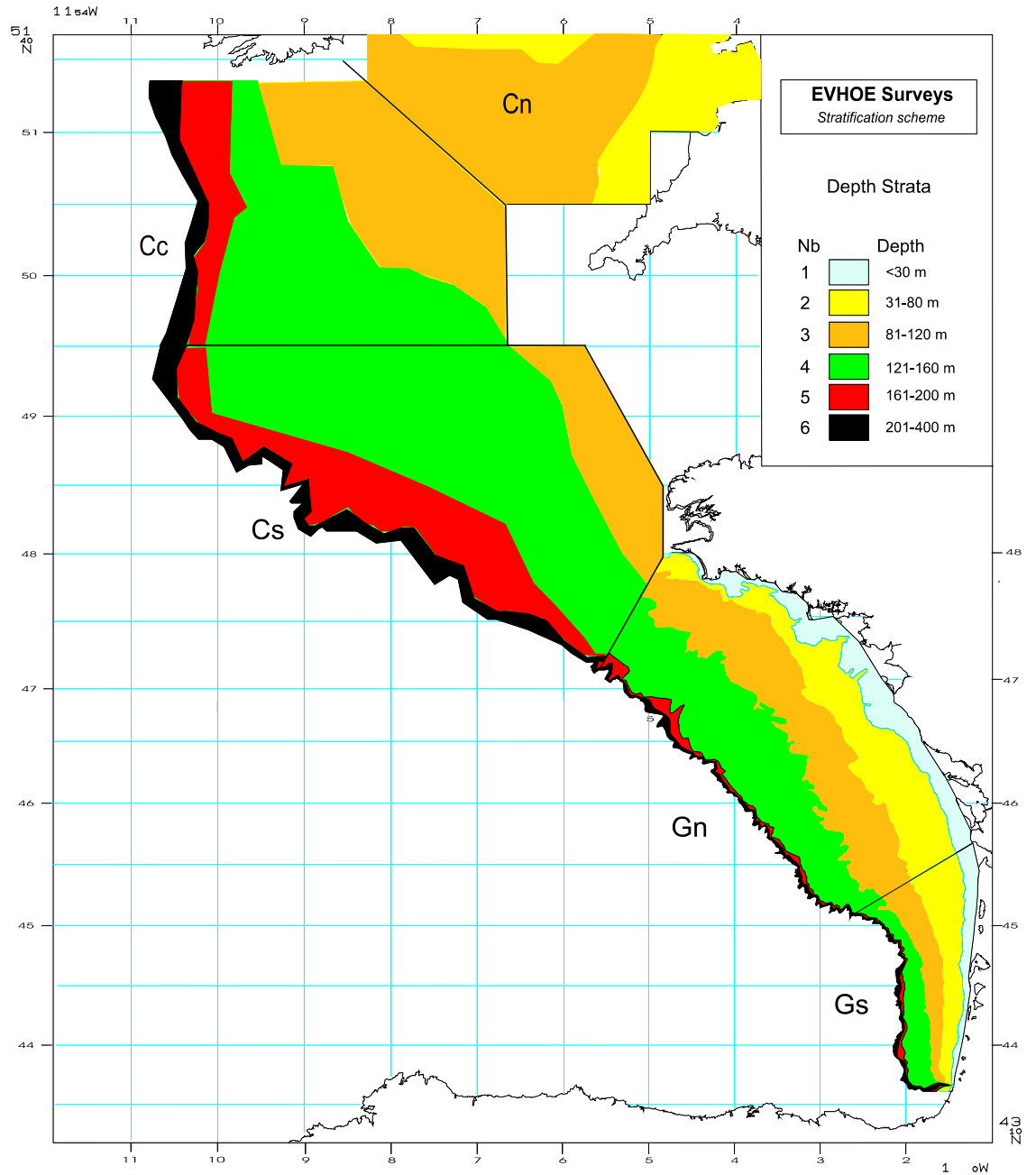


Figure 7.7.1. Stratification used in the Bay of Biscay and in the Celtic Sea for the French surveys.

Table 7.7.1. Bathymetric strata in EVHOE Survey.

Depth Stratum	Depth Range
1	20–30 m
2	31–80 m
3	81–120 m
4	121–160 m
5	161–200 m
6	201–400 m
7	401–600 m

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

7.7.2 Vessel and gear

The EVHOE is carried out with RV “Thalassa”, a stern trawler of 73.7 m long by 14.9 m wide, gross tonnage of 3022 t.

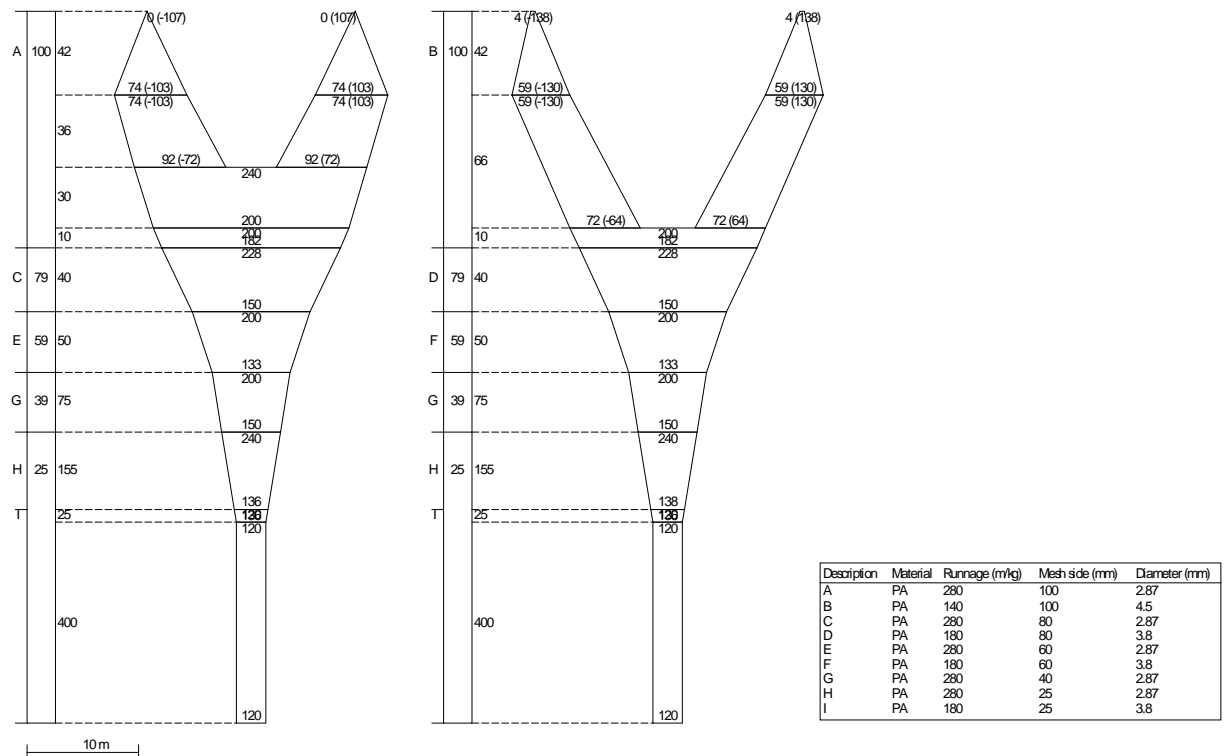


Figure 7.7.2. Scheme of the GOV 36/47 trawl gear used in the French surveys.

The trawl is a GOV 36/47 as described in the IBTS Survey manual and shown in Figure 7.7.2 except that the exocet Kite is replaced by additional buoyancy 66 floats instead of 60 and weight of SCANMAR sensors placed in the middle of the headline has been balanced by adding 21 4l floats (see Figure 7.7.3). Generally, the gear has a

horizontal opening around 20 m and a vertical opening of 4 m. The doors are plane-oval of 1350 Kg. The net is fitted with a 20 mm codend liner.

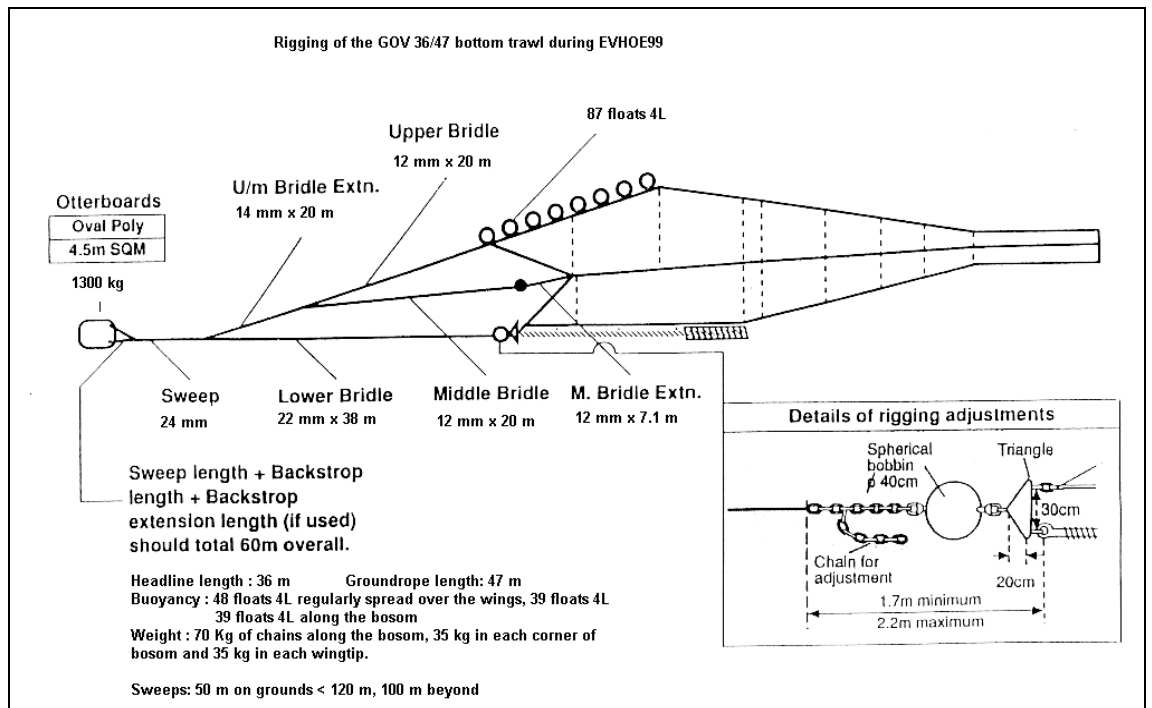


Figure 7.7.3. Rigging of GOV 36/47 used during EVHOE surveys.

7.7.3 Technical description of the hauls

The sets are straight tows, 30 minutes long and are carried during daylight at a towing speed of 4 knots. During the sets, the gear parameters are monitored by SCANMAR and the parameters are stored in the boat computer system. The parameters that are monitored are door spread, wing spread, headline height, height of groundrope. Additionally, a number of navigational parameters were also monitored.

7.7.4 Biological data and sampling protocols with target species

All species of fish are measured, for some species other biological samplings are made (individual weight, maturity, measurement by sex, ageing material). All commercial species are sexed when measured and the ageing material collected is following a stratified allocation by length class and by sex, therefore separate ALKs per sex are constructed.

7.7.5 Data base storage

All information is stored in a database in MS Access format, and reported to DATRAS.

7.7.6 Survey history: changes in sampling design and protocols

- For the 1987 to 1996 period, the Survey EVHOE was conducted in the Bay of Biscay on an annual basis with the exception of the years 1993 and 1996. It was been conducted in the third or fourth quarter except in 1991 where it took place in May.
- In 1988 two survey were conducted, one in May the other in October.

- The Celtic Sea was surveyed from 1990 to 1994 but the sampling was restricted to a small geographical area. The duration is between 40 to 45 days depending on year and availability of ship.
- Since 1997, with the recently commissioned RV “Thalassa”, the survey covered all the Celtic Sea and Bay of Biscay during the 4th quarter and the survey is conducted from 20 m to 600 m.

7.8 Quarter 4, Northern Spanish Shelf Groundfish Survey in the Cantabrian Sea and Off Galicia (Divisions VIIIc and Northern part of IXa; SPNGFS)

The SPGFN covers the northern Spanish shelf comprised in ICES Division VIIIc and the northern part of IXa, including the Cantabrian Sea and off Galicia waters. The surveys are conducted from 30 to 800 m depths, usually starting at the end of the third quarter (second fortnight of September) and ending in the fourth quarter (by the end of October).

7.8.1 Sampling design nowadays

The stratification is based on five geographical sectors between the Portuguese border at Miño river, and French border at Bidasoa river (Figure 7.8.1) and three bathymetric strata defined between 70 and 500 m (see Figure 7.2) with additional stations that, depending on vessel time available at sea, are usually carried out to cover the scarce trawlable grounds in the study area between 30–70 m and between 500 and 800 m.

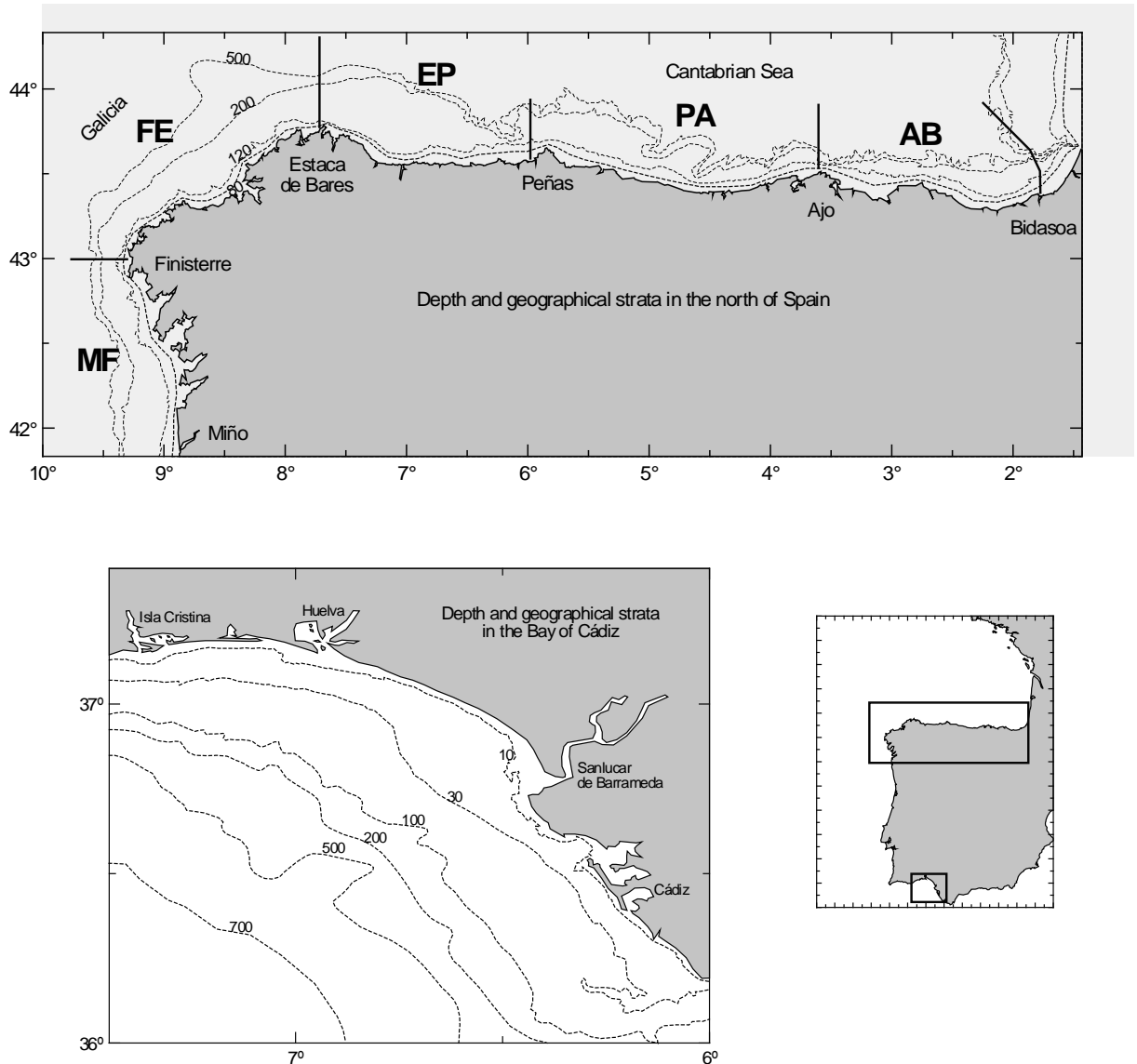


Figure 7.8.1. Stratification used in the Spanish surveys in the Iberian shelf.

The number of stations per strata is proportional to the strata area with an approximated coverage of 5.4 hauls for every 1000 Km² (ca. 120 hauls per survey), and are allocated with a semi-random design to ensure the coverage of hake nursery areas in the different parts of the northern Spanish shelf.

7.8.2 Vessel and gear

The SPGFN is usually carried out with RV "Cornide de Saavedra". The gear used is a Baka trawl 44/60 with a 43.6 m footrope and a 60.1 m headline (Figure 7.8.2). The traditional trawl doors used are rectangular, weighting 650 Kg and 3.6 m² of surface (2.67×1.34 m). The diameter of warp used is 22 mm (1.9 Kg/m). An inner 10 mm mesh codend liner is used to prevent the escape of small individuals (overall summary of present vessel/gear specifications for all surveys in Table 2.2).

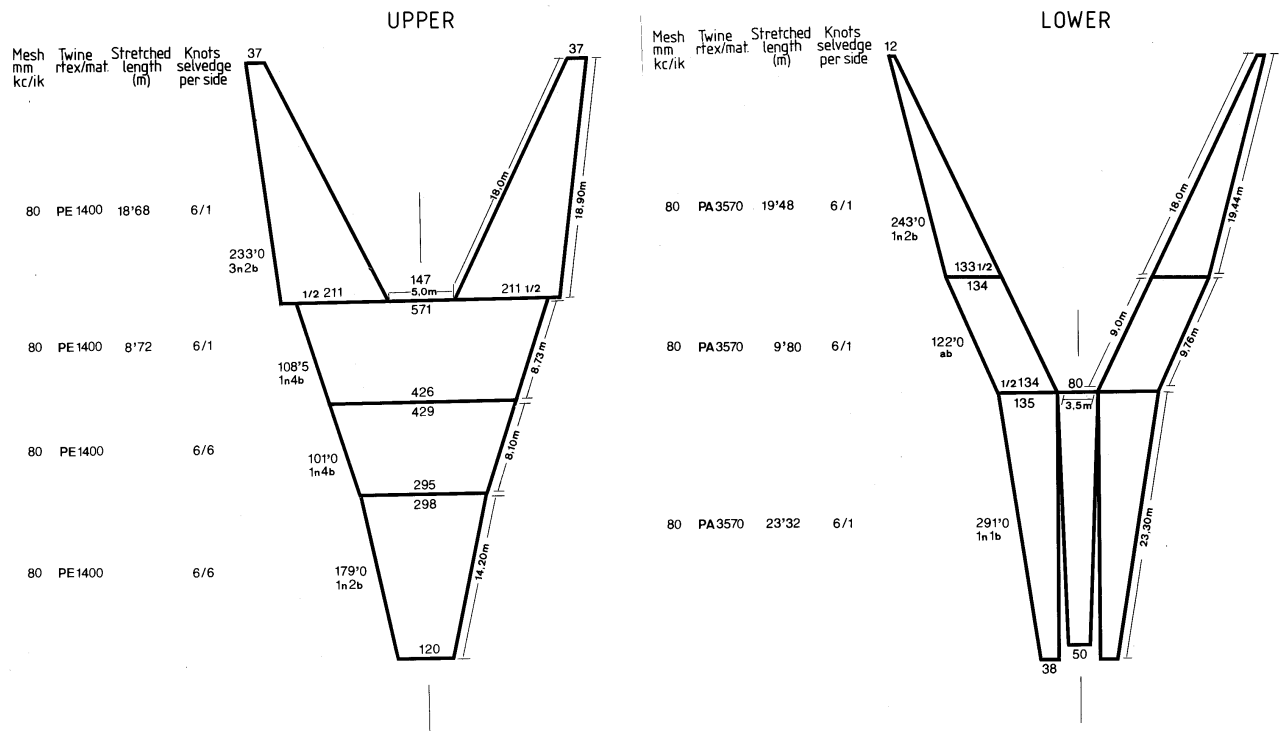


Figure 7.8.2. Scheme of the Baca 44/60 trawl gear used during the Spanish surveys in the Iberian shelf.

7.8.3 Technical description of the hauls

Hauls last 30 minutes from the end of shooting the gear and the warp (locking the winches), and the start of pulling back the gear. The length of warp shot is based on a power relationship with the depth ($\text{warp} = 9.062 \times \text{Depth}^{0.783}$). Trawl speed is 3 kn. Vertical opening of the net varies around 1.8–2 m; horizontal opening around 17–21 m, and doors spread 107 m, varying with depth. SCANMAR sensors for vertical opening, horizontal opening, doors spread, depth and temperature are used regularly. Haul duration in extra-hauls in grounds deeper than 500 m is set to 45 min to allow time for the gear to make ground contact and stabilize.

7.8.4 Biological data and sampling protocols with target species

- Apart from the normal description in Section 5 there are a few organisms measured differently:
 - 0.5 cm below is used apart from herring, sprat and anchovy, used also for sardine and silvery pout (total length)
- Molluscs: all cephalopods (squids, cuttlefish, octopus) but sepiolids are measured: length of the mantle.
 - 1 cm below for commercial cephalopods (mantle length)
- All other crustaceans, molluscs and other invertebrates are identified at the lowest taxonomic level possible and weighed, and depending on the catch a subsample is counted to record the numbers caught.
- All litter or ghost fishing gears are classified, weighed in mayor groups (plastics, metals, fishing gears, concrete debris, crystal...) and record of their appearance is kept.

7.8.5 Data base storage

See Section 7.4.4.

7.8.6 Survey history: changes in sampling design and protocols

- Since 1974 the IEO has performed bottom-trawl surveys in the Atlantic northern continental shelf waters of the Iberian Peninsula, but it was from 1980 that fishing resources of Divisions VIIIc and IXaNorth were monitored through surveys; nevertheless surveys were established following homogenous protocols in all the area in 1983.
- Two series of surveys, spring and autumn were started during the 1980s.
- Up to 1985, a codend cover of 20 mm mesh was used, since then it was placed as inner 10 mm mesh codend.
- In 1989 the “Cornide de Saavedra” was renovated from her original 56 m (LL) and 990 GRT, to the present LL 67 m and 1133 GRT. Due to this renovation in 1987 there was no survey and 1989 survey was carried out in the RV “Francisco de Paula Navarro”, a smaller stern trawler that only allowed a reduced sampling compared to the rest of the series. Intercalibration trials with both vessels were estimated in 1990 survey, and abundance indices for 1989 were consequently corrected.
- Hydrography sampling started in 1993 and has been carried out in each fishing station, and CTD casts following a radial sampling perpendicular to the coast has been carried out in some years.
- In 1997 a new depth stratification was adopted following the results of the SESITS project (Sánchez, 1997), original strata: 30–100 m, 101–200 m, 200–500 m; were changed to: 70–120 m, 121–200 m, 201–500 m. Haul allocation changed to keep it proportional to the new strata surface, and hauls shallower than 70 m were classified as additional hauls not used in the estimation of the stratified abundances obtained from the survey. These changes were adopted since the new stratification fitted better the depth distribution of the main fish assemblages in the area, and the trawlable grounds shallower than 70 m are scarce in the area. Besides trawling is banned in grounds shallower than 100 m.

7.9 Portuguese Groundfish Survey (Divisions IXa; PGFS)

The Portuguese Groundfish survey covers Division IXa in Portuguese continental waters. The surveys are mainly conducted at the beginning of the 4th quarter, in October. The area surveyed extends from latitude 41°20' N to 36°30' N, and from 20 to 500 meters depth.

7.9.1 Sampling design nowadays

The present sampling scheme (Figure 7.9.1) was implemented in 2005, based on a systematic and stratified random sampling, to facilitate the use of geostatistical models and to overcome the difficulties in the estimation of the variance. Additionally, it allows performing the calculations with the former 48 strata. The new sampling scheme includes depths from 20 to 500 m since the main objective of the survey is to estimate recruitment indices for hake and horse mackerel. A mixed sampling scheme composed by 66 trawl positions distributed over a fixed grid with 5' per 5' miles, corresponding to trawl positions already done, and 30 random trawl positions, with a tow duration of 30 minutes.

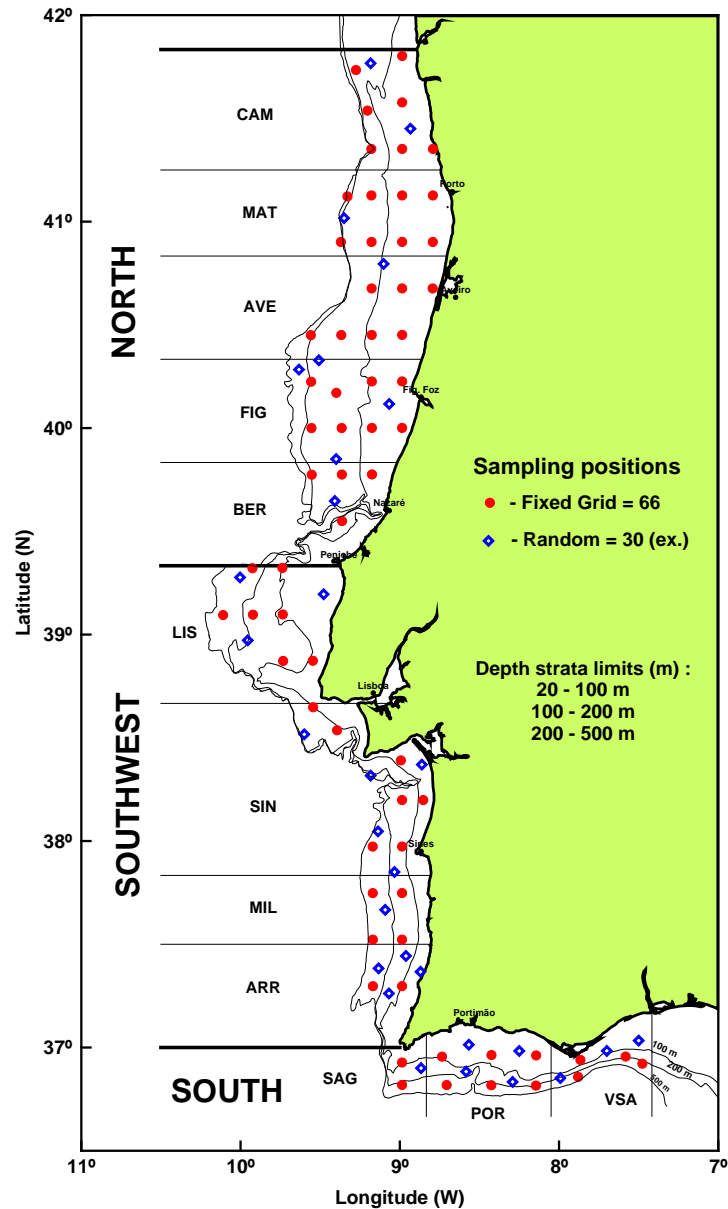


Figure 7.9.1. Sampling design used in the Portuguese surveys.

7.9.2 Vessel and gear

The surveys are carried with the RV “Noruega”, which is a stern trawler of 47.5 m length, 1500 horse power and 495 G.T.R. The fishing gear used is a bottom trawl (type Norwegian Campell Trawl 1800/96 NCT) with a 20 mm codend mesh size. The main characteristic of this gear is the groundrope with bobbins. The mean vertical opening is 4.6 m and the mean horizontal opening between wings and doors is 15.1 m and 44.4 m, respectively. The polyvalent trawl doors used are rectangular (2.7 m x 1.58 m) with an area of 3.75 m² and weighting 650 Kg (Figure 7.9.2; overall summary of present vessel/gear specifications for all surveys in Table 2.2).

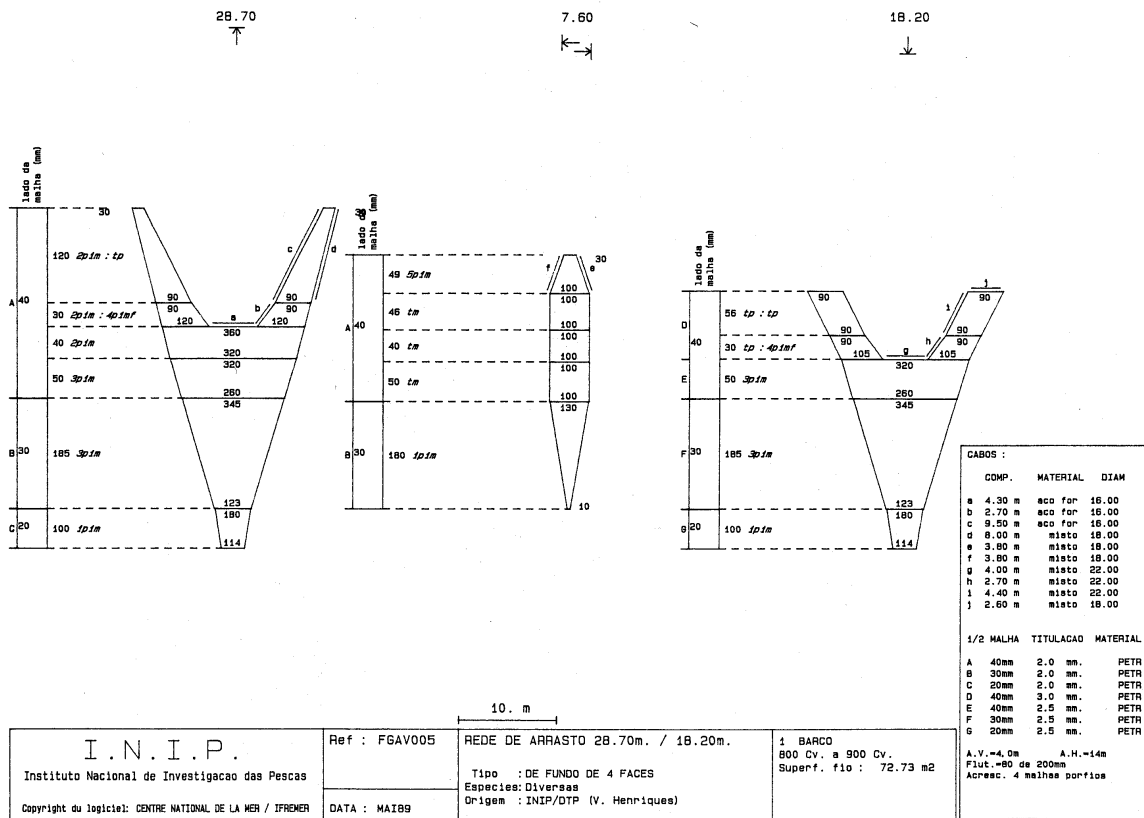


Figure 7.9.2. Scheme of the NCT trawl gear used in Portuguese surveys.

7.9.3 Technical description of the hauls

Fishing operations are carried out during daylight at a towing mean speed of 3.5 knots. Hauls last 30 minutes from the end of shooting the gear and the warp (locking the winches), and the start of pulling back the gear. SCANMAR sensors for vertical opening, horizontal opening, doors spread and depth are sometimes used. Oceanographic stations take place at the final of each fishing station using a CTD equipment in order to get temperature and salinity data by depth to be used in biological studies.

7.9.4 Data base storage

Data are stored on a MS-Access database. Data checking and data quality controls include:

- 1) Haul position vs. geographical sector allocation and depths ranges vs. strata allocation,
- 2) Catch weight vs. estimated weight of the sampled length distribution.

Portuguese data are being uploaded in DATRAS and are limited to length distributions by sex and information related with species routinely provided to the assessment Working Groups. Errors detected in the upload are being corrected to ensure best quality in the data provided.

7.9.5 Survey history: changes in sampling design and protocols

- The Portuguese groundfish surveys have been conducted since 1979, continuously in autumn and partially in winter and summer, with RV

"Noruega" and, in its absence, with RV "Capricórnio". Initially the main objectives of the surveys were to estimate the abundance and study the distribution of the most important commercial species in the Portuguese trawl fishery: hake, horse mackerel, blue whiting, sea bream and Norway lobster. Recruitment indices of abundance and distribution for hake and horse mackerel were also evaluated in autumn surveys. Additionally, trawl selectivity experiments for hake and horse mackerel with 40 mm mesh size were also conducted during 1981 surveys using the covered codend method.

- A stratified random sampling design was adopted during 1979–1989. The number of strata changed during this period: from 1979 to 1980 the surveyed area was divided into 15 strata and from 1981 onwards into 36 strata. Based on the statistical analysis of the previous surveys the design was revised in order to decrease the variance within stratum. The new strata are smaller than the previous ones and can be combined to get the previous ones. The aim of increasing the number of strata was to increase the probability of spreading the random sampled units to decrease the total variance of the species' mean abundance indices. The stratification is based on depth and geographical areas. The depth ranges used during 1979–1988 were 20–100m, 101–200m and 201–500m. Each stratum was divided into units of approximately 25 nm², sequentially numbered.
- During 1979–1980 the number of random hauls per stratum was based on the previous information of the relative abundance of the target species in each geographical area and on the ship time available. During 1981–1989, when the number of strata was 36, two random units were sampled by stratum whenever possible, to allow an estimate of the standard error of the stratified mean by stratum.
- The tow duration was 60 minutes during 1979–1985 at a trawling speed of 3.5 knots, changing to 30 minutes during 1986–1988 (Cardador, 1983), and changed back again to 60 minutes in 1989 as it was observed that the large adults of horse mackerel were not caught in 30 minutes tows at this trawling speed. However in 2002 the tow duration moved to 30 minutes since autumn surveys are directed to recruitment estimates, and increasing the number of hauls per survey allows a better resolution on the estimate (Cardador, pers. comm.).
- From 1990 to 2004, the sampling design was based on fixed stations. In all 97 fixed stations were planned, spread over 12 sectors. Each sector was subdivided into 4 depth ranges: 20–100m, 101–200m, 201–500m and 501–750 m, with a total of 48 strata. The positions of the 97 fixed stations were selected based on common stations made during 1981–1989 surveys and taking into account that at least two stations per stratum should be sampled. A maximum of 30 supplementary stations were planned, fixed in each season, to be carried out if ship time was available or to replace positions that due to particular factors were not possible to sample. Oceanographic stations took place at the final of each fishing station using a CTD equipment in order to get temperature and salinity data by depth to be used in biological studies. CTD sampling stations were also distributed all over the study area avoiding leaving large extensions uncovered, according to a scheme with 95 planned stations. CTD casts sampled at stations

over the shelf area covered the whole water column, from surface to a maximum of 400 m.

- Winter surveys were conducted recently in 2005–2008 mainly to estimate the abundance and distribution pattern of hake and of other target species in spawning season and to estimate maturity ogives. However in 2009 the EU/ DCF has excluded this surveys for funding.

7.10 Southern Spanish groundfish on the Gulf of Cadiz (Southern part of Division IXa; SP-GCGFS)

The SPGCGFS is conducted in the southern part of ICES Division IXa, the Gulf of Cádiz. The covered area extends from 15 m to 800 m depth, during spring (March) and autumn (November).

7.10.1 Sampling design nowadays

The whole area (7224 Km²) has been separated in five depth strata (15–30, 31–100, 101–200, 201–500 and 501–800 m; Figure 7.2). The sampling design is random stratified with proportional allocation with a total of 42 fishing stations according to the design shown in Figure 7.8.1.

7.10.2 Vessel and gear

The SPGCGFS is usually carried out with RV “Cornide de Saavedra”. The gear used is the one used in SP-NGFS, a Baka trawl 44/60 with a 43.6 m footrope and a 60.1 m headline (Figure 7.8.2). Thyboron trawl doors weighting 330 Kg and 1.8 m² of surface are used instead of the traditional wooden ones used in SP-NGFS. The diameter of warp used is 22 mm (1.9 Kg/m). An inner 10 mm mesh codend liner is used to prevent the escape of small individuals (overall summary of present vessel/gear specifications for all surveys in Table 2.2).

7.10.3 Technical description of the hauls

Hauls last 60 minutes from the end of shooting the gear and the warp (locking the winches), and the start of pulling back the gear. The length of warp shot is based on a power relationship with the depth ($warp = 9.062 \times Depth^{0.783}$). Trawl speed is 3 kn. Vertical opening of the net varies around 1.8–2 m, horizontal opening around 17–21 m, and doors spread 107 m, varying with depth. SCANMAR sensors for vertical opening, horizontal opening, depth and temperature are used regularly. Since 2004 depth, temperature and salinity are recorded by CTD situated on the net.

7.10.4 Data base storage

Same as database storage Section in 7.4.4 but using specifically created software developed in Access (WinCAMP).

7.10.5 Survey history: changes in sampling design and protocols

- In 1992 the IEO started spring series of bottom-trawl surveys in the Gulf of Cádiz. The autumn series was started in 1997.
- Hydrography sampling started in 1997.
- In 2003 the 4th quarter survey was not carried out due to the surveys to assess the impact of the Prestige oil spill on the Galician coast.
- In 2008 the traditional trawl doors used since 1992 (rectangular, 650 Kg and 3.6 m²) were replaced for new Thyboron doors (330 Kg and 1.8 m²).

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APPENDIX I: Format in DATRAS for HAUL INFORMATION records

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>

Record Type 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	✓	decimal
19	ShootLong	9	✓	decimal
20	HaulLat	8	✓	decimal
21	HaulLong	9	✓	decimal
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	Data Type	2	✓	char
29	Netopening	4		decimal
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		decimal
37	DoorWgt	4		int

Start/Order	Field Name	Width	Mandatory	Data Type
38	DoorSpread	3		int
39	WingSpread	2		int
40	Buoyancy	4		int
41	KiteDim	3		decimal
42	WgtGroundRope	4		int
43	TowDir	3		int
44	GroundSpeed	3		decimal
45	SpeedWater	3		decimal
46	SurCurDir	3		int
47	SurCurSpeed	4		decimal
48	BotCurDir	3		int
49	BotCurSpeed	4		decimal
50	WindDir	3		int
51	WindSpeed	3		int
52	SwellDir	3		int
53	SwellHeight	4		decimal
54	SurTemp	4		decimal
55	BotTemp	4		decimal
56	SurSal	5		decimal
57	BotSal	5		decimal
58	ThermoCline	2		char
59	ThClineDepth	4		int

APPENDIX II: Format in DATRAS for LENGTH FREQUENCY records

Record Type 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	9		decimal
17	CatIdentifier	2	✓	int
18	NoMeas	3	✓	int
19	SubFactor	9	✓	decimal
20	SubWgt	6		int
21	CatCatchWgt	8	✓	int
22	LngtCode	2	✓	char
23	LngtClass	4	✓	decimal
24	HLNoAtLngt	6	✓	decimal

APPENDIX III: Format in DATRAS for SMALK records

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

Record Type 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
15	AreaCode	4	✓	char
16	LngtCode	2	✓	char
17	LngtClass	4	✓	decimal
18	Sex	2	✓	char
19	Maturity	2	✓	char
20	PlusGr	2	✓	char
21	AgeRings	2	✓	int
22	CANoAtLngt	3	✓	int
23	IndWgt	5		decimal

APPENDIX IV: Intercalibration experiments in IBTS North Eastern Atlantic area

This Appendix presents a short summary of the different intercalibration experiments performed between different vessels and/or gears in the IBTS North Eastern Atlantic area. References are listed in the global reference list for this manual, Section 8.

Table 1. Intercalibrations experiments -Type of experiments: 1= between gears, 2 = between gears/Vessels.

AREA	COUNTRY	INSTITUTE	YEAR	TYPE	GEARS	RES.VESSEL	CONTACT	REFERENCE
Bay of Biscay: VIIIc/VIIIb	Spain- France	Ifremer IEO	2006– 2009	2	GOV/ Standard Baca	Thalassa/ Cornide de Saavedra	Jean- Claude Mahé / Francisco Velasco	On going yearly
Bay of Biscay: VIIIc/VIIIb	Spain- France	IEO Ifremer	1997	2	Standard Baca/ GOV	Cornide de Saavedra Old Thalassa	Francisco Sánchez / Jean- Claude Mahé	Borges, <i>et al.</i> , 1999
Porcupine Survey, VIIbck	Spain- Ireland	IEO- Marine Institute	2005– 2007	2	Porcupine baca GOV	Vizconde de Eza Celtic Explorer	Francisco Velasco / Dave Stokes	IBTS 2006– 2008
Porcupine Survey, VIIbck	Spain	IEO	2003	1	Porcupine baca/Mod Porcupine baca	Vizconde de Eza	Francisco Velasco	SGSTG 2004, ICES, 2004
Irish Sea	Scotland (UK) Ireland	FRS MI	2004	2	GOV	Scotia III Celtic Explorer	Finlay Burns D. Stokes	IBTS 2005, Burns & Stokes, 2005
Rockall	Scotland	FRS	2006	1	GOV*	Scotia III	Dave Reid	Not yet
ICES VIIa and VIIb	France Ireland Scotland	Ifremer MI FRS	1999/2000	2	GOV 36/47 & GOV 28.9/37**	Thalassa CelticVoyager Scotia II	J.C. Mahé D. Stokes K. Coull	IPOST Study
Portuguese waters - SW and South	Portugal	IPIMAR	1997/1998	1	NCT/GOV	Noruega	Fátima Cardador	Borges, <i>et al.</i> , 1999
Portuguese waters - South & Spanish waters - Gulf Cadiz	Portugal /Spain	IPIMAR & IEO	1997/1998	2	NCT/Baca	Noruega & Cornide de Saavedra	Fátima Cardador & Francisco Sanchez	Borges, <i>et al.</i> , 1999
Cantabrian Sea, VIIIc	Spain	IEO	1997	1	Standard Baca /GOV	Cornide de Saavedra	Francisco Sanchez	Borges, <i>et al.</i> , 1999, Cardador <i>et al.</i> , 1999

AREA	COUNTRY	INSTITUTE	YEAR	TYPE	GEARS	RES.VESSEL	CONTACT	REFERENCE
Spanish waters Gulf of Cadiz	Spain	IEO	2000/2001	1	Baca / GOC 73	Cornide de Saavedra	Fernando Ramos	SGSTG 2003 ICES, 2003
Portuguese waters - SW and South	Portugal	IPIMAR	2005	2	NCT/CAR	Noruega & Capricornio	Fátima Cardador	Cardador & Azevedo, 2006

* Intra-calibration between a GOV 36/47 with groundgear C against an identical trawl with the newly developed groundgear D.

** The Irish vessel in this time-series used a scaled down GOV 28.9/37 due to vessel power.