

WGBEAM MANUAL 2009

Manual for the Offshore Beam Trawl Surveys

Version 1.0, June 2009

Working Group on Beam Trawl Surveys



ICES

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the Exploration of the Sea

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Recommended format for purposes of citation:

ICES. 2009. Manual for the Offshore Beam Trawl Surveys, Revision 1.2, June 2009,
Working Group on Beam Trawl Surveys. 30 pp.

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Introduction

Five countries are participating in the Working Group on Beam Trawl Surveys (WGBEAM). In total, during 8 offshore surveys data are collected. An overview of the main characteristics of the different offshore beam trawl surveys is given in Annex 1; the geographic distribution of the surveys is in Annex 2.

The surveys covered by WGBEAM have all their own origins and were not set up as one survey. Due to that, no standardization has taken place in gears. The different countries all have their own sampling area and because the gears used vary, it is not possible to change sampling locations from one country to the other without any thorough scientific study beforehand. However, WGBEAM tries to increase standardization in sampling by staff exchange during the surveys and by publishing this manual.

The paragraphs in Section 2 and 3.1 are split up by country to point out clearly differences in the surveys. Since collection of the biological and length data are often more or less equal for the countries, from Section 3.2 onwards, the countries are put together.

Objectives and survey design

Objectives

History of the surveys

Belgium

The Belgian offshore beam trawl survey, collecting fisheries independent data primarily for plaice and sole in the South-eastern North Sea, started in 1992. The continuous time-series using a 4 m beam trawl as the standard gear started in 1993. The area covered is IVb,c (southern and central North sea). 62 fixed stations are fished for 30 min at 4 knots. Although target species are plaice and sole, all fish species are measured with some exceptions of which the numbers are recorded. A selection of (epi)benthic species is recorded (numbers).

Germany

The German survey started in 1991, covering areas off the Jutland coast which were not sampled by the international survey so far. The gear is a 7m light beam trawl, since 1992 with 40mm liner in the codend, and 80mm mesh in the first year. Some years are missing in the series as a result of technical failures. The survey started with RV "Solea" (A) which was replaced in 2004 with the newly build "Solea" (B).

Netherlands

The Dutch offshore beam trawl survey started in 1985 by RV "Isis". Target species were plaice and sole because those species were (and are) commercially exploited by the Dutch fisheries. The main goal of the survey was to create fisheries independent indices for plaice and sole in the South-eastern North Sea to be used in the ICES North Sea demersal working group (WGNSSK). Although the first focus was on the target species, since the beginning all fish species were measured and for epifauna species numbers were recorded. Otoliths are collected for plaice, sole, dab, brill, turbot and cod since 1985.

In 1996, "Tridens" started carrying out a beam trawl survey in the Central North Sea. Originally, this was the Q3 IBTS but because Dutch fisheries concentrate on flatfish species, it seemed to be more appropriate to get more information on those species in the Central North Sea and to change the gear from GOV to a beam trawl. In 1996 and 1997 part of the IBTS Q3 was given up to fish with a beam trawl. From 1998 onwards, the complete survey is done as a beam trawl survey. The fisheries independent indices for plaice and sole from this survey are used in the ICES North Sea demersal working group (WGNSSK).

United Kingdom

UK (Cefas) Eastern English Channel Beam Trawl Survey

A July/August beam trawl survey has been carried out annually by MAFF/DEFRA since 1989 using a commercial 4m beam trawl, and has provided the commercially independent dataset used in the North Sea demersal working group (WGNSSK). The primary aim was to assess the relative abundance of prerecruit plaice and sole in ICES Division VIIId. Consequently, most of the sampling was carried out in areas are nursery grounds for these species. In 1995 the survey was extended to include the southern North Sea in order to sample the whole population of plaice and sole. In recent years additional stations have been fished off the Belgium coast in order to start a time-series of stations for comparison purposes.

UK (Cefas) Irish Sea and Bristol Channel Beam Trawl Survey

An Autumn Irish Sea groundfish survey has been carried out annually by MAFF/DEFRA since 1979. A Granton otter trawl was used until 1987, and then in 1988 the commercial 4m beam trawl that is currently used was introduced. At the same time, a limited beam trawl survey was carried out in the Bristol Channel. From 1988 to 1992 the main survey effort was concentrated in the northeast Irish Sea and the Bristol Channel and since 1993 a standard survey covering the whole of ICES Divisions VIIa, f, and g, has been undertaken. In 2002, the survey was extended to cover the survey area in ICES Division VIIe, previously undertaken by the charter vessel MV "Carhelmar" that had been used since 1988. In 2005 the VIIe survey was moved back to the "Carhelmar".

UK (Cefas) Western English Channel Beam Trawl Survey

Complaints from the fishing industry in the southwest about the lack of scientific investigation and knowledge of the local sole stock provided the catalyst for the survey in VIIe. Following enquiries of the local fishery officers and normal tendering procedures, a skipper-owned 300-hp beam trawler the Bogey 1 was selected. The first year (1984) the survey consisted of a collection of tows on the main sole grounds. For the years 1984–1988 the vessel was unchanged. In 1989 the Bogey 1 was replaced by the latest design 24m 300hp (220kw) beam trawler FV "Carhelmar". Between 1989 and 2001, the survey continued to be fished from the FV "Carhelmar". In 2002 the survey moved onto the RV "Corystes", until it was reinstated on the FV "Carhelmar" in 2005.

France

The French offshore beam trawl survey started in 2007. It is carried out by IFREMER with the "Gwen Drez", a 24 m trawler, in November. The main goal of the survey is to get a fisheries independent index for sole in the Bay of Biscay. Consequently the survey spread over the whole Bay of Biscay sole habitat, from the coast to 100m. Al-

though the target species is sole, all fish species are measured, weighted and counted and benthos species are weighted and counted by group.

Current objectives

Belgium

To produce commercially independent indices of abundance of sole and plaice in the Southern North Sea. Collecting epibenthos/benthos data for ecosystem purposes.

Germany

Purpose is to cover a coastal area for the international survey which would otherwise not be intensely sampled.

Netherlands

The current objectives are:

- Create a fisheries-independent stock estimate for plaice and sole
- Collection of data on all fish species and epibenthos species for ecosystem purposes

United Kingdom

UK (Cefas) Eastern English Channel Beam Trawl Survey

To provide a commercially independent indices of abundance of all age groups of sole and plaice on the east channel grounds, and an index of recruitment of young (1–3 year old) sole prior to full recruitment to the fishery.

UK (Cefas) Irish Sea and Bristol Channel English Channel Beam Trawl Survey

To provide independent (of commercial) indices of abundance of all age groups of plaice, sole, cod and Whiting in the Irish Sea, Bristol Channel and Western English Channel. Provide an index of recruitment of juvenile plaice and sole prior to full recruitment to the fishery to the Working Group on the Assessment of Northern Shelf Demersal Stocks (WGNSSDS) and the Working Group on the Assessment of Southern Shelf Demersal Stocks (WGSSDS) expert groups.

UK (Cefas) Western English Channel Beam Trawl Survey

To provide independent (of commercial) indices of abundance of all age groups of sole and plaice on the west channel grounds, and an index of recruitment of young (1–3 year old) sole prior to full recruitment to the fishery.

France

The main objective of the survey is to provide fishery-independent indices of abundance of all age groups of Bay of Biscay sole, and recruitment indices of young sole (1–2 year old).

Survey design

Fishing positions and stratification

Maps of the areas fished by country are in Annex 2.

Belgium

62 fixed positions are distributed over the area trying to cover adequately the ICES rectangles and the population and fishing characteristics. There is no fixed order in which the stations are fished but a similar yearly pattern is executed as much as possible.

During the span of the time-series, stations can have been moved slightly. The rationale for the new locations has been: within 5 nautical miles, similar grounds and depth.

Germany

About 50 stations are fished in a grid of statistical rectangles which is tried to be kept fixed. Typically the same stations are fished every year. Four stations are placed in the most inshore rectangles, three in the next seaward ones, and two otherwise.

Netherlands

About 75 stations are planned to be fished by "Tridens". One haul is done in every rectangle planned. A haul is carried out in the centre of a rectangle, unless fishing is not possible in that area. In that case, the best position in the neighbourhood of the centre of the rectangle is chosen.

"Isis" has 82 first priority stations and 12 additional stations planned. The priority stations are taken into account for the independent survey indices. 2-4 hauls are carried out in a rectangle. The ICES rectangles to be fished are standard. The minimum distance between two hauls is set at 10 nautical miles.

The sampling of biological data (weight, sex, maturity, otoliths) is stratified by flatfish area ("Isis") or roundfish area ("Tridens").

United Kingdom**UK (Cefas) Irish Sea and Bristol Channel and Eastern English Channel Beam Trawl Surveys**

The positions of stations are set historically, originally from areas of deemed of high importance for plaice and sole catches by commercial fisherman. The cruise station number identifies the order of each gear deployment (including invalid tows) of any gear that goes over the side of the vessel during the cruise (i.e. the first deployment is station 1, and subsequent stations are incremental). Prime stations are unique number that do not change, irrespective of the cruise station number, and provide a fixed numbering system for sampling sites.

In the Eastern English Channel, tows are done in two sub-areas: originally 79 in 107d and 29 in 104c. All tows in 107d have equal priority and the tows in 104c are worked time permitting. Since 1999 the number of tows worked has been reduced to 75 in 107d and 16 in 104c, as a result of a reduction of cruise time. Additional stations have been added off the Belgium coast in recent years.

In the Irish Sea and Bristol Channel, the standard survey has in all 119 tows. Of the 119 primary stations, 68 are in ICES Division VIIa, 51 in ICES Divisions VIIf and g. All primary station positions are fixed and can be identified by a unique prime station number. The stations are stratified by sector and depth-band. The number of primary survey stations within each sector amount to: ISS (18 stations), ISN (16 stations), ISW (15 stations), SGC (16 stations), SEI (11 stations), BCI (32 stations), (BCO 11 stations). The 66 stations in sectors ISN, ISS and BCI are given top priority as they contribute to the VPA tuning and recruitment indices at the respective working

groups. Three depth bands were used until 2000 - 0–20m, 20–40m and 40+m; in 2001 these were reduced to 2 depth bands - 0–20m and 20+m.

UK (Cefas) Western English Channel Beam Trawl Survey

Since 1989 the survey has remained relatively unchanged apart from small adjustments to the position of individual hauls to provide an improved spacing. The survey design is stratified by distance from the coast bands, in contrast to the VIIa, f and g survey that is by depth bands. The reason for this is that the coastal shelf with a depth of water less than 40m is relatively narrow and in addition is often fished with fixed gear. The survey bands (in miles) are 0–3; 3–6; 6–12; 12+ inshore; and 12+ offshore. Station positions are fixed and each station has a unique prime number. The prime station number consists of a letter and number. The survey was originally divided into 16 blocks all identified by a letter (A- P) and within a block there may a number of stations from 1 to 6. A full block of 6 stations equates to 15' of Longitude and 30' of Latitude. The full survey of 58 tows should be completed each year.

For the years 1985 to 1997 the number of stations used for the assessment was between 47 and 49 and was called **the 'Grid'**. By 1998 the 2 new inshore stations had been fished for four years so it was decided to re-calculate sole and plaice indices to include all stations that were fished each year. For the record the GRID stations (49) are ALL stations (58) less Blocks: F (4), G (1) L (2) and stations D0o +D0i.

France

The sampling program is to do a minimum set of 50 stations, on fixed positions. The survey was defined according to information on sole fishing areas. Hauls were provided by fishers. Station positions were selected to have a complete coverage of the survey area by a systematic sampling with at least one haul in each 10' latitude by 10' longitude rectangles of the fishing area. Four strata are defined to have a sampling effort in proportion to the abundance of sole and its variability in the Bay of Biscay.

Standard fishing method

Belgium

A haul consist of 30 minutes trawling during daytime, starting when the gear settles on the bottom and ending when hauling commences. Depending on the circumstances a shorter period is allowed not dropping below 15 minutes. Trawl speed should be 4 knots over the ground. Warp length is, on average, 7 times the fishing depth (double wire).

Germany

Haul duration is mostly 30 minutes but may be shorter in cases of foul ground. Trawling speed is 4 knots over the ground.

Netherlands

Trawls speed is set at 4 knots over the ground, trawl duration should be 30 minutes. The moment the warp length is set is considered as the beginning of the haul (end of shooting). The end of the haul when hauling of the gear starts. Warp length varies, depending on water depth from 3.5 to 4 times water depth. The catch is always fully processed, even when haul duration is less than 15 minutes. However, if for any reason the haul is shorter than 15 minutes, the haul validity will be set at invalid. Trawling should be conducted in daylight hours, as defined as the time between 15 minutes before sunrise and 15 minutes past sunset. If a tow is conducted outside

these hours it must be reported as an additional tow and a valid tow attempted where practicable.

United Kingdom

Trawl speed should be 4 knots over the ground. Although commercial fishing vessels generally fish at higher speeds for a longer period, 4 knots is considered appropriate to shorter tows. Trawl duration should be 30 minutes. The start of the trawl should be given as the time that the gear has settled on the bottom, and the end of the trawl should be given as the time that hauling commenced. If for any reason a tow is less than 20 minutes or greater than 40 minutes, then the catch should still be fully processed, though the tow should be classified as an Additional tow, and a valid tow attempted where practicable. A warp length appropriate to the depth of water (on "Corystes" a ratio of between 3.5 and 4.0) is to be used. If for any reason this cannot be followed then you should document reasons why and flag the station as an additional tow and a valid tow attempted where practicable. Trawling should be conducted in daylight hours, as defined as the time between 15 minutes before sunrise and 15 minutes past sunset. If a tow is conducted outside these hours it must be reported as an additional tow and a valid tow attempted where practicable.

In the Irish Sea and Bristol Channel there are currently 8 primary stations that are only fished for 15 minutes primarily because of large numbers of small fish being caught or a high bycatch of benthic species.

France

The trawl speed was fixed to 5 knots, according to advice of a Dutch skipper who was on-board during the first survey. They are carried out with the stream. The trawl duration is 30 minutes. The start of the trawl is as the time that the gear has settled on the bottom, and the end of the trawl should be given as the time that hauling commenced. Beginning and ending of the daylight period hauls is set according to astronomical sunset and sunrise. Fishing is carried out in daylight and at night on the same station.

Beam trawl construction and rigging

History of the survey gear

Belgium

Since 1993 a 4 meter beam trawl is used, equipped with a chain mat and a 40 mm codend.

Germany

The beam trawl used is a light one, similar to those employed by the shrimping fleet. Five tickler chains are attached without modification. Width of the trawl is 7.2m. Since 1992 with 40mm liner in the codend, and 80mm mesh in the first year.

Netherlands

The 8 meter steel beam trawl used in the Dutch survey is developed as a gear which can be operated in the North Sea on all grounds. For the stony areas, a flip-up rope is applied to the net. Because the gear has to be used in different areas, its efficiency varies in different sediment types. However, by sampling the same area every year, no major effect is expected in the time-series.

United Kingdom

UK (Cefas) Irish Sea and Bristol Channel and Eastern English Channel Beam Trawl Surveys

Cefas has always used a commercially rigged 4m steel beam trawl, for the duration of this survey. See section 2.4 for a full description. The sampling gear consists of a commercially rigged (1989 style) 4m beam trawl (measured between inside edges of shoes) fitted with a chain mat, flip-up ropes, and a 40mm codend liner. The liner needs to be sufficiently long, that when attached to the forward end of the codend it extends to about 1 metre below the cod-line. The gear is towed at 4 knots (ground speed) for 30 minutes on a warp length appropriate to the depth of water (on "Corystes" a ratio of between 3.5 and 4.0). All the stations are identified by a unique number (Prime station no.), which never changes irrespective of the cruise station number. All tows (positions) should be stored on a disc held on board "Corystes" with a backup held at the laboratory. There is no particular order in which the stations should be worked, although attention to the historical calendar period would be sensible. If static gear or other restrictions prevent the execution of a primary station there are often alternative tows in the same area. The SIC usually has positions of alternative tows that have been used before, when the primary station was not available.

UK (Cefas) Western English Channel Beam Trawl Surveys

For the years 1984–1988 the vessel was equipped with two 6m chain mat beam trawls with 75mm codends. For the survey hauls one of the codends was fitted with a 60mm liner. In 1989 when the Bogey 1 was replaced two commercial chain mat 4m-beam trawls (measured inside the shoe plates) were purchased by MAFF as dedicated survey gear. Both beams were fitted with the standard flip-up ropes and 75mm codend. For years 1989 and 1990 only 1 codend was fished with a 40mm liner but from 1991 with the introduction of 80mm codends both were fitted with 40mm liners. The gear has remained unchanged since 1991. As the FV "Carhelmar" uses blocks on the derrick heads and beam bridles for double purchase warps, the usual triangular towing plates used to bring the three bridles together are not used. In addition to the blocks, each of the four main towing bridles are extended in length by a 9 link length of chain that are usually retained aboard FV "Carhelmar" for this purpose. The skipper initiated the bridle length extension when the MAFF beams were first used to improve the towing stability of the beams when used on "Carhelmar".

France

A first survey was carried out in 2006 using a twin otter trawl and it was presented at the IBTS WG at its 2007 meeting. Because the survey aims to get a flatfish index, the IBTS WG advised that this survey should be presented to the WGBEAM. This latter recommended the use of a beam trawl which is considered to be more adapted when aiming at flatfish abundance index. Consequently, the gear was changed to a 4 meter beam trawl in 2007.

Current gear and rigging

Belgium

The Belgian beam trawl survey uses a 4 meter beam trawl equipped with a chain mat. The rigging is checked by the skipper prior to the yearly survey to meet the standard. The gear is trawled from the aft. The warp length is, on average, 7 times the station depth as the warp is used double. The skipper assures that the gear fishes well and is in good contact with the bottom. The chief scientist decides, in accordance with the skipper, when the circumstances are no longer appropriate to deliver valid hauls.

The gear is a commercially rigged 4 m beam trawl equipped with a chain mat and a 40 mm codend.

Germany

The beam trawl used is a light one, similar to those employed by the shrimping fleet. Five tickler chains are attached without modification. Width of the trawl is 7.2m and 40mm liner in the codend is used.

Netherlands

The sampling gear is an 8m beam trawl, especially designed for the survey (in 1985). The beam trawl is fitted with 8 chains, of which 4 are connected to the beam and 4 to the net. RV "Tridens" operates this gear with a flip-up rope to keep boulders out of the net. The area covered by the Isis is mainly sandy, so no flip-up rope is needed. Mesh size in the codend is 40 mm.

United Kingdom

The sampling gear consists of a commercially rigged (1989 style) 4m beam trawl (measured between inside edges of shoes) fitted with a chain mat, flip-up ropes, and a 40mm codend liner. The liner needs to be sufficiently long, that when attached to the forward end of the codend it extends to about 1 metre below the cod-line. The dimensions are listed below:

| | |
|-------------|--|
| Headline: | 4m x 22mm Combination wire rope. |
| Groundrope: | 10.8m x 22mm 6/19 construction wire rope. |
| Flip-up: | 10.4m x rubber on 22mm corlene rope. |
| Mesh sizes: | 125mm x braided nylon back + 120mm polybraid in belly + 75mm x codend with 40mm liner. |
| Bridles: | 2.9m x 5/8" Grade 40 drag alloy chain. |
| Width: | 4.5m (4m inside shoes). |
| Weight: | Approx 2.5 Tonnes. |

France

The gear is derived from commercially beam trawl used by the Belgian fleet in the Bay of Biscay on soft grounds. Because the lack of skill for this kind of gear in France, it was ordered in Netherlands. The French beam trawl survey is carried out using a 4 meter beam trawl in 2007, equipped with 10 tickler chains and a 40 mm codend. The warp length was about 4 times the depth of water in 2007.

Handling of catches

Catch sorting and collection of fish data

Belgium

Catch sorting

The whole catch is weighted and sorted for all fish species, rays, sharks and shellfish and total weight by species is collected. The sub sample for the epibenthos/benthos species is composed of a mixed sample from the total catch, weighted and the number of the individuals, identified to the lowest taxonomic level possible, is recorded

Length composition

All fish species, rays, sharks and shellfish are measured to the cm below except for dragonet species, bullrout species, pogge, lesser weever, sandeel species, rockling species, butter fish, gobies, snake pipefish species, but does register the quantity of those species. Rays are measured for both length and width. Sub sampling by species may occur for the length measurements when the numbers are extremely high.

Table 3.1.1 shows from which species biological data will be collected. For this report, a Y is noted when age material is collected. Additionally, weight, sex and maturity might be collected.

Sampling for Age, Sex and Maturity

When otoliths are removed, the weight of the individual is collected together with its sex. For sole and plaice, 20 otoliths are collected by cm class and flatfish area. Otoliths are also taken for cod, turbot and brill. Only for rays, the maturity stage is investigated.

Germany

Catch sorting

The whole catch is weight and sorted, unless for the exceptional case of a very large catch, when only a sub sample is processed. With the new "Solea" (B) the catch is sorted on a belt, while sorted on deck in previous years.

Length composition

All fish species are measured by all countries from tip of snout to tip of caudal fin, to the cm below. Herring and sprat are measured to the half cm below. As many individuals as needed for a proper length distribution is measured.

Sampling for Age, Sex and Maturity

Germany collects three specimens per sex per cm class per rectangle for plaice and dab. If sole is in the catch, the otoliths will be collected. Table 3.1.1 shows from which species biological data will be collected. For this report, a Y is noted when age material is collected. Additionally, weight, sex and maturity might be collected.

Netherlands

Catch sorting

Catch is sorted differently on "Isis" and "Tridens" as a result of different size of the vessels and space for sorting.

On-board “Tridens”, all fish is sorted. Larger or rare epifauna species are sorted, too. The epifauna are collected in baskets. If the quantities of epifauna are more than one fishing basket, a mixed sample (from different baskets) of one basket is created. This sample is sorted and, if necessary, sub-sampled. Sub-sampling of fish species is generally done by fraction. If the length distribution is homogeneous, the catch per species is sub-samples. If there are for example a few larger fish of a species and many small fish of the same species, the smaller fish will be sub sampled and the larger will not be sub-sampled. The measured (sub-)sample is weighed after measuring.

On-board “Isis”, larger fish and larger or rare epifauna species are sorted. Small fish and other epifauna, is collected in baskets of which a mixed sample of one basket is created. This sample is sorted and, if necessary, subsampled.

All species are identified to the lowest taxonomic level. Only if this proves impossible can some be grouped by genus or larger taxonomic group (e.g. *Pomatoschistus* species, *Ammodytidae*).

Length composition

Length distributions are recorded for all finfish species caught, measured to the cm below. Herring and sprat are measured to the 0.5 cm since 2007. Length is defined as total length (measured from tip of snout to tip of caudal fin). Elasmobranch species are measured by sex, to the cm below.

Minimum number of individuals to be measured is 50 per species. Sub sampling is allowed as long as minimum 50 fish will be measured.

Sampling for Age, Sex and Maturity

Depending on the species, a fixed number of fish per cm class per ICES rectangle, flatfish area (“Isis”) or roundfish area (“Tridens”) is collected. All fish is measured to the mm below, weighted to the gram and sex is identified. Only for lemon sole maturity is staged.

Numbers of samples to be collected:

- Plaice and sole: 1 per ICES rectangle per cm class
- Turbot, brill, dab, flounder, lemon sole, cod: 5 per flatfish/roundfish area per cm class
- Tridens: all other flatfish species caught during the survey to a maximum of 5 per cm class per flatfish/roundfish area.

Table 3.1.1 shows from which species biological data will be collected. For this report, a Y is noted when age material is collected. Additionally, weight, sex and maturity might be collected.

United Kingdom

Catch sorting

It is recommended that the catch from all valid hauls be sorted fully were practicable. Wherever possible, the entire catch is sorted, with fish and shellfish species identified to the lowest taxonomic level possible. In the case of larger catches a selection of species/size categories of species may be identified as being sufficiently abundant that they can be subsampled, appropriately. If the entire catch cannot be sorted through then the data should be flagged accordingly when submitted to the DATRAS database.

Length composition

Length distributions are recorded for all fish species caught. Length is defined as total length (measured from tip of snout to tip of caudal fin). Length is measured to 0.1cm below for shellfish, to 0.5 cm below for herring and sprat, and to 1 cm below for all other species.

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 (as a result of 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 less. In the event that a truly representative subsample cannot be selected, it will be necessary to further sort the species into two or more size grades or categories. The following two examples are used to describe incidences when grading or 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 can some be grouped by genus or larger taxonomic group (e.g. *Pomatoschistus* species, *Ammodytidae*).

Sampling for Age, Sex and Maturity

Each survey has its own sampling regime that matches its survey design.

Table 3.1.1 shows from which species biological data will be collected. For this report, a Y is noted when age material is collected. Additionally, weight, sex and maturity might be collected.

France

Catch sorting

The whole catch is sorted and weighted with all fish and shellfish species identified to the lowest taxonomic level possible. Non commercial epibenthos is sorted

in three groups: starfish, crabs and shrimps, which are weighed and counted (eventually by subsample).

Length composition

All fish species are measured to the centimetre below, eventually by sub samples of 30 to 100 individuals according to variability of length distributions of catch (eventually sub sample are done by length category if several size groups are obviously present). When sub sampling, the total length distribution is estimated using sample weight to total weight ratios.

Sampling for Age, Sex and Maturity

Otoliths are collected for sole, hake, megrim, red mullet and illiciums for monk. France collects, for sole, 10 otoliths per sex and cm. Maturity is investigated for sole, megrim and red mullet.

Table 3.1.1 shows from which species biological data will be collected. For this report, a Y is noted when age material is collected. Additionally, weight, sex and maturity might be collected.

For all countries maturity stage keys are used when biological sampling, Annex 3 and 4 shows these.

Table 3.1.1. Species for which biological data are collected.

| SPECIES | UK | | | | NETHERLANDS | | | GERMANY | BELGIUM | FRANCE |
|------------------------------------|------|------|-------|-------|-------------|------|---------|---------|---------|--------|
| | VIIA | VIIF | VII E | VII D | IVC | ISIS | TRIDENS | | | |
| <i>Arnoglossus laterna</i> | N | N | N | N | N | N | Y | N | N | N |
| <i>Buglossidium luteum</i> | N | N | N | N | N | N | Y | N | N | N |
| <i>Dicentrarchus labrax</i> | Y | Y | N | Y | Y | N | N | N | N | N |
| <i>Gadus morhua</i> | Y | Y | Y | Y | Y | Y | Y | N | Y | N |
| <i>Hippoglossoides platesoides</i> | N | N | N | N | N | N | Y | N | N | N |
| <i>Hippoglossus hippoglossus</i> | Y | Y | Y | Y | Y | - | Y | N | N | N |
| <i>Lepidorhombus whiffiagonis</i> | - | Y | Y | N | N | Y | Y | N | N | Y |
| <i>Limanda limanda</i> | Y | Y | Y | Y | Y | - | Y | Y | N | N |
| <i>Lophius piscatorius</i> | Y | Y | Y | Y | Y | N | N | N | N | Y |
| <i>Melanogrammus aeglefinus</i> | Y | Y | - | N | N | - | N | N | N | N |
| <i>Merlangius merlangus</i> | Y | Y | - | N | N | N | N | N | N | Y |
| <i>Microstomus kitt</i> | Y | Y | Y | Y | Y | Y | Y | N | N | N |
| <i>Mullus surmuletus</i> | N | N | N | N | N | N | N | N | N | Y |
| <i>Phrynorhombus norvegicus</i> | N | N | N | N | N | - | Y | N | - | - |
| <i>Pleuronectes platessa</i> | Y | Y | Y | Y | Y | Y | Y | Y | Y | N |
| <i>Raja brachyura</i> | Y | Y | Y | Y | Y | N | N | N | Y | N |
| <i>Raja clavata</i> | Y | Y | Y | Y | Y | N | N | N | Y | N |
| <i>Raja microcellata</i> | Y | Y | Y | Y | Y | N | N | N | Y | N |
| <i>Raja montagui</i> | Y | Y | Y | Y | Y | N | N | N | Y | N |
| <i>Raja naevus</i> | - | Y | Y | Y | Y | N | N | N | Y | N |
| <i>Scophthalmus maximus</i> | Y | Y | Y | Y | Y | Y | Y | N | Y | N |
| <i>Scophthalmus rhombus</i> | Y | Y | Y | Y | Y | Y | Y | N | Y | N |
| <i>Solea solea</i> | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

Handling shellfish and benthos (epifauna)

Commercial species *Cancer pagurus* is measured by all countries to the mm below, as indicated in Figure 3.2.1. All countries measure by sex. However, the UK and Germany have an additional category for egg bound individuals.

Commercial species *Nephrops norvegicus* is measured to the mm below (see Figure 3.2.1) by all countries except Belgium. Length measurements of *Nephrops norvegicus* are done by sex. UK and Germany have an additional category for egg bound individuals.

Other benthos species are treated differently per country:

- Belgium records a selection of epibenthic/benthic species through sub sampling (numbers of individuals).
- Netherlands records on-board "Tridens" for most free-living epifauna species minimum and maximum length (to mm below) for the species, per sample.

- UK does not sample benthos completely on all stations, but has identified stations on which a complete benthos sample is to be taken. On those stations, a minimum of 32 species will be identified to the taxa. At all other stations, the UK records presence-absence of benthos and records weight and /or number of 9 sentinel species which are regarded as “indicator” species. These species include:

Pink seafan *Eunicella verrucosa*
 Large colonies of *Sabellaria spinulosa*
 Ross coral *Pentapora foliacea*
 Sea pen *Funiculina quadrangularis*
 Mantis shrimp *Meiosquilla desmaresti*
 Sponge crab *Dromia personata*
 Ocean quahog *Arctica islandica*
 Fan mussel *Atrina fragilis*
 Purple sunstar *Solaster endeca*

- France measures among the epibenthos catch cuttlefish (to the cm below).

In the Dutch, German and Belgian surveys, benthos is sorted if possible to the taxa and at least counted. UK and the Netherlands collect weight per species additionally. All countries (with the exception of the UK that only record these species at its core benthic stations) record presence/absence and number of the following 13 species and these data are presented in the WGBEAM report.

Sea mouse *Aphrodita aculeata*
 Common sea star *Asterias rubens*
Astropecten irregularis
 Common whelk *Buccinum undatum*
 Edible crab *Cancer pagurus*
 Masked crab *Corystes cassivelaunus*
 Heart urchins *Echinocardium sp.*
 Harbour crab *Liocarcinus depurator*
 Swimming crabs *Liocarcinus sp.* (*Liocarcinus holsatus*, *Liocarcinus marmoreus*, *Liocarcinus pusillus*, *Macropipus arcuatus*)
 Norway lobster *Nephrops norvegicus*
 Common european brittle star *Ophiothrix fragilis*
 Brittle stars *Ophiura sp.* (*Ophiura ophiura*, *ophiura fragilis*)
 Hermit crabs *Pagurus sp.* (*Pagurus bernhardus*, *Pagurus pubescens*, *Pagurus prideauxi*, *Anapagurus laevis*)

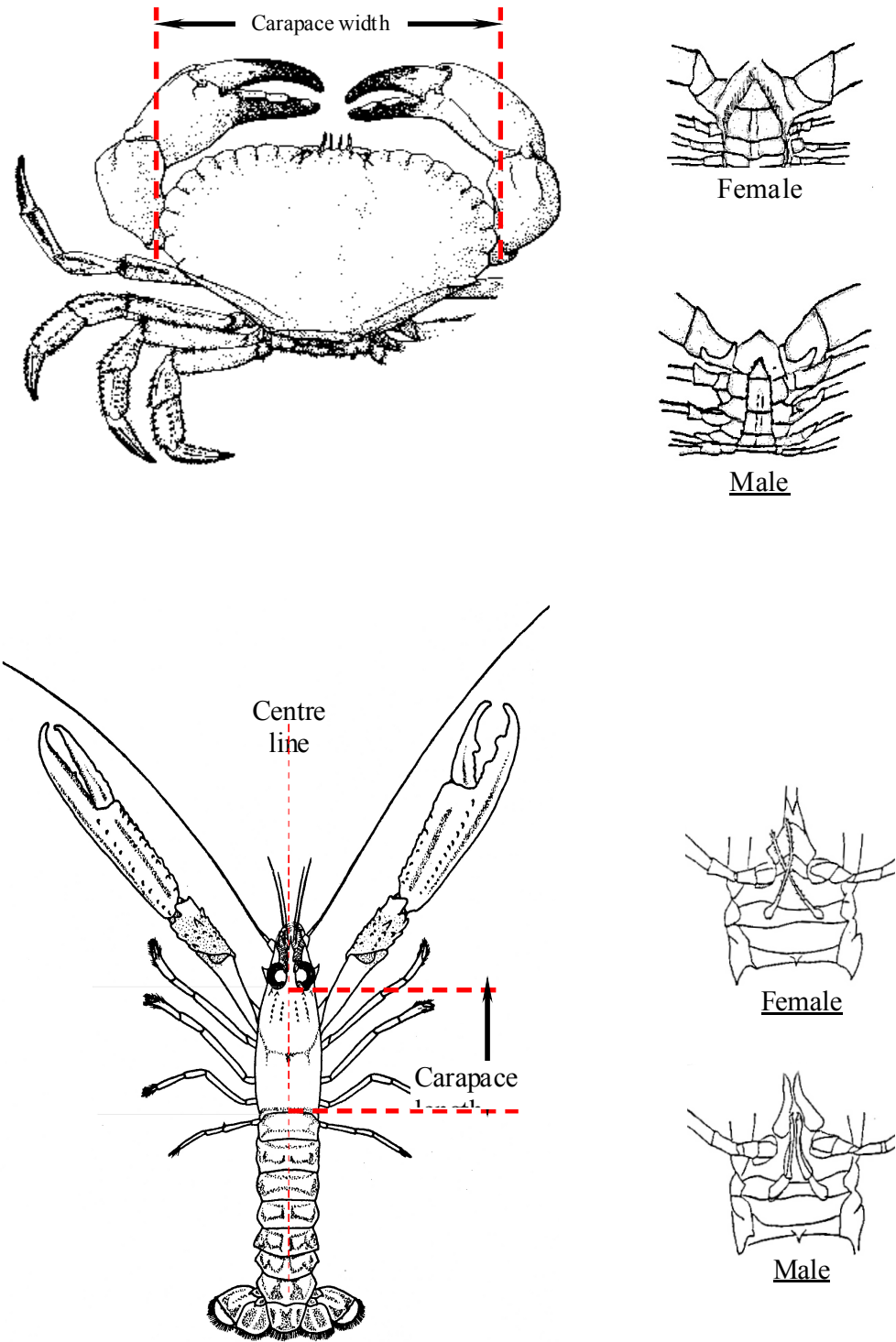


Figure 3.2.1. Measurement of *Cancer pagurus* (upper) and *Nephrops norvegicus* (lower).

Quality assurance

Gear: In the UK and Netherlands, standard gear descriptions are used to maintain the gear. A check is done before or after each survey. If the gear does not match the description, the gear technicians overhaul the gear. If the gear is damaged during the survey, a check will be performed immediately after the survey. Germany does not have a standard gear description to which the gear is checked, because the crew carries out the maintenance. In Belgium, the fishing skipper and the gear technicians check the gear prior to the yearly survey to meet the standard. Every haul, the gear is checked and repaired before deployment.

Identification: WGBEAM will use the outcome of the Workshop on Taxonomic Quality (ICES, 2007b) concerning problem taxa. Generally, literature is used on board to identify species. All countries' sampling procedures allow for continuous feedback on species identification on board. Species that cannot be identified at sea are conserved and taken home for expert identification. In the Netherlands, quality assurance of difficult species is done by internal identification workshops after the survey. For near future, a yearly identification workshop will be planned for all seagoing personnel in the institute. In UK, fish identification tests are carried out on a weekly basis whilst at sea.

Sub sampling: for the Dutch survey quality assurance for the fraction and numbers subsampled is defined. At least three times during a survey is checked if the last two fractions in the sub sample are equal and the numbers of fish in the sub sample is recorded continuously.

General: for the Dutch offshore survey a quality assurance is available in Dutch (2008) but will be available in English within due time.

Environmental data

Environmental data collected by countries includes temperature, salinity and turbidity.

Belgium

A continuous CTD on-board ship is use to collect data throughout the survey track.

Germany

At the end of a beam trawl station a vertical cast with Seabird SP19plus with Niskin bottle attached, is made. I water sample is collected from the bottom of the cast. This is used to calibrate the salinity data collected by the Seabird instrument.

Netherlands

Netherlands collects on-board "Tridens" a vertical CTD sample (with a Hydrolab data log CTD) after each fish haul. On-board "Isis" during the haul a continuous CTD sample is taken by a sampler connected on the beam.

United Kingdom

During the standard surveys, at the start and end of the working day, a vertical profile with a CTD unit with a Niskin bottle attached is carried out. A water sample is taken from the bottom of the cast to calibrate the data collected. Also a SAIV CTD is attached to the beam trawl, collecting continuous data during the tow.

France

Attached to the 4m beam trawl is a SCANMAR temperature unit which records data throughout the tow.

Exchange specifications for WGBEAM data

Data exchange for WGBEAM data is from 2009 onwards planned to be in DATRAS format. Survey data for all countries will be provided to the ICES database DATRAS. Formats for the different record types are given in Annex 5 (haul information), Annex 6 (length frequency information) and Annex 7 (age information). For the latest version of the exchange format see also <http://www.ices.dk/datacentre/datsu/selrep.asp>.

Each country is responsible for the quality assurance of the data.

Protocol for starting a new beam trawl survey

This manual should be the starting point for any institute or body that wishes to start a beam trawl survey that will be used for indices purposes. Although there are 5 different gears and 7 different vessels participating in the current coordinated surveys, all countries are using similar methods to carry out their surveys. All countries use protocols to ensure that the sampling on their survey is carried out in a standard way, year on year, and many of the processes used are the same across the coordinated surveys. Gear is maintained and deployed to specified standards and this is fundamental to the process of maintaining high quality data suitable for scientific use. Whenever a new survey is commissioned the suitability of the gear is paramount and liaison with the industry and the WGBEAM would be first steps along the correct path to an inaugural survey. Fundamentally the following steps should be carried out before any survey is started.

- 1) Identify the species that are to be targeted.
- 2) Identify the area to be fished.
- 3) Identify the most appropriate gear to use.
- 4) Ensure the gear can be deployed efficiently from your research platform.
- 5) Ensure that you have competent and expert knowledge to deal with the gear and the sampling.
- 6) Design the survey to deliver robust data that is representative of your needs.
- 7) Document the process and ensure that there is repeatability to all of the processes that you carry out.
- 8) Liaise with experts (such as those at WGBEAM) when designing and carrying out your survey.

One of the remits of WGBEAM to provide expert advice on such issues as listed above and one should take advantage of this, to help ensure the success of any new beam trawl survey.

Annex 1: Overview of WGBEAM offshore surveys

| | BELGIUM | FRANCE | GERMANY | NETHERLANDS | NETHERLANDS | UK | UK | UK |
|------------------------------------|----------------|-------------------------|----------------|------------------------|--------------------------|--------------|------------------------------|---------------|
| Survey area: | IVb and c west | VIIIa,b | IVb east | IVb and c east | Central N Sea | VIIId | VIIe | VIIa, f and g |
| Year survey started: | 1992 | 2007 | 1991 | 1985 | 1996 | 1988 | 1988 | 1988 |
| Dates: | August | November/early December | mid August | August-early September | mid August-mid September | late July | late September/early October | September |
| Usual start date | week 33 | week 45 | week 32 | week 32/33 | week 34 | week 30 | week 39/40 | week 36/37 |
| Number of survey days | 10 | 30–36 | 11 | 20 | 16–20 | 15 | 8 | 21–24 |
| Ship: | RV Belgica | RV Gwen Drez | RV Solea | RV Isis | RV Tridens | RV Endeavour | MFV Carhelmar | RV Endeavour |
| Ship length: | 50 m | 24 m | 42 m# | 28 m | 73.5 | 72 m## | 22 m | 72 m @ |
| Beam trawl length: | 4 m | 4 m | 7 m | 8 m | 8 m | 4 m | 4 m | 4 m |
| Number of beams fished: | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 1 |
| Number of beams sorted: | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| Trawl duration (min): | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| Tow speed (knots): | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 |
| Cod end liner stretched mesh (mm): | 40 | 40 | 44 | 40 | 40 | 40 | 40 | 40 |
| Number of ticklers: | 0 | 10 | 5 | 8 | 8 | 0 | 0 | 0 |
| Gear code: | BT4M | BT4A | BT7 | BT8 | BT8S | BT4FM | BT4FM | BT4FM |
| Attachment: | * | (none) | (none) | (none) | ** | * | * | * |
| Station positions: | fixed | Fixed | pseudo-random | pseudo-random | pseudo-random | fixed | fixed | fixed |
| Av No stns/yr | 53 | 130 | 63 | 88 | 63–73 | 100 | 57 | 94 |
| Benthos sampling since: | 1992 | 2007 (partly) | 1992 | 1985 | 1996 | 1991 | 1992 | 1992 |

new vessel since 2004; previously 35m

new vessel since 2008; previously RV "Corystes" 54m

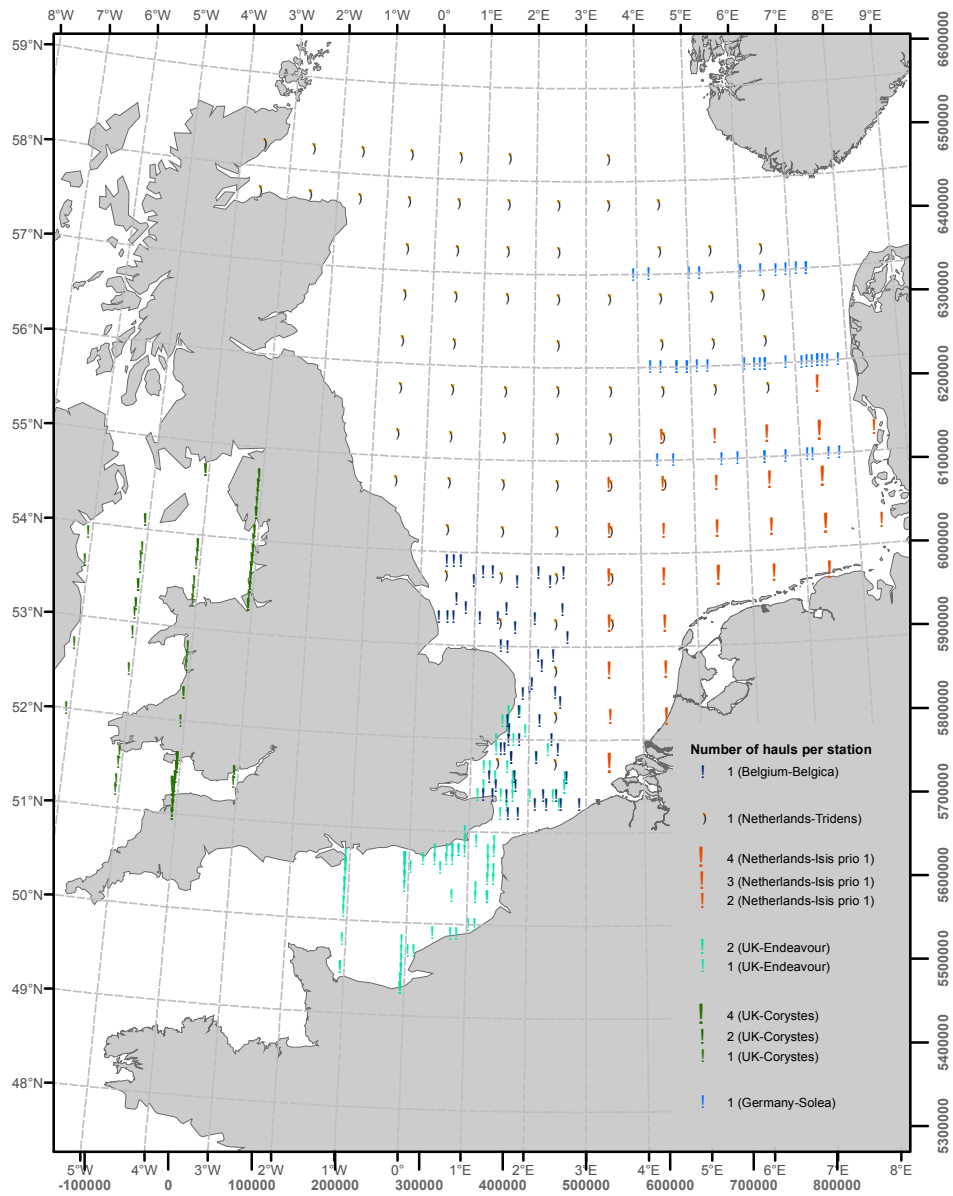
@ new vessel since 2009; previously RV "Corystes" 54m

* chain mat and flip-up rope

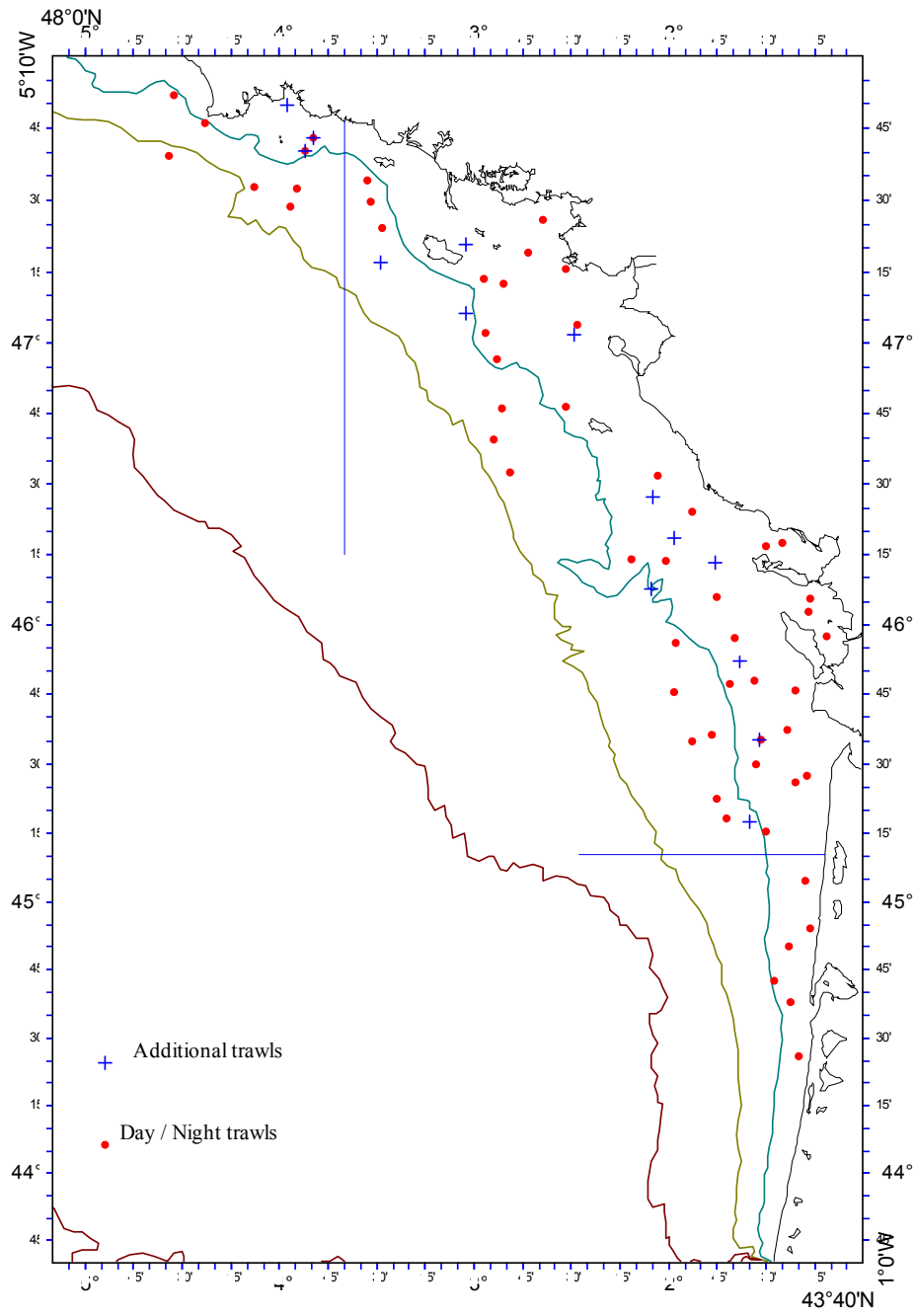
** flip-up rope only

Annex 2: Geographic distribution of the surveys

Beam trawl surveys in the North Sea, Channel and the Irish Sea (Belgium, Germany, Netherlands and UK)



Beam trawl survey in the Bay of Biscay (France)



Annex 3: Finfish maturity key

A workshop on maturity stages of the major flatfish species will occur in February 2010, at which time a more appropriate maturity key will be produced to be used by the beam trawl surveys coordinated by WGBEAM.

Annex 4: Four stage maturity key for Skates and rays (Rajidae)

| STAGE | STATE | MALE | FEMALE |
|-------|--------------|--|--|
| A | Immature | Claspers undeveloped, shorter than extreme tips of posterior margin of pelvic fin Testes small and thread-shaped | Ovaries small, their internal structure gelatinous or granulated and with no differentiated oocytes visible Oviducts small and thread-shaped, width of shell gland not much greater than the width of the oviduct |
| B | Maturing | Claspers longer than posterior margin of pelvic fin, their tips more structured, but cartilaginous elements are not hardened, and the claspers are soft and flexible. Testes enlarged, sperm ducts beginning to meander | Ovaries enlarged and with more transparent walls. Oocytes differentiated in various small sizes (<5mm). Oviducts) small and thread-shaped, width of the shell gland much greater than the width of the oviduct, but not hardened |
| C | Fully mature | Claspers longer than posterior margin of pelvic fin, cartilaginous elements hardened and claspers stiff. Testes enlarged, sperm ducts meandering and tightly filled with sperm | Ovary/ovaries large and tight. Oocytes enlarged, with some very large, yolk-filled oocytes (>5mm). Uteri enlarged and widening, shell gland fully formed |
| D | Active | Claspers reddish and swollen, sperm present in clasper groove, or flows if pressure exerted on cloaca | Viviparous species (e.g. Spurdog, tope and smoothhounds, sting/electric rays): Distinct yolk-filled eggs with developing embryos present in the oviducts. Oviparous species (e.g. Lesser-spotted dogfish and skates (Rajidae): Egg capsules beginning to form in shell gland and partially visible in uteri, or egg capsules fully formed and hardened in oviducts/uteri. |

Annex 5: DATRAS exchange specifications: Haul information

| | | | | | |
|----|----------------|---|---|----------|-----------------------------------|
| 1 | RecordType | 2 | ✓ | char | |
| 2 | Quarter | 1 | ✓ | int | |
| 3 | Country | 3 | ✓ | char | TS Country |
| 4 | Ship | 4 | ✓ | char | TS Ship |
| 5 | Gear | 6 | ✓ | char | Gear |
| 6 | SweepLngt | 3 | | int | <i>Not used in this format</i> |
| 7 | GearExp | 2 | | char | <i>Not used in this format</i> |
| 8 | DoorType | 2 | | char | <i>Not used in this format</i> |
| 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 | TS DayNight |
| 18 | ShootLat | 8 | ✓ | decimal4 | |
| 19 | ShootLong | 9 | ✓ | decimal4 | |
| 20 | HaulLat | 8 | ✓ | decimal4 | |
| 21 | HaulLong | 9 | ✓ | decimal4 | |
| 22 | StatRec | 4 | | char | |
| 23 | Depth | 4 | ✓ | int | |
| 24 | HaulVal | 1 | ✓ | char | TS HaulVal |
| 25 | HydroStNo | 8 | | char | |
| 26 | StdSpecRecCode | 1 | ✓ | char | TS StdSpecRecCode |
| 27 | BycSpecRecCode | 1 | ✓ | char | TS BycSpecRecCode |
| 28 | DataType | 2 | ✓ | char | TS DataType |

| | | | | | |
|----|---------------|---|---|----------|--------------------------------|
| 1 | RecordType | 2 | ✓ | char | |
| 29 | Netopening | 4 | | decimal1 | <i>Not used in this format</i> |
| 30 | Rigging | 2 | ✓ | char | |
| 31 | Tickler | 2 | ✓ | int | |
| 32 | Distance | 4 | | int | |
| 33 | Warplngt | 4 | | int | <i>Not used in this format</i> |
| 34 | Warpdia | 2 | | int | <i>Not used in this format</i> |
| 35 | WarpDen | 2 | | int | <i>Not used in this format</i> |
| 36 | DoorSurface | 4 | | decimal1 | <i>Not used in this format</i> |
| 37 | DoorWgt | 4 | | int | <i>Not used in this format</i> |
| 38 | DoorSpread | 3 | | int | <i>Not used in this format</i> |
| 39 | WingSpread | 2 | | int | <i>Not used in this format</i> |
| 40 | Buoyancy | 4 | | int | <i>Not used in this format</i> |
| 41 | KiteDim | 3 | | decimal1 | <i>Not used in this format</i> |
| 42 | WgtGroundRope | 4 | | int | <i>Not used in this format</i> |
| 43 | TowDir | 3 | | int | |
| 44 | GroundSpeed | 3 | | decimal1 | |
| 45 | SpeedWater | 3 | | decimal1 | |
| 46 | SurCurDir | 3 | | int | <i>Not used in this format</i> |
| 47 | SurCurSpeed | 4 | | decimal1 | <i>Not used in this format</i> |
| 48 | BotCurDir | 3 | | int | <i>Not used in this format</i> |
| 49 | BotCurSpeed | 4 | | decimal1 | <i>Not used in this format</i> |
| 50 | WindDir | 3 | | int | |
| 51 | WindSpeed | 3 | | int | |
| 52 | SwellDir | 3 | | int | |
| 53 | SwellHeight | 4 | | decimal1 | |
| 54 | SurTemp | 4 | | decimal1 | |
| 55 | BotTemp | 4 | | decimal1 | |
| 56 | SurSal | 5 | | decimal2 | |
| 57 | BotSal | 5 | | decimal2 | |

| | | | | | |
|----|--------------|---|---|------|--------------------------------|
| 1 | RecordType | 2 | ✓ | char | |
| 58 | ThermoCline | 2 | | char | <i>Not used in this format</i> |
| 59 | ThClineDepth | 4 | | int | <i>Not used in this format</i> |

Annex 6: DATRAS exchange specifications: Length frequency information

| | | | | | |
|----|---------------|----|---|----------|---------------------------------|
| 1 | RecordType | 2 | ✓ | char | |
| 2 | Quartyer | 1 | ✓ | int | |
| 3 | Country | 3 | ✓ | char | TS_Country |
| 4 | Ship | 4 | ✓ | char | TS_Ship |
| 5 | Gear | 6 | ✓ | char | Gear |
| 6 | SweepLngt | 3 | | int | <i>Not used in this format</i> |
| 7 | GearExp | 2 | | char | <i>Not used in this format</i> |
| 8 | DoorType | 2 | | char | <i>Not used in this format</i> |
| 9 | StNo | 6 | ✓ | char | |
| 10 | HaulNo | 3 | ✓ | int | |
| 11 | Year | 4 | ✓ | char | |
| 12 | SpecCodeType | 1 | ✓ | char | TS_SpecCodeType |
| 13 | SpecCode | 10 | ✓ | char | |
| 14 | SpecVal | 2 | ✓ | char | TS_SpecVal |
| 15 | Sex | 2 | | char | TS_Sex |
| 16 | TotalNo | 9 | | decimal2 | |
| 17 | CatIdentifier | 2 | ✓ | int | |
| 18 | NoMeas | 3 | ✓ | int | |
| 19 | SubFactor | 9 | ✓ | decimal4 | |
| 20 | SubWgt | 6 | | int | |
| 21 | CatCatchWgt | 8 | ✓ | int | |
| 22 | LngtCode | 2 | ✓ | char | TS_LngtCode |
| 23 | LngtClass | 4 | ✓ | int | |
| 24 | HLNoAtLngt | 6 | ✓ | decimal1 | |

Annex 7: DATRAS exchange specifications: Smalk

| | | | | | |
|----|--------------|----|---|----------|---------------------------------|
| 1 | Record Type | 2 | ✓ | Char | |
| 2 | Quarter | 1 | ✓ | int | |
| 3 | Country | 3 | ✓ | char | TS_Country |
| 4 | Ship | 4 | ✓ | char | TS_Ship |
| 5 | Gear | 6 | ✓ | char | Gear |
| 6 | SweepLngt | 3 | | int | <i>Not used in this format</i> |
| 7 | GearExp | 2 | | char | <i>Not used in this format</i> |
| 8 | DoorType | 2 | | char | <i>Not used in this format</i> |
| 9 | StNo | 6 | ✓ | char | |
| 10 | HaulNo | 3 | ✓ | int | |
| 11 | Year | 4 | ✓ | char | |
| 12 | SpecCodeType | 1 | ✓ | char | TS_SpecCodeType |
| 13 | SpecCode | 10 | ✓ | char | |
| 14 | AreaType | 2 | ✓ | char | TS_AreaType |
| 15 | AreaCode | 4 | ✓ | char | |
| 16 | LngtCode | 2 | ✓ | char | TS_LngtCode |
| 17 | LngtClass | 4 | ✓ | int | |
| 18 | Sex | 2 | ✓ | char | TS_Sex |
| 19 | Maturity | 2 | | char | TS_Maturity |
| 20 | PlusGr | 2 | | char | <i>Not used in this format</i> |
| 21 | AgeRings | 2 | ✓ | int | |
| 22 | CANoAtLngt | 3 | ✓ | int | |
| 23 | IndWgt | 5 | | Decimal1 | |