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Manual for the North Sea International Bottom Trawl Surveys

Revision 11

International Bottom Trawl Survey Working Group
(IBTSWG)

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International Council for the Exploration of the Sea
CIEM
Conseil International pour l'Exploration de la Mer

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Contents

1 Introduction

Overview of the survey

The International Bottom Trawl Survey (IBTS) in the North Sea has been conducted in the 1st quarter of the year since the beginning of the 1960s. The survey was first aimed at juvenile herring in the central and southern North Sea, but then the objectives of the survey were broadened to also provide recruitment indices for gadoids. The survey area was extended towards the northern North Sea and the Skagerrak/Kattegat in the 1980s. From 1991 to 1996, surveys were also conducted in the 2nd, 3rd, and 4th quarters, but since 1997, only the 1st and 3rd quarter surveys continued. The current extent of the surveys can be seen in Figures A1.1 and A1.2 in Annex 1. The GOV trawl (chalut à Grande Ouverture Verticale) was introduced as the standard gear and the gear rigging and fishing method were standardized. However, some countries continued to use gears other than the GOV in the 3rd quarter IBTS until 1998.

February is the target month for the Q1 survey, where Denmark, France, Germany, Netherlands, Norway, UK Scotland, and Sweden participates. The target month for the Q3 survey is August, with Denmark, Germany, Sweden, Norway, UK England, and UK Scotland as participants.

A more detailed description of the history of the North Sea IBTS surveys can be found in Annex 2.

IBTSWG coordinates fishery-independent multi-species bottom-trawl surveys within the ICES area. In order to be considered for a North Sea survey to be coordinated under IBTSWG, it must fulfil the following criteria:

1) Be carried out within the ICES areas: 27.3.a.20, 27.3.a.21, 27.4, and 27.7.d;

2) An ICES assessment working group provides a brief outline of the management need/context for the survey;

3) Be an otter-trawl survey, but note that there may be other working groups better placed to coordinate some bottom-trawl surveys;

4) Have appropriate survey sampling methods and protocols (including gear descriptions) that conform to the standards encouraged by the IBTSWG or that can be improved after joining the IBTSWG;

5) Aims to enhance existing IBTS surveys and improve data collection for important stocks. For example, proposed surveys for inclusion within IBTSWG will (i) overlap and extend existing survey areas using comparable gear, or (ii) operate on more specific grounds/times of year with a gear more appropriate for the target species;

6) Store data in DATRAS database and participate in data quality checks;

7) Nations must attend and present data at the annual meetings of IBTSWG;

8) For those surveys that do not utilize standard gear for IBTS surveys, it must be confirmed by assessment working groups (e.g. after a five-year period) that

these surveys are still providing data of high quality, used for assessment and provision of advice.

Use of the data

Annual abundance indices by species and age group are routinely calculated in DATRAS; a description of the estimation procedure can be found at https://www.ices.dk/data/data-portals/Pages/DATRAS-Docs.aspx, and in ICES (2013a). For herring, sprat, and saithe, weighting factors for the surface area of statistical rectangles at water depths between 10 m and 200 m are applied in the index estimation.

Data products to calculate abundance indices by swept area in addition to tow duration are available for the time-series since 2004 for both Quarter 1 and 3 surveys.

2 North Sea IBTS survey

2.1 Current objectives

The North Sea 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) the biological parameters of commercial fish species for stock assessment purposes.

The main objectives of groundfish surveys coordinated by IBTS are:

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

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

3) To monitor the distribution and relative abundance of all fish species and selected invertebrates;

4) To collect data for the determination of age composition and biological parameters for selected species;

5) To collect hydrographical, environmental, and marine litter information;

6) To determine the abundance and distribution of clupeid post-larvae (Quarter 1).

7) To be used as a platform to collect ichthyoplankton data.

2.2 Survey Design

The current stratification of the survey has always been grid-based, using ICES statistical rectangles of roughly 30 x 30 nautical miles (1 degree longitude x 0.5 degree latitude). These rectangles were convenient to use for survey stratification as they were already being used for fisheries management purposes. Typically, each rectangle is sampled with two hauls by two different countries/vessels, where logistically possible (for exceptions see Annex 1). Priority is given to have sampled all rectangles rather than having two samples per rectangle.

The rectangle allocations are assigned annually during the IBTSWG and, if necessary, by the international coordinators prior to and during the survey. The international survey coordinator is responsible for the realized allocation of statistical rectangles to each country, taking into account constraints produced by, e.g. weather conditions or technical failures on vessels. The coordinator supports adequate coverage during the survey by liaising with the national coordinators/survey cruise leaders.

The vessels are free to choose any position in the rectangles as long as the hauls are separated by at least 10 nautical miles where possible, except where nations take more than two tows per rectangle. Whenever possible, tows in adjacent rectangles should be separated by at least 10 miles. Countries must avoid clustering their stations between adjacent rectangles in order to reduce positive serial autocorrelation and thereby maximize survey precision.

Trawl-tow locations are ultimately selected by the cruise leader for each individual country. The selection process is based on a semi-random format with each survey having a series of 'clear' (and in many circumstances, previously visited) trawl sites. Cruise leaders are encouraged to utilize known trawl positions taken by other countries in previous years, in order to increase the number of available positions within a rectangle. In the unusual event that no 'clear' tow exists, the cruise leader may select to undertake a 'blind' tow on unknown ground, after checking the proposed trawl track for hazardous seabed obstructions with acoustic methods. The cruise leader will select a site that allows the cruise to maximize efficiency and secure as many trawl hauls in the 'daylight' period prescribed to the day in question.

Table 2.1. Current protocol for selection of GOV trawl stations by each country and quarter.

Nation	Q1	Q3
Denmark	2, 3	2, 3
England	NA	4
France	2, 3	NA
Germany	2, 3	2, 3
Netherlands	2, 3, 5	NA
Norway	2, 3	2, 3
Scotland	2, 3, 5	2, 3, 5
Sweden	4	1

1 Depth stratified, semi-randomly
2 Proportion semi-randomized (from database of national safe tows, or DATRAS, or commercial fishing data)
3 Proportion opportunistic station selection (from database of national safe tows or DATRAS, and from commercial data)
4 Fixed stations
5 Proportion semi-randomized (new positions)

2.3 GOV-trawl construction and rigging

The original construction of the 36/47 GOV-trawl is shown in Figure 2.2. It has been acknowledged by IBTSWG (ICES, 2012a) that historical drift and technical creep have impacted national GOV specifications and therefore deviations from the standard manual have occurred. This technical creep has been documented in ICES (2015a; Annex 7, WD 3). The historical drift from the standard GOV has widened to a point where it would be more disruptive to the time-series to revert to the original specification. It was therefore recommended that each country should maintain the current standardisation.

The information in this manual is insufficiently specified to fully rig a GOV trawl. In order to maintain consistency at a national level, it was recommended that each nation should draft their own comprehensive user manual. This document should detail all trawl components and rigging to provide sufficient information to fully rig their trawl gear. Furthermore, it should include a section detailing how net monitoring instrumentation, such as Scanmar or bottom-contact units, are attached to the trawl.

To assist each GOV user, a set of check sheets (Annex 3 to 6b) is to be used for each trawl to maintain their national standard rigged GOV. It should be noted that the check sheets provided are for guidance and should be adopted to suit each national GOV specification and rigging. All dimensions of the GOV must be checked to ensure that it is rigged correctly on the vessel. When a new net is delivered, check sheets 1 (Annex

3) and 2 (Annex 4) are to be filled in to ensure that the net is manufactured to the correct specification.

2.3.1 Rigging: Kite, flyers, and floats

To increase the trawl opening, a kite or a flyer is fitted to the trawl. The 'standard' flyer is the "Exocet" kite, but other kites or flyers (e.g. Voilin flyer) are also acceptable, as long as the resulting trawl geometry is within the acceptable bounds (see section 2.6, and rigging manual for details for each kite and flyer). Details of the "Exocet" kite and suggestions how to attach the kite to the trawl are shown in Figure 2.3. Five floats with a buoyancy of 2.9 kg each are attached to the kite.

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

The rigging is provided in Figure 2.4. On board the vessel, when attaching the trawl to the bridles and doors, use check sheet 3 (Annex 5).

2.3.2 Net geometry – sweeps

The most important consideration is that the **net geometry is within the acceptable limits** for water depth (see Section 2.6 on monitoring net geometry, and theoretical headline height and doorspread limits for deployment depth). Because the acceptable limits were not achieved by some nations, particularly when using the long sweeps at deeper stations, several countries stopped changing sweep lengths during Q1 surveys. Current advice is for all nations to maintain their current rigging; therefore, Norway and Sweden will continue to vary sweep length with bottom depth.

Deviations from the standard trawl specification are further detailed in Annex 2, Table A2.4.

2.3.3 Groundgear

The standard groundrope with rubber discs (groundgear 'A'), as shown in Figure 2.5, is used throughout the survey area. However, since 1985, Scotland have used groundgear 'B' (with larger rubber discs) on all stations north of 57°30'N due to the rough seabed (Figure 2.6). Use check sheet (Annexes 6a and 6b) to ensure the groundgear is to specification.

Extra weights in the groundrope are 70 kg in the square, 35 kg in each quarter, and 35 kg in each forward wing-end. These weights should be evenly spread over the appropriate length of the groundrope. This can be achieved by wrapping chain externally around the groundrope, using a thicker centre chain, or by interspersing the groundrope rubber discs with steel discs of the same diameter. Approximate weight in air is given for each section of the groundgear.

Proper contact of the groundgear should be monitored by use of acoustic devices, in addition to checking the wear on chains, and presence of benthic organisms and flatfish in the catch. The contact of the groundgear with the bottom can be greatly influenced by changing the length of the adjustment chain between the lower leg and the bumper bobbin. The normal length of this chain is 2 metres, but on rough ground it can be shortened to 1.7 metres; if the gear is fishing too light it can be lengthened to 2.2 metres. Shortening the chain means the net sits lighter upon the bottom, but care must be taken to maintain proper bottom contact throughout the tow duration.

2.3.4 Trawlnet

For a proper performance of the net, it is essential that the four upper bridles are of identical length, and regular checks must be made to ensure this. A total check of the trawl must be carried out prior to the survey. Annex 7 contains the net plans and gear component tables for all countries, as produced in 2015 (ICES, 2015a; Annex 9).

When checking the GOV mesh sizes, either during construction or when rigging the net, either an Omega net gauge or another standard net gauge should be used (Figure 2.1).

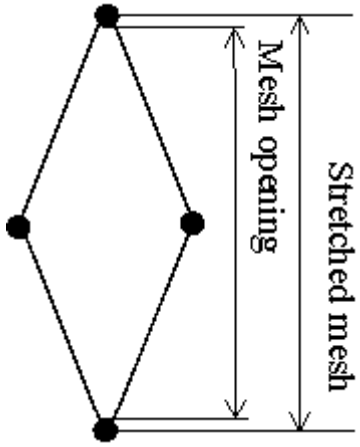


Figure 2.1. Mesh size: the measurement of the mesh opening vs. the stretched mesh.

During measuring, a 5% tolerance is allowed. When using the Omega gauge, please follow the manufacturers' instructions for correct use, as overstretching could be an issue. The net can be measured either wet or dry. This is a summary of the information taken from the working document presented at IBTSWG in 2008 (ICES, 2008; Annex 5, WD1).

The lining of the codend should consist of 400 stretched meshes of 20 mm each, giving a total length of 8 m. The total circumference of the lining should be 600 meshes.

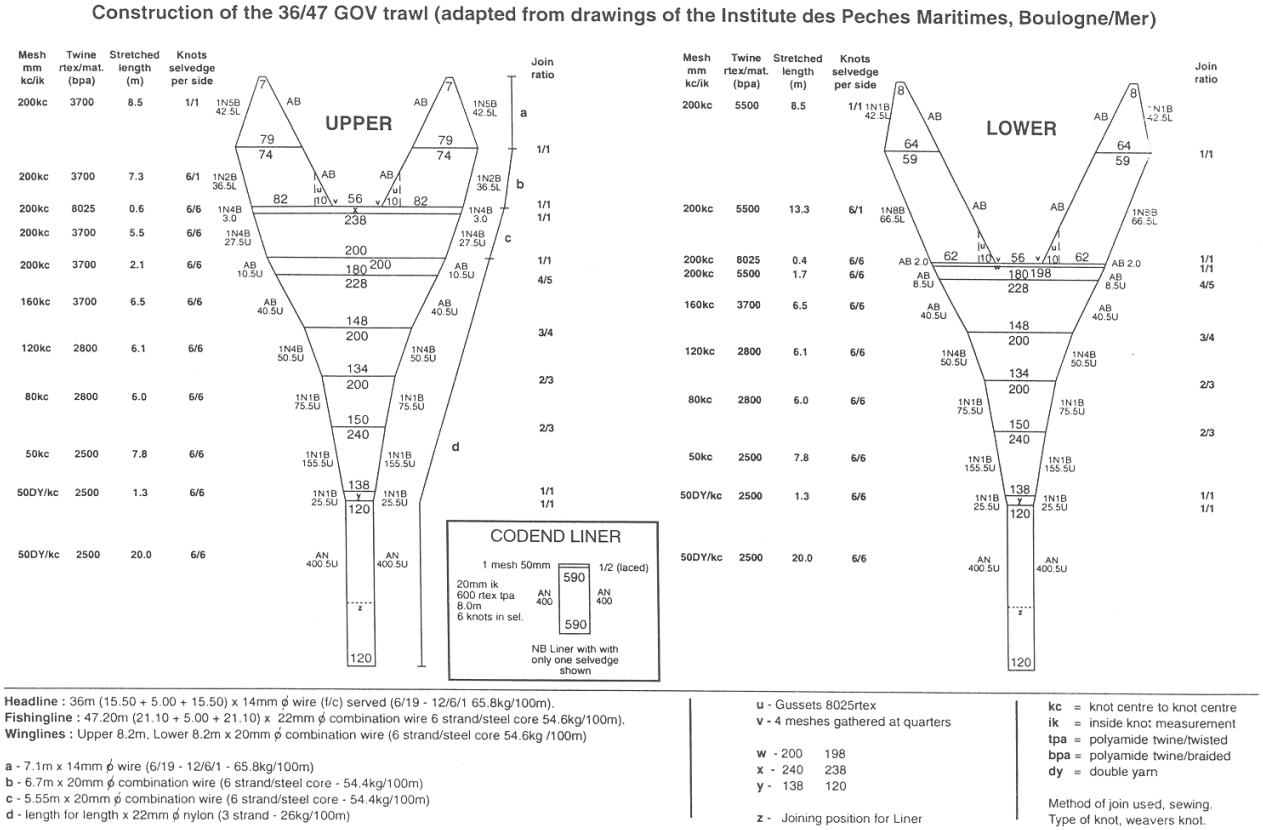


Figure 2.2. Construction of the 36/47 GOV trawl.

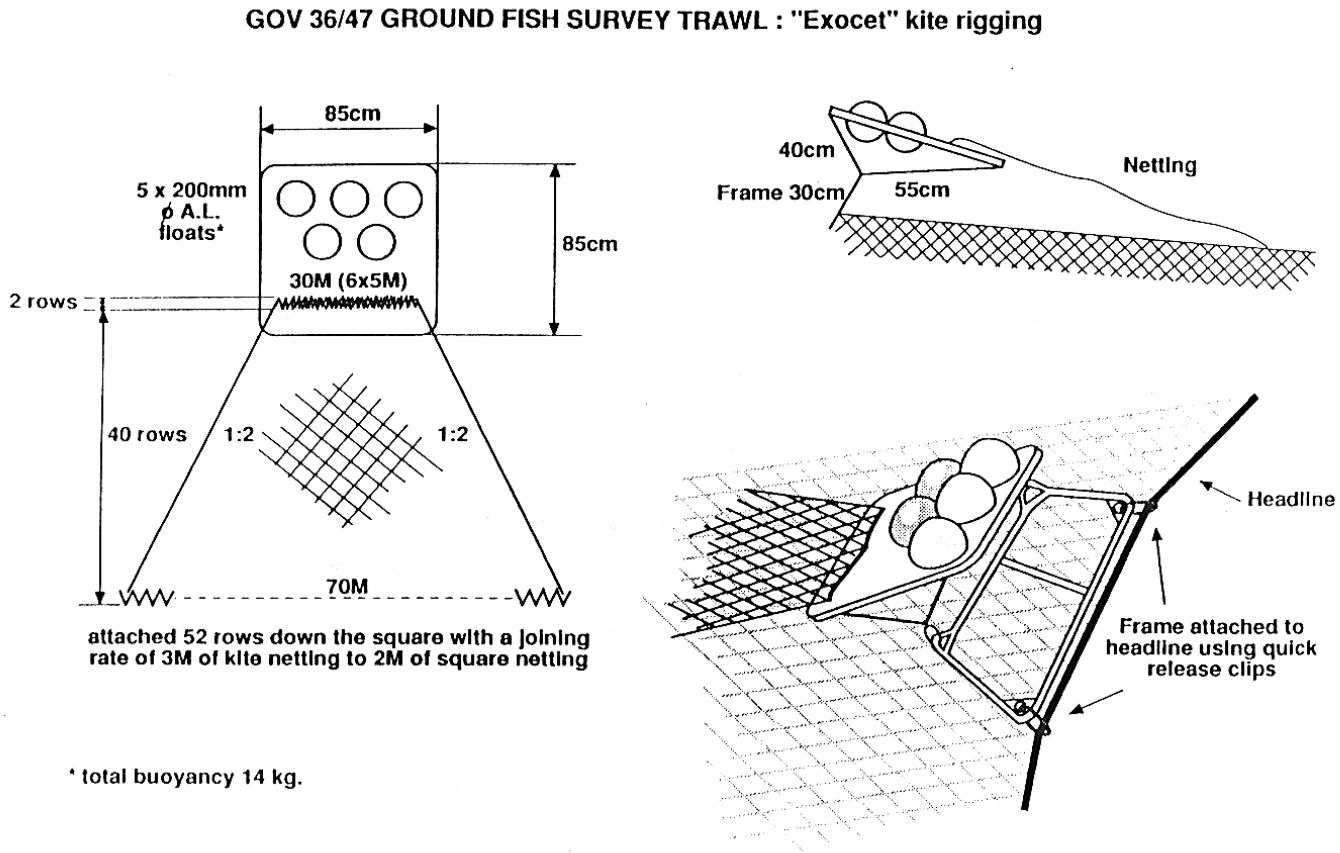


Figure 2.3. "Exocet" kite for the 36/47 GOV trawl.

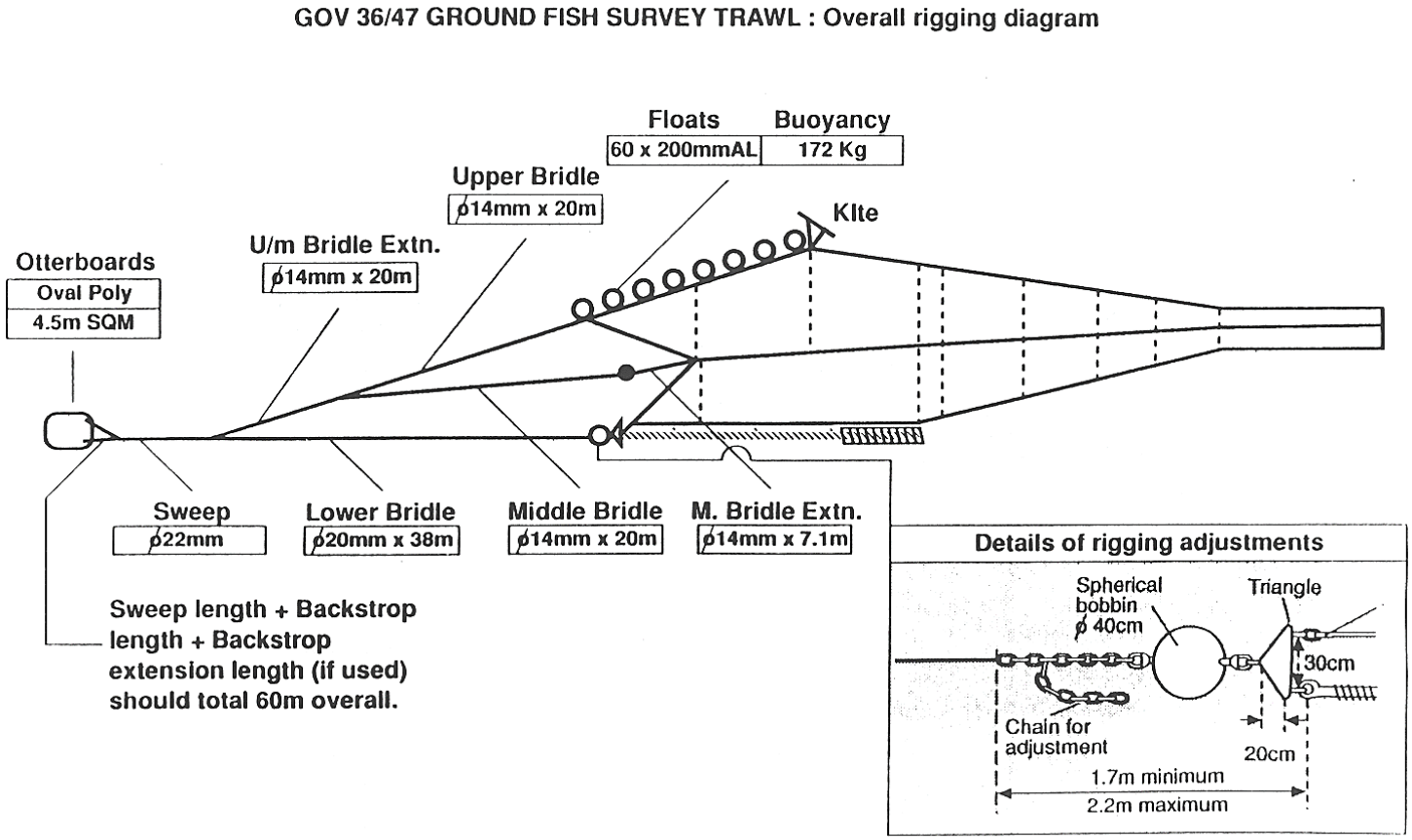


Figure 2.4. Rigging of the 36/47 GOV trawl.

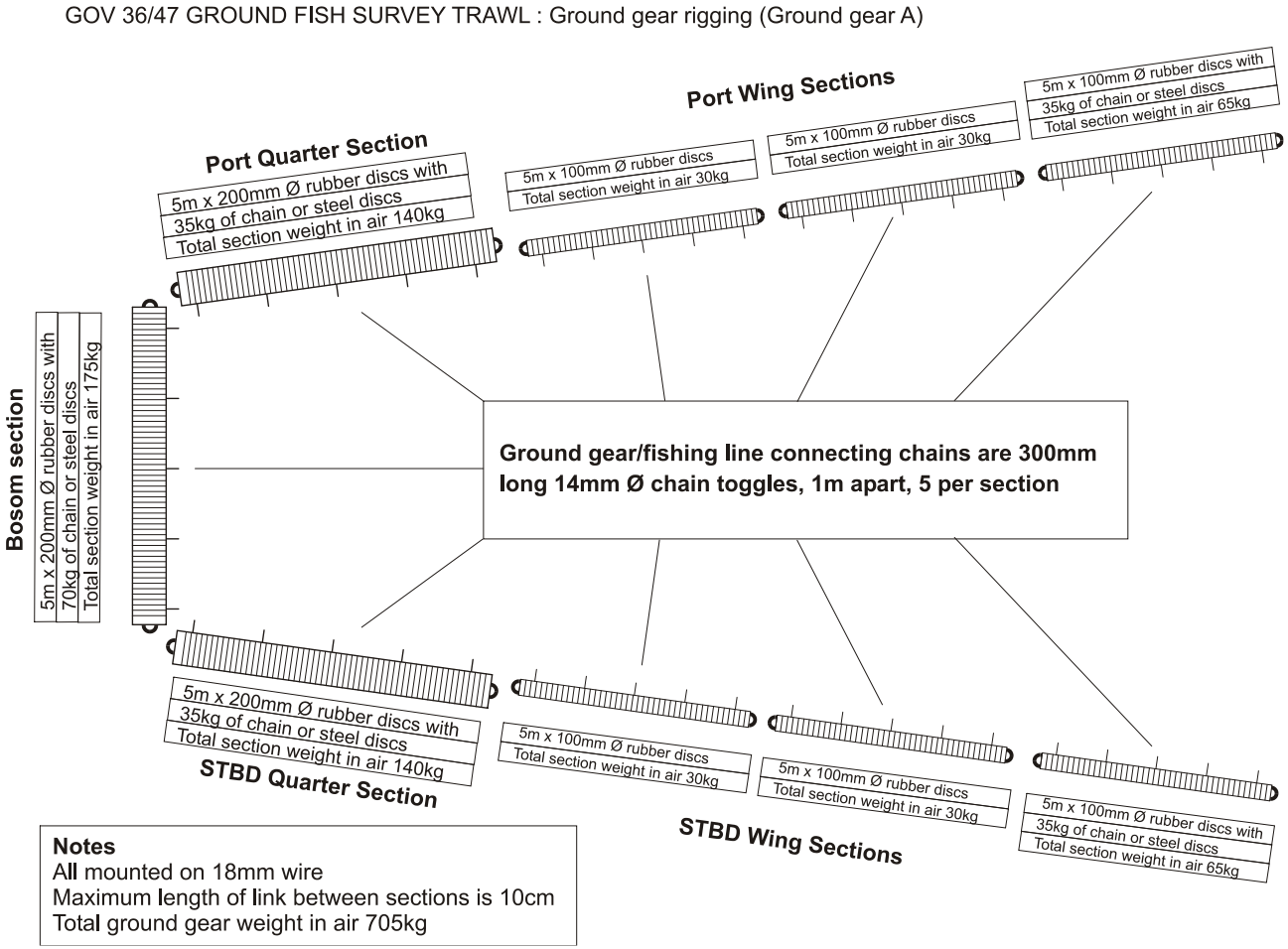
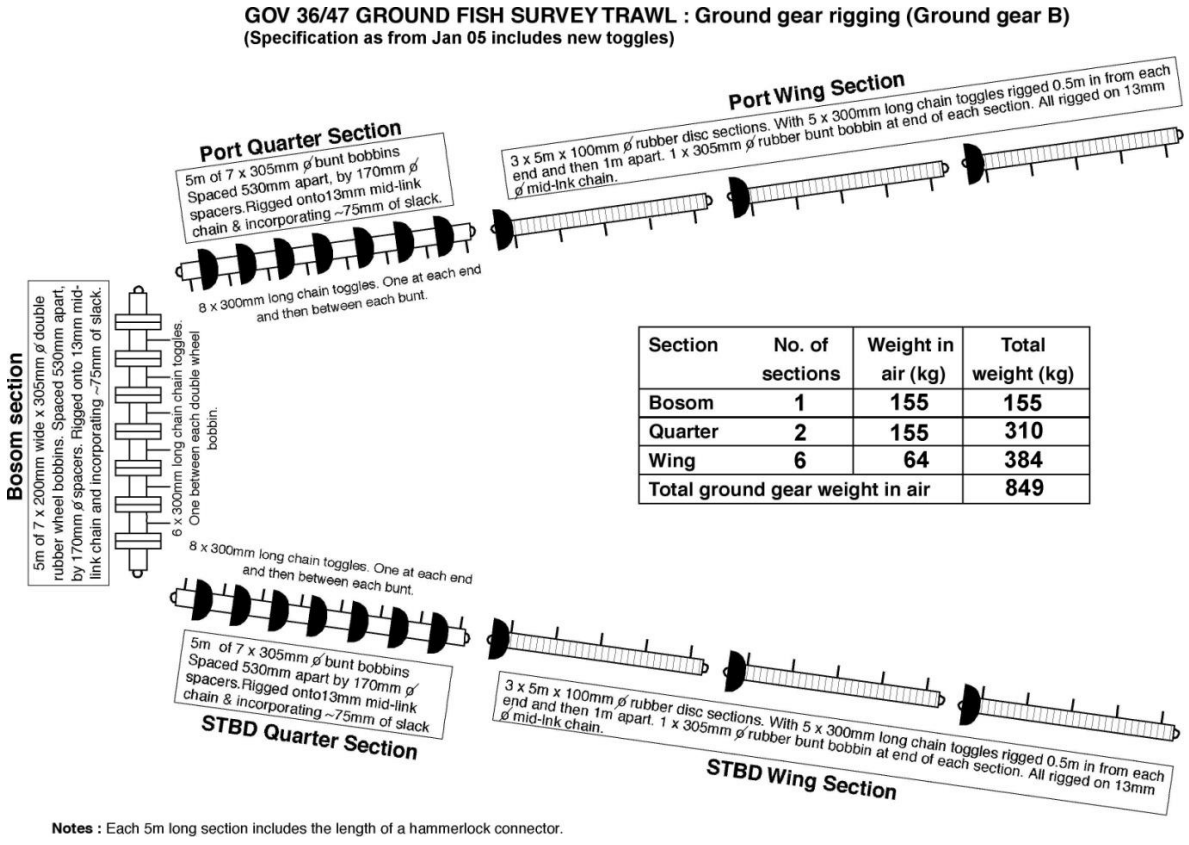


Figure 2.4 Standard groundrope for the 36/47 GOV Trawl

Figure 2.5. Standard groundrope for the 36/47 GOV trawl groundgear 'A'.



Section	No. of sections	Weight in air (kg)	Total weight (kg)
Bosom	1	155	155
Quarter	2	155	310
Wing	6	64	384
Total ground gear weight in air			849

Figure 2.6. Groundrope for the 36/47 GOV trawl groundgear 'B'.

2.4 Gear quality control

2.4.1 Before and during the Survey

The flow diagram can be used to describe the procedure for the preparation of the GOV trawl prior to the survey and each haul (Figure 2.7).

The table below presents a short description for each country of the procedure for the preparation of the gear before and during the survey.

Procedure for the preparation of the gear before and during the survey	
Denmark	Before the survey: Primary and spare trawls are visually inspected when taken onboard. During the survey: Nets are checked and measured according the check sheets 1–3 if the correct doorspread and vertical net opening cannot be achieved or after damages by the fishing master. The control sheets are given to the scientist in charge.
England	Before the survey: The primary net and a spare net are pulled out at the net store. The net manager along with the primary and secondary scientists in charge check the net, using the specification sheets in Annex 3 to 6b of this manual. During the survey: The flow diagram in Figure 2.7 is followed. The damages and repairs are reported on the specification sheet, which is given to the scientist in charge at the end of the survey.
France	Before the survey: The net, which has its own specification sheet, is prepared by the fishing master and checked in the presence of the scientist in charge. During the survey, the procedure is followed according to the flow diagram. The damages and repairs are reported on the specification sheet, which is given to the scientist in charge at the end of the survey. A copy is sent to the technologists team.
Germany	Before the survey: The primary net and spare nets are transported aboard from the net store and prepared by the ship's crew (fishing master) according to the IBTS manual. The chief scientist does not conduct a formal control, but a visual inspection of the rigged net on deck. During the survey, small net damages are repaired directly after each haul; in the case of larger damages, the replacement net is rigged. No documentation is made of net damages, but the haul is marked invalid if the captain/chief scientist assumes that the haul has been affected by the damage.
The Netherlands	Before the survey: The primary net and a spare net are checked by the Wageningen Marine Research gear technician together with the crew on board, following the specification sheets 3 and 4 of this manual. During the survey: The crew rigs, controls, and repairs the net if necessary.

Procedure for the preparation of the gear before and during the survey	
Norway	Norway revized its procedures in 2015. Before the survey, primary and spare nets (4 in total) are pulled out at the net store. Primary nets are visually inspected by the trawl master and a gear technician, if present, on the vessel. The survey coordinator and gear technician ensure the trawl master has the necessary information to rig the gear properly. Gear calibration trials are performed prior to starting the survey to ensure all gear, including sensors, are working properly. During the survey: The crew rigs, controls, and repairs the net if necessary. All repairs are noted in gear specification sheets and added to the 'trawl history' binder that follows each set of gear. If a net is excessively damaged, a replacement is rigged and calibrated before use. The trawl history binder is delivered to the gear store with the nets at the end of the survey; nets are then inspected and repaired, if needed. The haul is marked invalid if the captain/science survey leader deem that the catch has been affected by the damage.
Scotland	On each IBTS survey, four GOV-trawls are carried aboard Scotia and rotated each cruise, so they all get similar soak time. Any trawls used during the preceding survey are fully checked over by staff in the Marine Laboratory Netstore and given a full overhaul. Prior to each survey, all wires and groundgear sections are inspected and measured, and if found defective replaced or rerigged. Prior to the start of each survey, the initial rigging aboard the vessel is undertaken by the crew in the presence of either a gear technologist, a scientist in charge (SIC), or a nominated competent deputy. During the rigging, a member of scientific staff ensures the gear conforms to the standard trawl/gear rigging plan and acts as a point of contact between the vessel and net store to resolve any queries or problems. Gear technologists at the Laboratory have drafted a rigging manual that details how every component connects together to fully rig the GOV (from trawl door to codline) for Scottish surveys. This manual is more detailed than the IBTS manual and is intended to act as an aid for RV vessel crews and scientists to ensure consistency on every survey. As standard practice on every survey, one member of the scientific staff is allocated responsibility to act as deck person. This role includes observing shooting and hauling of the gear, along with operating the SCANMAR and bottom-contact instrumentation and relaying any issues to the SIC. During the survey, the procedures, as detailed in the flow diagram (2.6), are followed. An electronic haul-by-haul record (Net check form) is kept by the deck person for each trawl used, and this details any damage sustained and repairs or replacements made to the fishing gear. A copy of this file is given to the SIC at the end of the cruise.
Sweden	Currently, Sweden carries two GOV-trawls on board. Both trawls will be checked and measured at least once a year by the net maker together with the laboratory gear specialist and cruise leader. The flow diagram in Figure 2.7 is followed, except that the fishing master together with onboard crew rig the trawl without staff from the Institute being present.

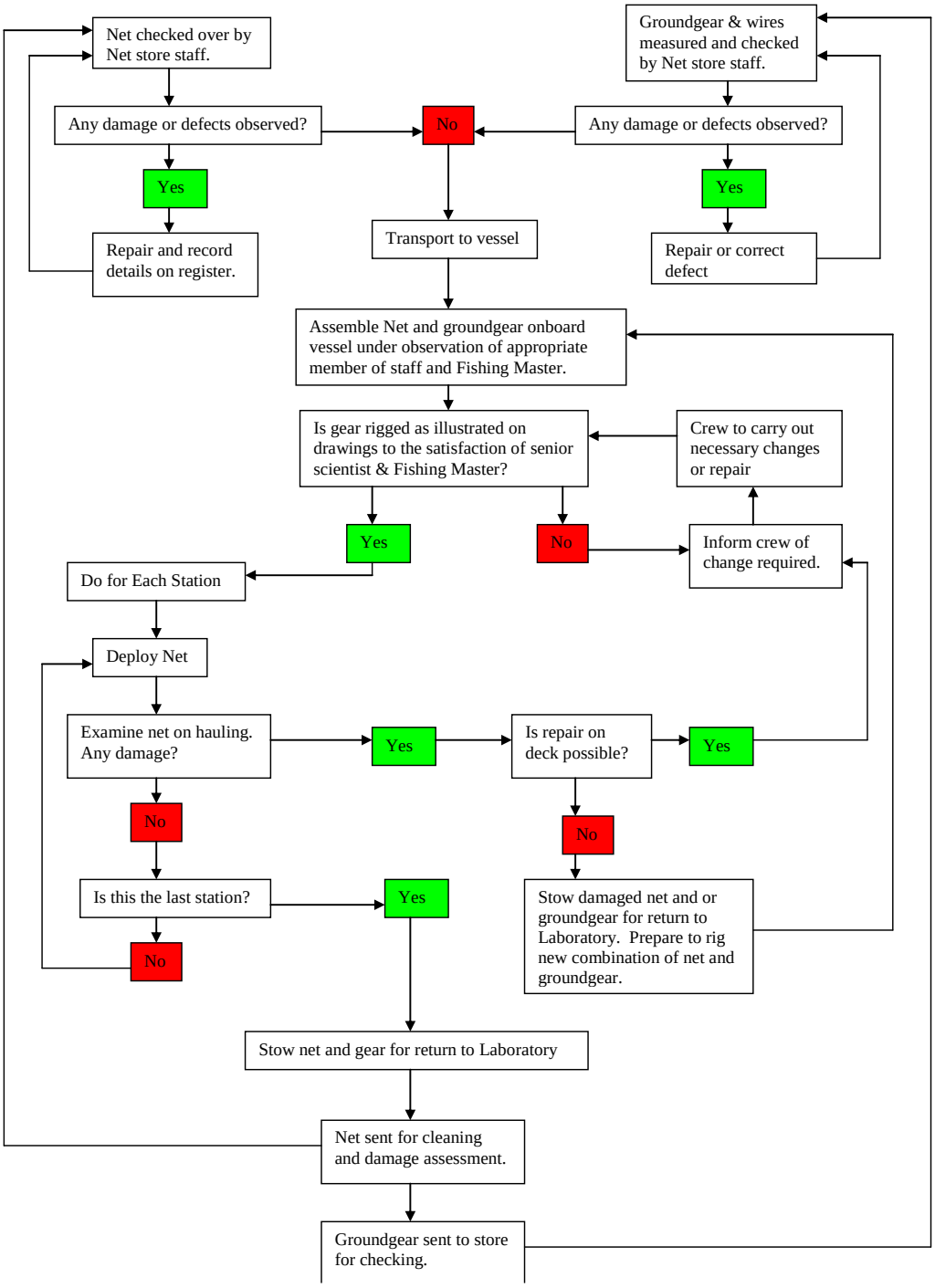


Figure 2.7. IBTS GOV preparation flow diagram.

2.4.2 Quality control during the survey

The GOV trawls are generally used for several surveys during the year. They must be regularly checked by the fishing crew with scientists and/or gear technologists. All countries must record all modifications or damage to the gear having occurred during a survey.

2.4.3 Quality control after a survey

Each country has its own protocol for quality control of the net. The procedure implemented is described in the table below.

Frequency of the Quality Control and brief description of the procedure after the survey	
Denmark	At the end of the survey: If necessary, repairs are specified by the fishing master and discussed with the scientist in charge.
England	Before the next survey, the main trawl and the spare trawl are completely checked by the net store personnel under the responsibility of the scientist in charge. Results are recorded and kept on file by the net store manager and the scientist in charge of that survey. Trawls are identified by a specific number assigned when originally received by the net store after initial purchase.
France	Since 2010, a new quality control procedure was implemented at Ifremer. Once a year, all trawls are completely checked by the crew under the responsibility of the gear technologists. A detailed protocol describes all controls that must be done. Results are sent to the cruise leaders and uploaded on the Ifremer Intranet site. Trawls are identified by a specific number (acquisition year and order number).
Germany	During and after each survey, the fishing master/captain inform the chief scientist if net material needs to be purchased for replacement.
The Netherlands	At the end of the survey: If necessary, repairs are specified by the fishing master and discussed with the scientist in charge.
Norway	Norway revised its procedures in 2014. The nets are checked by the net store personnel and a gear technician after the survey. Results are recorded and kept on file – electronic and in the 'trawl history' binder that follows each set of gear; gears are numbered for identification. Any specific problems that need resolution are brought up to the trawl forum for discussion and solving.
Scotland	Prior to each survey, any used trawl gear is thoroughly inspected and, where required, repaired or replaced by Marine Lab net store personnel, supervised by the store manager. Results are recorded and kept on file by the net sore manager. All trawls have a unique number identifier and all wires are tagged with their details (length and diameter). All newly purchased trawl gear is inspected by the net store manager prior to being brought into stock. Revised quality control protocols were introduced during 2003 and these firmed up procedures with regard to rigging and operation of all survey gears during Marine Laboratory cruises. As mentioned in the previous section, a rigging manual specific to the Scottish GOV has been drafted and acts as a master specification when RV crew are rigging and operating the fishing gear.
Sweden	The fishing master and the cruise leader compile a post-cruise trawl-status list for the trawls to make sure that faulty or worn parts of the netting and the rig are replaced prior to the next survey. The trawls are after the cruise delivered to a netmaker to be mended and stored. The mended trawls are also measured once a year. The repairs are documented in an excel sheet.

2.4.3.1 Quality control steps

Checking procedures have to follow several steps and each piece of the net has to be verified, as well as the rigging, the doors, the salvages, panel frames, and the groundrope. Sheets presented from Annex 3 to Annex 6b are to be used as a guide to check the trawl.

The trawl must be stretched out on the ground. It is recommended that all pieces are measured by the same person. Each piece is defined by its length, thread strength, shape, meshing, and identification number, indicated on a reference plan.

Different controls made by each country are described in the following tables.

	Net panels
Denmark	As specified in the IBTS manual.
England	The size of each panel is calculated according to the mesh number. Selvedge meshes are not included. To be valid, the mesh number must be identical, as the values described in the original net diagrams (Section 2.3). The net is measured dry and not damp. Meshing control consists of measuring 20 meshes consecutively. A bronze mesh gauge is used to measure the height of the meshes from front to back. An average is taken from the 20 meshes recorded and the tolerance between nominal value and effective value is ±5%.
France	The size of each panel is calculated according to the mesh number. Selvedge meshes are not included. To be valid, the mesh number must be identical as the nominal values. Otherwise, a second numbering has to be carried out. The tolerance between nominal value and effective value is: ± 1 mesh for the base; ± 0.5 mesh for the height, for each piece except the codend; ± 2 meshes for the GOV 36/47 codend; ± 10 meshes for the double codend. The thread strength is checked, comparing the thread of each piece and standard commercial samples. Each part of the net must be dampened regularly (uniformly) before being measured. Meshing control consists of measuring 20 meshes consecutively. The zero marking of the ruler is placed on the upper mesh knot and the measurement is read below the opposite knot. Piece meshing is calculated by working out the average of the consecutive 20 meshes. Millimetre is the unit used to measure the mesh and the tolerance between nominal value and effective value is ±5%.
Germany	No formal procedure has been specified in writing; control in responsibility of fishing master.
The Netherlands	As specified in the NS-IBTS manual.
Norway	As specified in the NS-IBTS manual as of 2014. If a new net is needed, the gear store arranges for its purchase from the Norwegian net maker, ensuring conformity to the standard net plan.
Scotland	All netting used to repair or renew GOV trawls is purchased by the Marine Laboratory net store from an outside supplier. It is specified from the manufacturer as full mesh size and subsequently measured (meshes per 1 m) on delivery by the net store manager to ensure conformity with the standard net plan. After each cruise, the netting panels of every used trawl are inspected and if found to be stretched or distorted, replaced. No ± mesh tolerances are used as every panel must conform to the number of meshes and length described in the standard net diagrams.
Sweden	When checking the net panels, the net maker (with cruise leader present) follow the gear checking sheets, supplied in Annex 3 of the IBTS manual. If the panels have not been altered, the number of meshes will not be counted and the different sections will be measured only to ensure trawl symmetry .

	Salvages and panel frames
Denmark	As specified in the NS-IBTS manual.
England	Salvages and panel frames are attached along parts of the net. Each is stretched and measured with a tape measure from eye to eye. The unit is centimetre and tolerance between nominal value and effective value is ±5 cm. On the same part of the trawl, the port side and the starboard must be equal and the difference should not exceed ±5 cm.
France	Lines are attached along parts of the net. Each of them is stretched and measured with a decameter from eye to eye. The unit is the centimetre and tolerance between nominal value and effective value is ±5 cm. The diameter is controlled with a calliper rule and tolerance between nominal value and effective value is ±5 mm. On the same part of the trawl, the port side and the startboard must be equal and the difference should not exceed ±5 cm.
Germany	As specified in the NS-IBTS manual.
The Netherlands	As specified in the NS-IBTS manual.
Norway	As specified in the NS-IBTS manual.
Scotland	Selvedge and panel framelines are attached along parts of the trawl. All are measured to the exact value specified in the standard plan. After a survey, each used trawl is returned to the laboratory net store, where all lengths and diameters are checked and, if different from the standard plan, replaced. Particular attention is made to checks along the nylon (PA) selvedge rope sections, as these shrink and are replaced regularly. When selvedge ropes are replaced on one side of the gear, the opposite side is automatically replaced.
Sweden	The net maker (with the cruise leader present) follow the gear checking sheets supplied in Annex 3 of the IBTS manual when checking salvages and panel frames.

	The groundrope
Denmark	Once measured, not remeasured unless damaged.
England	The groundrope is stretched on the floor and its different parts measured with a tape measure. The unit is centimetre and the tolerance should not exceed ±5 cm.
France	The groundrope is stretched on the floor and its different parts measured with a decameter. The unit is the centimetre and the tolerance may not exceed ±5 cm. The weight of the groundrope could only be estimated. Its load must be well distributed on the square and equal between the port side and the starboard wings.
Germany	Once measured, not remeasured unless damaged.
The Netherlands	Once measured, not remeasured unless damaged.
Norway	Once measured, not remeasured unless damaged.
Scotland	Two sets of each groundrope (A and B) are available for each survey They are checked and measured twice per year, the unit is centimetre and the tolerance should not exceed +3 cm.
Sweden	The measuring of the ground gear follow the gear checking sheets supplied in Annex 3 of the IBTS manual.

	The rigging
Denmark	Once measured, not remeasured unless damaged.
England	Each part of the rigging (bridles and sweeps) are stretched on the floor. They are measured with a tape measure in the same procedure as the frames. The unit is centimetre and the tolerance value is ± 0.5%. The port side and the starboard symmetry must be checked and difference does not exceed ± 2 cm.
France	Each part is defined by a specific number (example in table below) which will be stamped on each coupler's cables. Each part of the rigging is stretched on the floor. They are measured with a decameter in the same procedure as the lines. The unit is centimetre and the tolerance value is ± 0.5%. The port side and the starboard symmetry must be checked and the difference does not exceed ± 2 cm. The diameter is controlled with a calliper rule and the tolerance between nominal value and effective value is ± 2 mm.
Germany	Once measured, not remeasured unless damaged.
The Netherlands	Once measured, not remeasured unless damaged.
Norway	Once measured, not remeasured unless damaged.
Scotland	Each part of the rigging (bridles and sweeps) are checked and inspected by the net store manager prior to a survey. They are measured with a tape measure in the same procedure as the frames. The unit is centimetre and the tolerance value is + 0.3% or, if less than the required length, it is condemned and removed from service. All acceptable components are then tagged and ready for dispatch to the vessel for rigging. When rigging the gear prior to starting the survey, the scientific desk person in conjunction with the Fishing Master ensures the gear is rigged to the correct specification.
Sweden	Each part of the rigging (bridles and sweeps) is measured with a tape measure and the port and starboard symmetry checked in accordance with the gear check sheets, supplied in Annex 3 of the IBTS manual. If needed, they are adjusted by our trawl net maker.

	The doors
Denmark	Once weighed, no further measurements are taken.
England	Each pair of door is identified by the same number. The doors are only weighed when repaired. A scale is used to weigh the doors (in kilogramms). Tolerance interval between the nominal value and the effective value is ± 5% for each door. The length and the height of the doors, as well as the back-strops, are measured. The unit is centimetre and the tolerance value is 5 cm. Differences between the port side and the starboard back-strops may not exceed 5 cm.
France	Each pair of the door is identified by the same number. For the first time, the size and weight are checked without rigging. For further controls, it is possible to control the weight with the rigging. A scale is used to weigh the doors (in kilogramms). The tolerance interval between the nominal value and the effective value is ± 5% for each door. The length and the height of the doors, as well as the back-strops, are measured. The unit is centimetre and the tolerance value is 5 cm. Differences between the port side and the starboard back-strops may not exceed 5 cm. The weight between the two doors should not exceed 2%.
Germany	Once weighed, no further measurements are taken.
The Netherlands	Once weighed, no further measurements are taken.
Norway	Once weighed, no further measurements are taken.
Scotland	Each set of polyvalent doors are identified by a unique number with the port door and starboard doors being given an odd and even value, respectively. The doors are only weighed when new or repaired, but unless otherwise damaged, the policy is to change out the keels every 5 years. Tolerance interval between the nominal value and the effective value is ± 5% for each door. The Marine Lab has two sets of polyvalent doors and each set is always fished as a pair and never mixed. If a door is damaged or lost, then it is replaced using the unique Morgere identifier, which relates back to the original production in the factory. The length and the height of the doors, as well as the back-strops, are measured. The unit is centimetre and the tolerance value is 3 cm. Differences between the port side and the starboard back-strops should not exceed 3 cm.
Sweden	The doors are checked for damages and measured/weighed if repairs are done.

Table 2.2. Summary of quality controls used for GOV.

		Net Tolerance %		Rigging Tolerance %			
	Control Frequency	Size and length	Mesh size	Salvages and frames	Groundrope	Rigging	Doors
Denmark	As required	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets
England	Annually	± 5% (length)	± 2 meshes	± 5 cm (length) difference port side/starboard ± 5 cm	± 5 cm (length)	± 5% (length)	± 5% (each door) ± 2% (between the two doors)
Scotland	Prior to every survey	0%	Must conform to length and count of meshes in standard net plan	Length must match standard net plan, otherwise replaced	+ 3 cm (length)	+ 0.3% (length)	± 5% (each door)
Netherlands	As required	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets
Germany	Prior to every survey	Expert judgement of fishing master	Expert judgement of fishing master	Expert judgement of fishing master	Expert judgement of fishing master	Expert judgement of fishing master	Expert judgement of fishing master
Norway	Prior to every survey	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets
Sweden	As required (but at least once a year)	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets	As described in check sheets
France	Annually (since 2010)	± 5% (length)	Base: ± 1 mesh Height: ± 1 mesh Codend: ± 2 meshes Double codend: ± 10 meshes	± 5 cm (length) difference port side/starboard ± 5 cm	± 5 cm (length)	± 5% (length) ± 2 mm (diameter)	± 5% (each door) ± 2% (between the two doors)

2.5 Standard fishing method

2.5.1 Calibration at start of the survey

It is suggested that all nations undertaking standardized surveys allocate some of the survey time to carry 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 (i.e. calibration of trawl and sensors). This includes:

- Gear deployment: is the gear rigged correctly and being deployed and retrieved appropriately by the crew? Is all deck machinery functioning?
- Ground contact: do the groundgear, doors, and sensors 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 check the gear and electronics, and would also save time in case a piece of equipment requires further attention.

2.5.2 Trawling speed

Standard fishing speed is 4 knots, measured as vessel speed over the ground. The recommended speed is set as a target and actual (ground) speed and distance towed must be monitored and reported. With tide and weather affecting the average speed of a vessel, as a guide, the minimum speed should not go below 3.5 knots and the maximum should not exceed 4.5 knots, with the average for the entire tow being as close to 4 knots as possible. It is also recommended that, if possible, the speed of the trawl through the water should be monitored by a speed sensor mounted on the net and reported.

2.5.3 Fishing depth

The maximum fishing depth for standard stations in the entire survey area is 250 m.

2.5.4 Tow duration

A standard tow is fished for 30 minutes. Start time is defined as the moment when the gear geometry is stable (i.e.. vertical net opening, speed over ground, wingspread, doorspread), as monitored by sensors. Stop time is defined as the start of the winches hauling the net back in. At this time, vessels should reduce speed considerably. It may be acceptable to fish for a shorter period than 30 minutes, i.e. haul early for safety reasons or in the case of very large catches. However, any tow under 15 minutes is considered invalid. Invalid are not included in index calculations and therefore a second valid station must be attempted in that rectangle.

2.5.5 Vertical opening, wingspread, doorspread

All countries must use electronic equipment to monitor net geometry. Refer to the sensor manual for the correct method for attaching the units to the gear. Vertical net

opening (headline height over bottom), wingspread, and doorspread are to be monitored at as high a rate as possible (at least 30-second intervals; 1-second intervals are recommended) and, after appropriate filtering for invalid values, the mean value is reported. It is highly recommended that all gear parameter files are recorded and archived. Summarized trawl monitoring data are to be sent to DATRAS with the standard upload from institute databases.

2.5.6 Trawling during daylight only

To minimize the effects of diurnal fish behaviours on catch rates of the survey, sampling is standardized to daylight. In the morning, the net cannot be shot (i.e. touching the ground) earlier than 15 minutes before sunrise. At the end of the day, the net must be hauled (having left the ground) within 15 minutes after the time of sunset. It is recommended to use an electronic application or lookup table to determine local times of sunrise and sunset.

2.6 Monitoring net geometry

To ensure a valid tow, gear stability is crucial. **Throughout the tow, it is imperative that net geometry is measured, and that data are collected at an appropriate resolution.** If needed, the warp length to depth ratio should be adjusted to remain within accepted limits of net geometry; this ratio can vary between vessels. As an example, Scotland uses a ratio of 3:1, plus 30 m for warp. Constant monitoring of the gear is necessary to build up a baseline of gear performance for national coordinators/cruise leaders, making it easier to spot abnormal gear behaviour while carrying out a survey. If readings remain outside recommended values for an unacceptable period of time, the gear may has become fouled or damaged and should be hauled. Each country should aim to keep their gear performance within the bounds of what is considered normal for their gear (Annex 8).

Figure 2.8 shows the recommended theoretical ranges of the headline height and doorspread of the GOV, relating to the depth of water. This should be used as a guide to ensure optimum gear performance. Table 2.1 details the formula and parameters used to create the bounds shown in Figure 2.8, allowing the user to determine how their gear operates in relation to the recommended range. Currently, no theoretical relationship exists for wingspread; however, see Annex 8 for national gear specifications deviating from theoretical values.

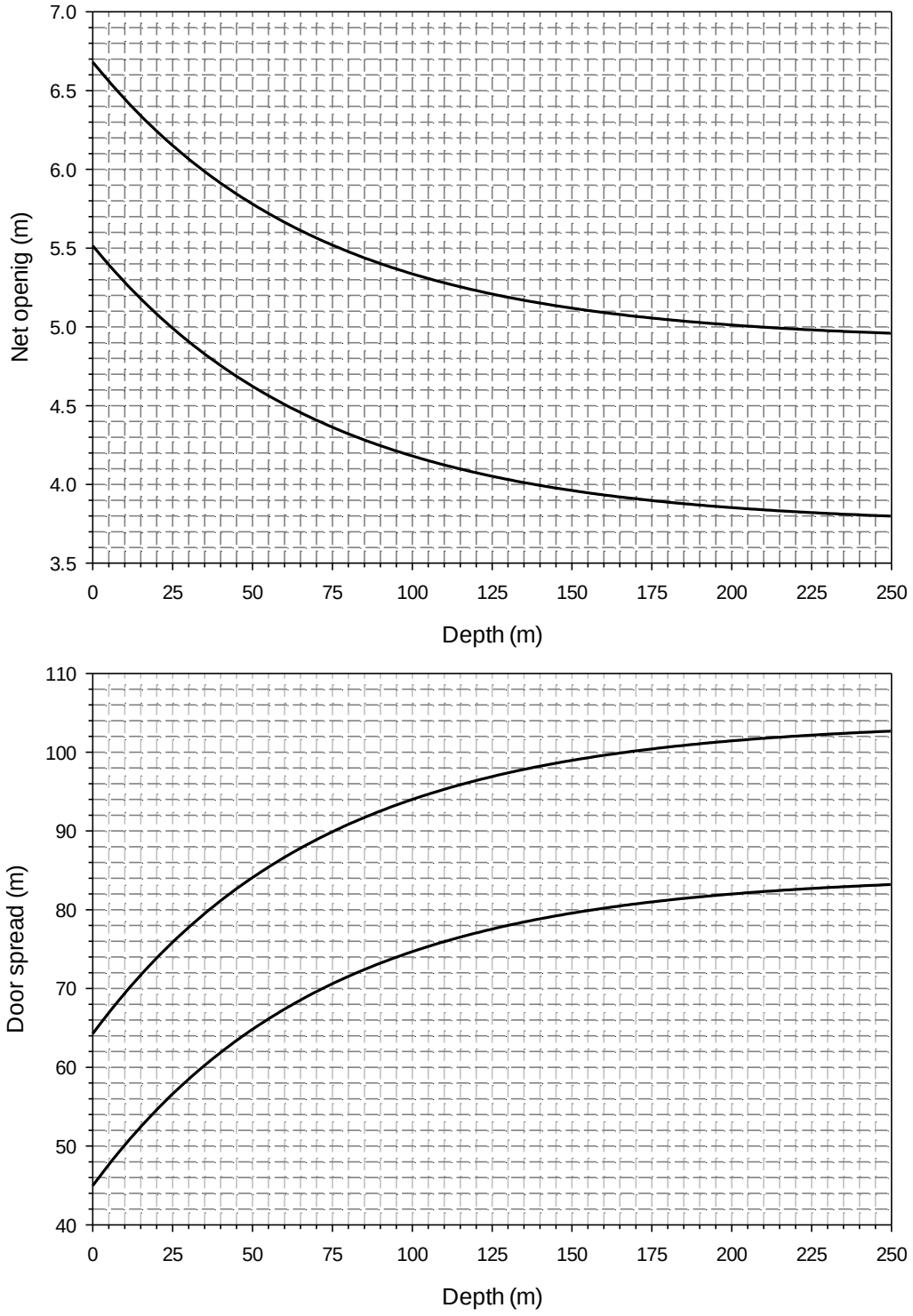


Figure 2.8. General guidance with average recommended upper and lower limits of vertical net opening and doorspread in relation to depth. For specified recommendations for each of the gears used, please refer to Annex 8.

Table 2.. Definition of recommended (theoretical) upper and lower limits of vertical net opening and doorspread in relation to depth (y = a + b × exp (–c × z), where y is net opening or doorspread and z is depth in meters). National-specific definitions can be found in Annex 8.

	Net opening limits		Doorspread limits	
Coefficient	upper	lower	upper	lower
a	3.7461	4.9088	84.3842	103.9178
b	1.7689	1.7727	-39.4195	-39.6521
c	0.0140	0.0142	0.0140	0.0139

The following flow diagram should be used to help in the process of using net performance sensors and units during a GOV haul (Figure 2.9).

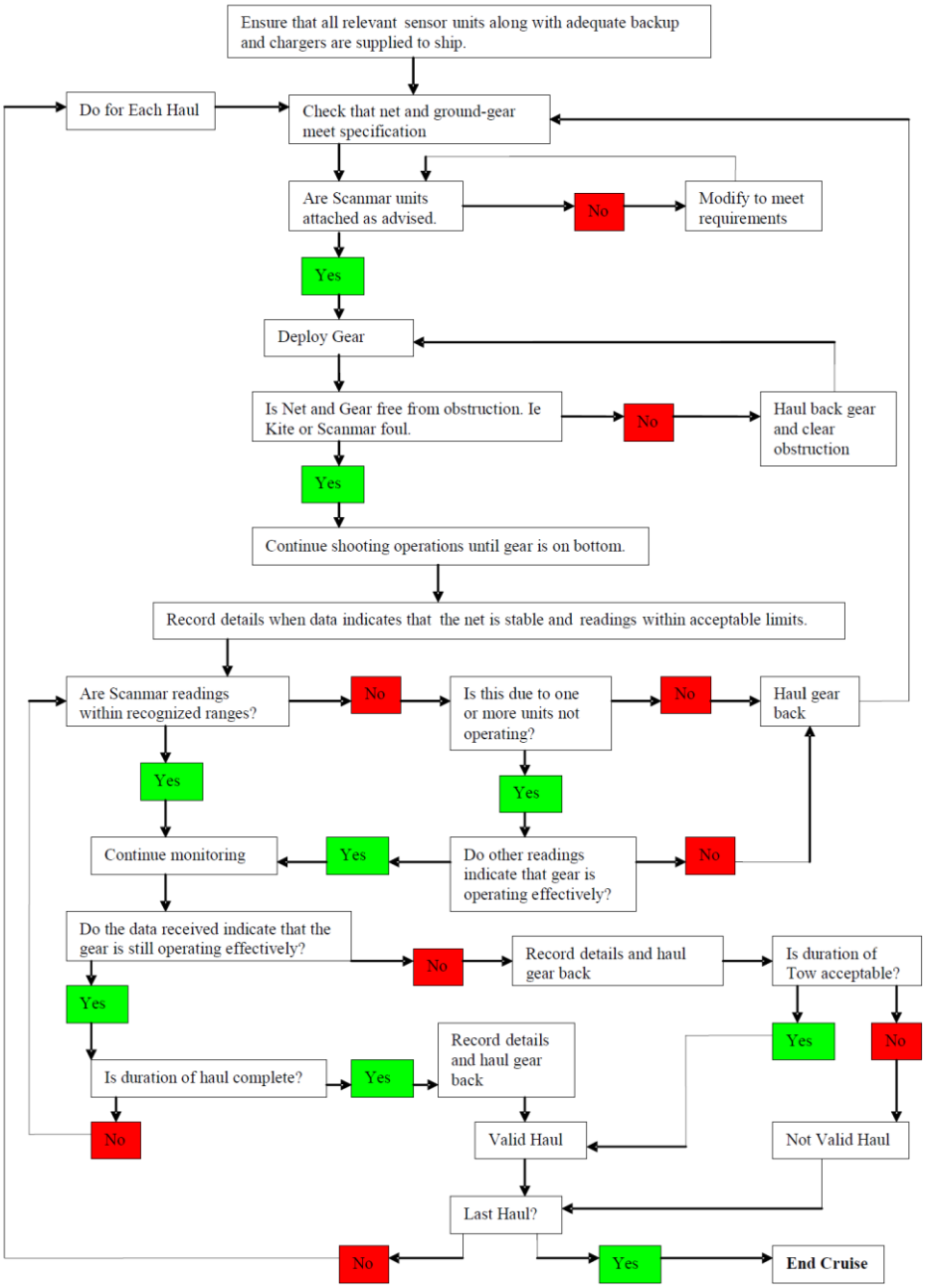


Figure 2.9. IBTS flow diagram for use of data from net performance sensors.

2.7 Trawl stations

Most statistical rectangles contain a number of possible tows that are deemed to be free of obstruction. From these, the survey coordinator will draw a random set of trawl locations to be used in the specific surveys. This ensures a semi-random design of the survey, allowing for estimating statistical uncertainty of the catches. For practical and historic reasons, some countries have not implemented this semi-random station selection, but continued with the historical fixed station survey design. In some rectangles, sampling may be further stratified due to significant changes in seabed depth, which may, in turn, cause variations in the fish population. If vessels are not fishing at the predefined stations, they are free to choose any position in the surveyed rectangles if hauls are sufficiently far apart from each other. In rectangles or strata that

are to be sampled more than once by the same vessel, it is recommended that valid hauls are separated by at least one day (24-hours), or by at least 10 miles. Tows conducted by the same vessel in adjacent rectangles must also be separated by at least 10 miles, except where one country takes more than 2 tows per rectangles. Exceptions can also be made in rectangles with little surveyable area, where stations may be less than 10 nm apart. Countries must avoid clustering tow positions between adjacent rectangles in order to reduce positive serial autocorrelation and thereby maximize survey precision. Survey partners exchange information on available clear tows between vessels in order to increase the variance in fishing positions used. Fish shoals located by sonar or echosounder must not influence fishing locations.

3 Sampling of GOV-trawl catches

3.1 Catch sorting and sampling

The catch from all valid hauls must be fully sorted if practically possible. Fish and shellfish species are identified to the lowest taxonomic level possible. For larger catches, a selection of species/size categories of species may be identified as being sufficiently abundant to be subsampled appropriately.

Only if it is practically impossible to identify organisms to species level may some be grouped by genus or larger taxonomic group (e.g. *Pomatoschistus*, Ammodytidae). Table 3.1 lists shellfish and cephalopods that must be sorted, measured, and included in the data submission to DATRAS.

3.1.1 Additional collection of invertebrates (benthos)

Although standardized data collection for fish is well established in IBTS protocols (see below), there is no standardized approach to the submission of data on the catches and size distribution of other invertebrate species (those not included in Table 3.1). No agreed protocols for the collection and submission of data exist because the levels of taxonomic expertise on board vessels can be variable. The GOV is not an effective gear for catching benthos for quantitative sampling, but it can be used for some crude distribution information, as long as the limitations of the gear are taken into consideration, e.g. the type and rigging of the groundgear and the size of the net meshes. These data may be collected as presence/absence or weights/numbers. It is at the discretion of the institute collecting the data to decide what means is most appropriate. Hence, national laboratories collecting information on benthos may continue to do so.

Table 3.1. Shellfish and cephalopods to be recorded and/or measured during surveys.

AphiaID	Common name	Scientific name	Recording	Measurement	Unit
CRUSTACEANS					
107275	Golden crab	*Cancer bellanius*	Male/Female	Carapace width	mm below
107276	Edible crab	*Cancer pagurus*	Male/Female	Carapace width	mm below
107369	Deep-water red crab	*Chaceon affinis*	Male/Female	Carapace width	mm below
107253	European lobster	*Homarus gammarus*	Male/Female	Carapace length	mm below
107703	Crawfish/spiny lobster	*Palinurus elephas*	Male/Female	Carapace length	mm below
107704	Pink spiny lobster	*Palinurus mauritanicus*	Male/Female	Carapace length	mm below
107350	Spider crab	*Maja (Maia) squinado*	Male/Female	Carapace length	mm below
107254	Norway lobster	*Nephrops norvegicus*	Male/Female	Carapace length	mm below
107205	Stone crab	*Lithodes maja*	Male/Female	Carapace length	mm below
BIVALVES					
140712	Edible scallop	*Pecten maximus*	Sexes combined	–	–

AphiaID	Common name	Scientific name	Recording	Measurement	Unit
CEPHALOPODS					
141444	Cuttlefish	*Sepia officinalis*	Sexes combined	Mantle length	cm below
141443	Cuttlefish	*Sepia elegans*	Sexes combined	Mantle length	cm below
141445	Cuttlefish	*Sepia orbignyana*	Sexes combined	Mantle length	cm below
–	Squids	*Teuthoidea*(*)	Sexes combined	Mantle length	cm below
416668	Squids	*Loligo forbesii*	Sexes combined	Mantle length	cm below
140271	Squids	*Loligo vulgaris*	Sexes combined	Mantle length	cm below
153131	Squids	*Alloteuthis subulata*	Sexes combined	Mantle length	cm below
140625	Squids	*Todaropsis eblanae*	Sexes combined	Mantle length	cm below
140624	Squids	*Todarodes sagittatus*	Sexes combined	Mantle length	cm below
140621	Squids	*Illex coindetii*	Sexes combined	Mantle length	cm below
140600	Lesser octopus	*Eledone cirrhosa*	Sexes combined	–	–
140605	Octopus	*Octopus vulgaris*	Sexes combined	–	–
–	Bobtail squids etc. (*)	*Sepiola/Rossia/Sepietta*	Sexes combined	–	–
141454	Bobtail squids	*Sepiola atlantica*	Sexes combined		
141452	Bobtail squids	*Sepietta oweniana*	Sexes combined		
141449	Bobtail squids	*Rossia macrosoma*	Sexes combined		

(*) Identification to species level where possible, though juveniles may need to be aggregated.

3.2 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, for all fish species other than those described in Section 3.5. Length is measured to 0.1 cm below for shellfish, to 0.5 cm below for herring, sprat, and boarfish, and to 1 cm below for all other species. When measuring shellfish species, consult Figures 3.1 to 3.5 to ensure the correct carapace measurement is taken. When measuring cephalopods, use dorsal mantle length (see Figure 3.6).

Elasmobranchs and crustaceans are to be measured and weighed by sex.

3.2.1 Sorting and sub-sampling according to length groups

After sorting the catch into species or species/sex, a length distribution for each catch category that accurately represents the length distribution of the catch must be obtained. As a general guide, for catches with more than 75 individuals, a representative subsample is selected of at least 75 fish (may be less for limited length

ranges and more for extensive length ranges). For large catches above 1000 individuals, the sample size should be increased to 150 fish.

If a representative subsample cannot be selected when two or more distinct length groups (i.e. small and large fish with none in between) are present in the catch with a clear division between them, splitting in two size categories is necessary. See the following examples:

1) A catch of 999 fish in the length range 18–26 cm and one fish at 40 cm. A single subsample of 100 fish, when raised, will give either ten or zero fish at 40 cm. 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).
2) A catch of 994 fish in the length range 18–26 cm and three fish with a length of 10–12 cm, and a remaining three fish with a length of 38–40 cm. A single raised subsample of 100 fish could give anything between 0 and 6 fish in the length ranges 10–12 cm and 38–40 cm. The correct approach is to remove the small and large fish and measure them as category 1, then take a subsample from the remaining 994 fish (category 2).

3.3 Sampling for age, sex, and maturity

Otolith samples are to be collected from each trawl station by all nations. Both otoliths from each fish are to be collected. Fish with deformities should not be included in samples as representative of the population parameter.

Nations are to collect 1 otolith per 1-cm length group (0.5-cm length group for herring and sprat) from each trawl haul (Figure 3.2).

Table 3.2. Specifications on the numbers of otoliths to be collected.

Species	Minimum number of otoliths to be taken per trawl haul
Herring	1 otolith per 0.5-cm length class
Sprat	1 otolith per 0.5-cm length class
Mackerel	1 otolith per 1-cm length class
Cod	1 otolith per 1-cm length class
Haddock	2 otoliths per each 5-cm length class per haul for the length ranges 11-15, 16-20, 21-25, 26-30 cm, and to collect 2 otoliths per each 1-cm length class above 30 cm
Whiting	2 otoliths per each 5-cm length class per haul for the length ranges 11-15, 16-20, 21-25, 26-30 cm, and to collect 2 otoliths per each 1-cm length class above 30 cm
Norway pout	2 otoliths per each 5-cm length class per haul for the length ranges 5-10 and 11-15 cm, and 2 otoliths per 1-cm length class above 15 cm
Saithe	1 otolith per 1-cm length class
Plaice	1 otolith per 1-cm length class

Participants are encouraged to collect age samples from other commercially important species, such as sole, lemon sole, and any other species deemed important to the EU Data Collection Framework (DCF) or specified by the IBTS working group.

Sex, maturity (appropriate season), and weight data are to be reported for all target species for which age data are collected, especially for surveys that occur during the spawning period of that species. Roundfish maturity stages should be reported according to the maturity scales provided in Annex 9. For flatfish species, refer to ICES (2012b) and Annex 10 details maturity stages for skates and rays.

3.4 Measurement types for invertebrates

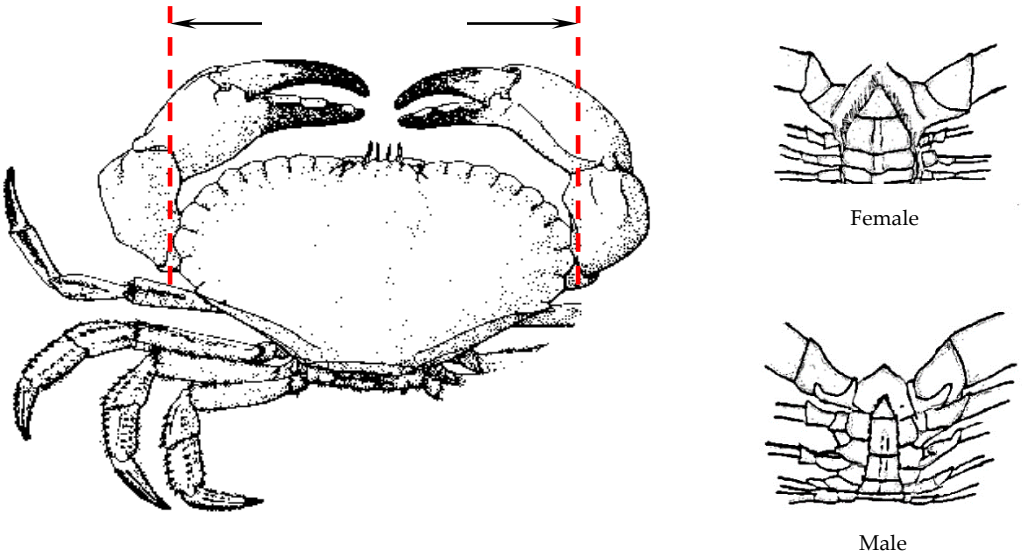


Figure 3.1. Measurement and sexing of *Cancer pagurus*. Size to be measured to the lower mm.

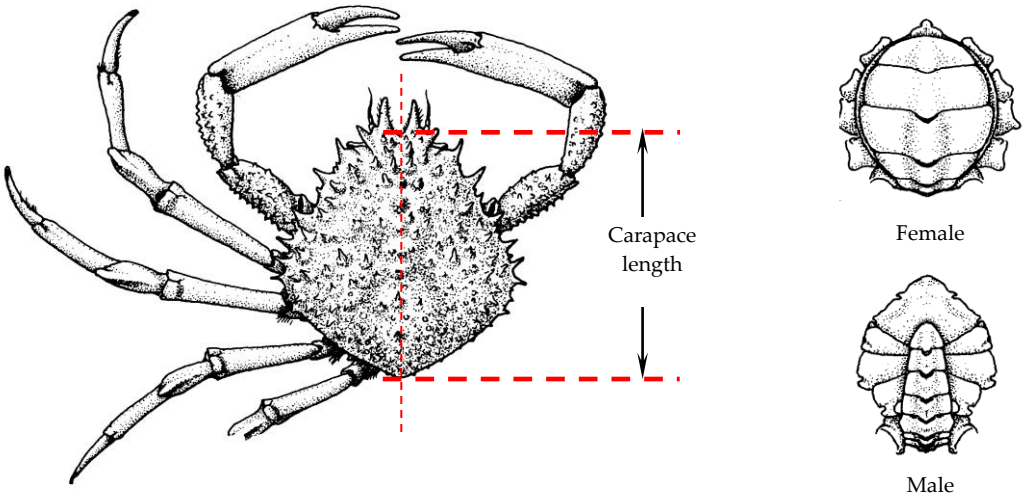


Figure 3.2. Measurement and sexing of *Maia squinado*. Size to be measured to the lower mm.

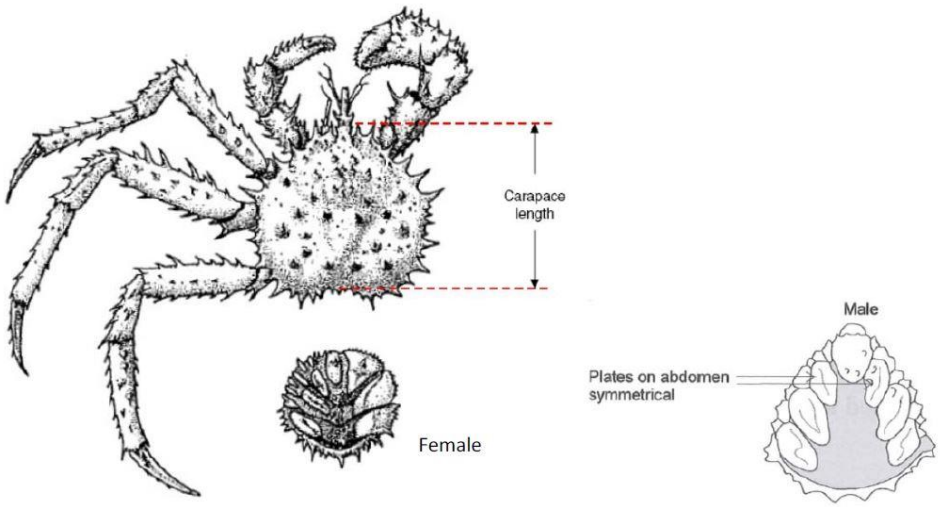


Figure 3.3. Measurement and sexing of *Lithodes maja*. Size to be measured to the lower mm.

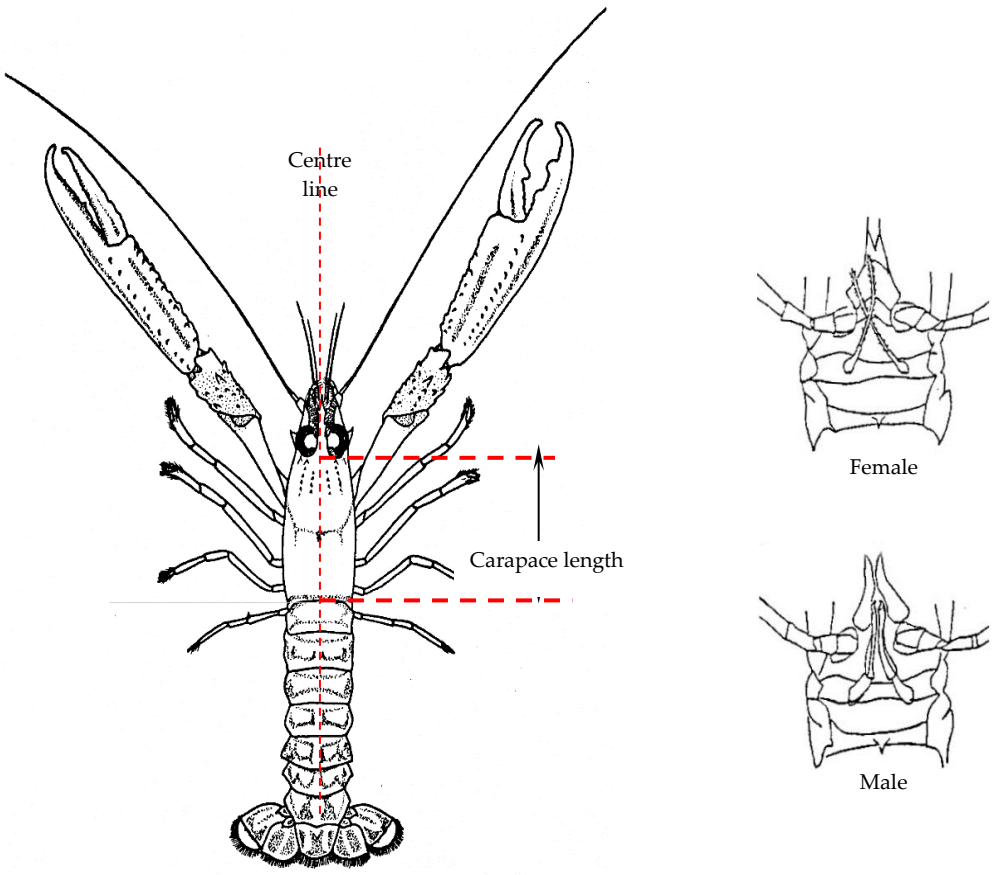


Figure 3.4. Measurement and sexing of *Nephrops norvegicus* and *Homarus gammarus*. Size to be measured to the lower mm.

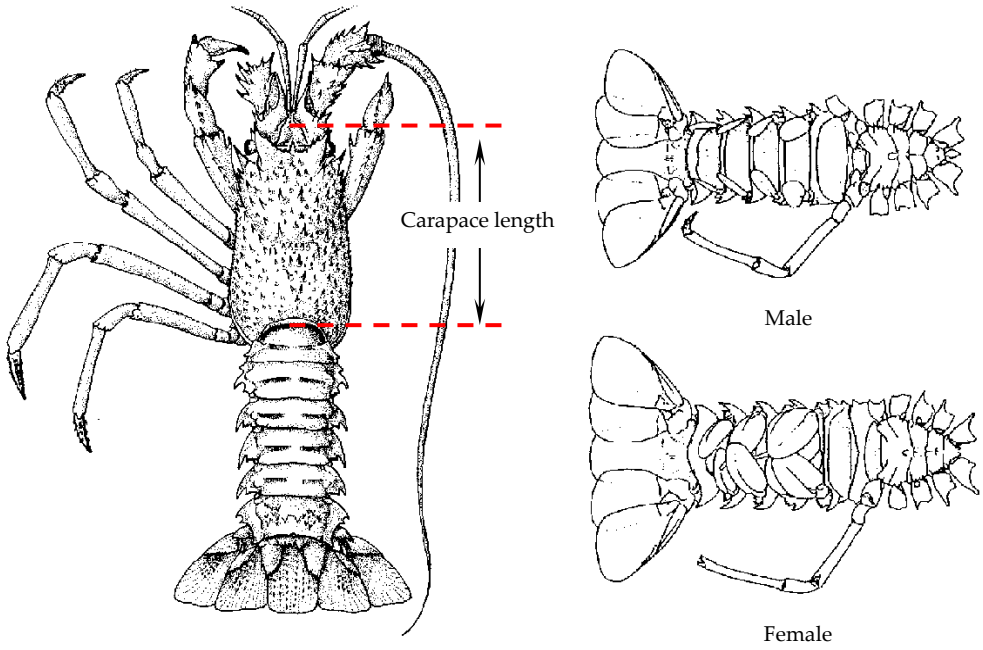


Figure 3.5. Measurement and sexing of *Palinurus* spp. Size to be measured to the lower mm.

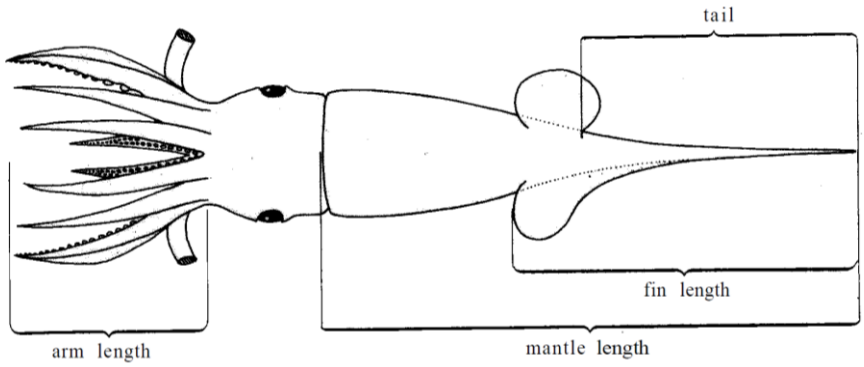


Figure 3.6. Measurement of Cephalopods. Mantle length to be measured to the lower cm.

3.5 Measurement types for deep-water species

The majority of species encountered during the deep-water surveys are measured to the centimetre below using total length **(TL;** Figure 3.7). However, some exceptions exist. As a result of 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. Listed below are the respective taxa, with details of the length measurements to be collected for each. Historically, these species, if caught, may not have been measured according to this protocol and care should be taken if using data for these species.

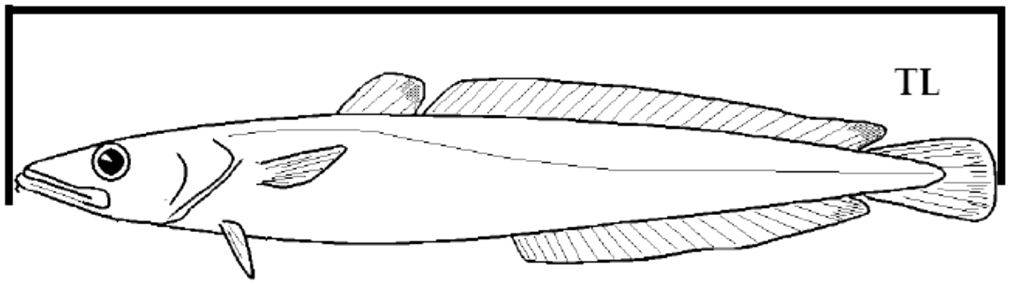


Figure 3.7. Measurement of total length (TL).

3.5.1 Smoothheads and Searsids (*Alepocephalidae* and *Searsidae*)

Standard length (**SL**) measurement taken from the tip of snout/anterior point of head to the end of the fleshy caudal peduncle (Figure 3.8). Not to be confused with TL, which includes the caudal fin rays. All smoothheads and searsids are measured to the nearest whole cm below.

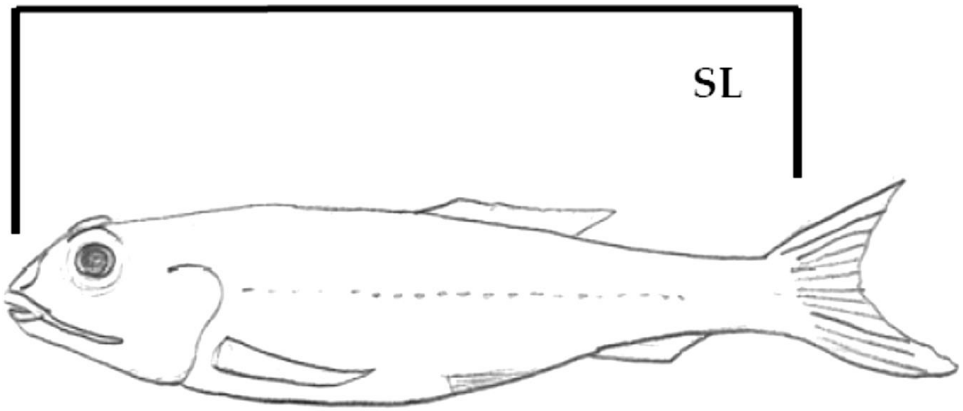


Figure 3.8. Measurement of standard length (SL).

3.5.2 Grenadiers (*Macrouridae*)

Measurement taken from the tip of the snout to the first anal fin ray (pre-anal fin length, **PAFL**; Figure 3.9). All grenadiers are measured to the nearest 0.5 cm below.

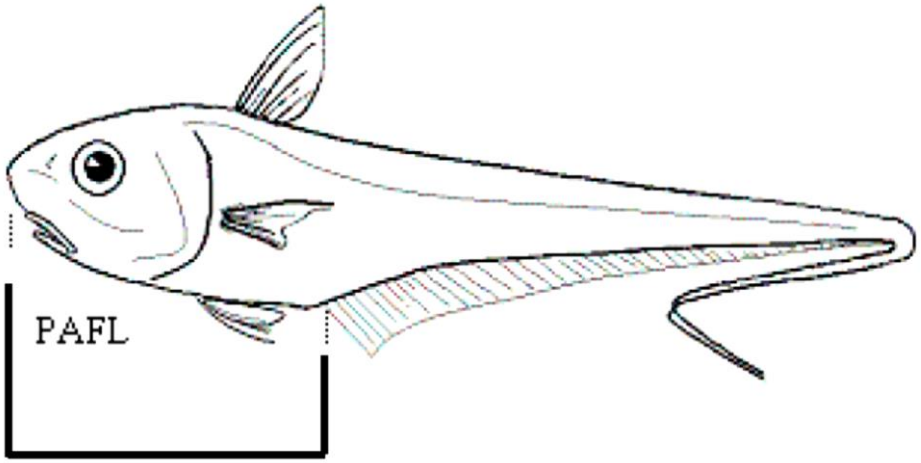


Figure 3.9. Measurement of pre-anal fin length (PAFL).

3.5.3 Chimaeridae (Rabbitfish)

All **Rabbitfish,** except Rhinochimaeridae are measured to pre-supra caudal fin length (**PSCFL**), which is from the tip of the snout to the point just before the start of the supra caudal fin (Figure 3.10). All Chimaeridae are measured to the nearest cm below.

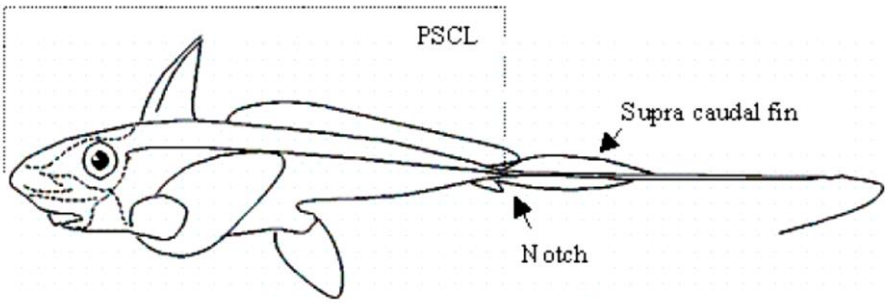


Figure 3.10. Measurement of pre-supra caudal fin length (PSCFL**).**

3.6 Collection of marine litter from the trawl

Marine litter is one of the MSFD descriptors. With this in mind, from 2011, all North Sea IBTS surveys collect data on marine litter captured in the GOV trawl. Currently two formats exist for submitting marine litter data; the original CEFAS trawl-litter categories used by IBTS previously (C-TS), or the revised CEFAS trawl-litter survey parameters (C-TS-rev); both are described in Annex 11.

Both the C-TS or C-TS-rev format classification systems are composed of main categories of litter, each further divided into subcategories. Items that are fragments from one item are to be counted as one item. All items that fall within a single category are to be counted and weighed individually; they should not be grouped. Photos of litter in each trawl sample are optional, not mandatory. Further guidelines on sampling seafloor litter are found in the WGML 2018 report, Annex 9 [1].

Once collected, these data are to be sent to each institute's marine litter co-coordinator and uploaded to ICES via Datras [2]. The litter data collection procedures are currently in revision; therefore, national survey coordinators must ensure they are up to date with the current procedures (see ICES website) prior to the survey.

1 http://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/HAPISG/2018/01%20WGML%20-%20Report%20of%20the%20Working%20Group%20on%20Marine%20Litter.pdf

2 https://datras.ices.dk/Data%20submission/Default.aspx

4 MIK net

4.1 Q1 sampling

The MIK net is a midwater ringnet and is the standard gear for the sampling of fish larvae at night during the International Bottom Trawl Survey in the first quarter.

A separate manual on all procedures and protocols regarding the MIK sampling on quarter 1 IBTS surveys has been developed (SISP 2). This is available on the ICES webpage. All nations sampling during IBTS Q1 must follow the protocols outlined in the MIK documentation.

5 Environmental data

Either before or after each GOV trawl, the following minimum hydrographical data are to be collected:

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

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

Details of environmental data should be submitted to the ICES Data Centre according to established procedures. The national hydrographic station number must be reported in Record Type 1 to allow the link to be estabilished between haul data and environmental data.

The following additional environmental data should be collected if available:

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

The above parameters, if collected, are reported in the 'Haul Information file HH' (Annex 12). Each nation must ensure that the units are uploaded as required in the HH specifications.

6 Exchange specifications for IBTS data

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

Type 1: HH – Record with detailed haul information (Annex 12);

Type 2: HL – Length frequency data (Annex 13);

Type 3: CA – Sex-maturity-age–length keys (SMALK; Annex 14);

Type 4: LT – Litter reporting format (Annex 15).

The summaries of the formats of these record types are provided in the appendices and detailed descriptions can also be found at the ICES web page [3].

Provisional data obtained from the North Sea and Skagerrak/Kattegat should be submitted to the quarterly coordinator as soon as possible after completion of the survey (see DATRAS website for upload deadlines). Annex 16 lists the sampling areas and standard areas for the calculation of abundance indices (using CM 1977/Gen:3 Figures 6.1 and 6.2 for guidance), while CM 1977/Gen:3 Figure 6.3 shows the index areas for those stocks that use the delta-GAM index estimation approach. Annex 17 lists the length splits for the various target species.

Final data should only be submitted to the ICES Data Centre after the national institute has checked the data; data is further checked using official checking programs issued by ICES within DATRAS, but institutes **must** instigate their own data checking routines and not rely solely on those within DATRAS.

3 https://datras.ices.dk/Data_products/ReportingFormat.aspx

7 References

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Annex 1: Current rectangle allocation between nations

The current quarter 1 and 3 allocation of the different nations is shown in Figures A1.1 and A1.2.

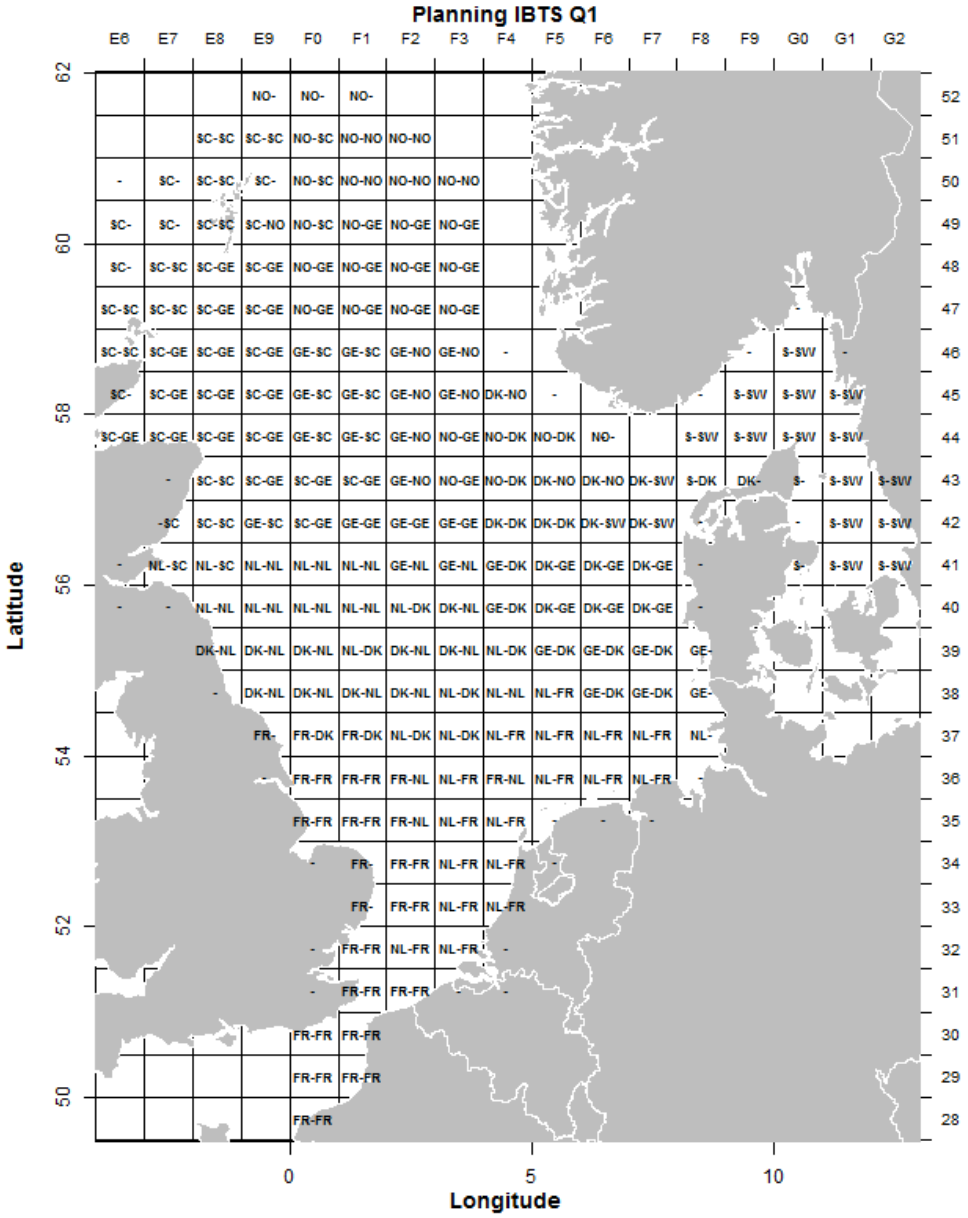


Figure A1.1. NS-IBTS Quarter 1 Survey Grid from 2020 onward for all participants (DK: Denmark, FR: France, GE: Germany, NO: Norway, NL: Netherlands, SC: Scotland, SW: Sweden).

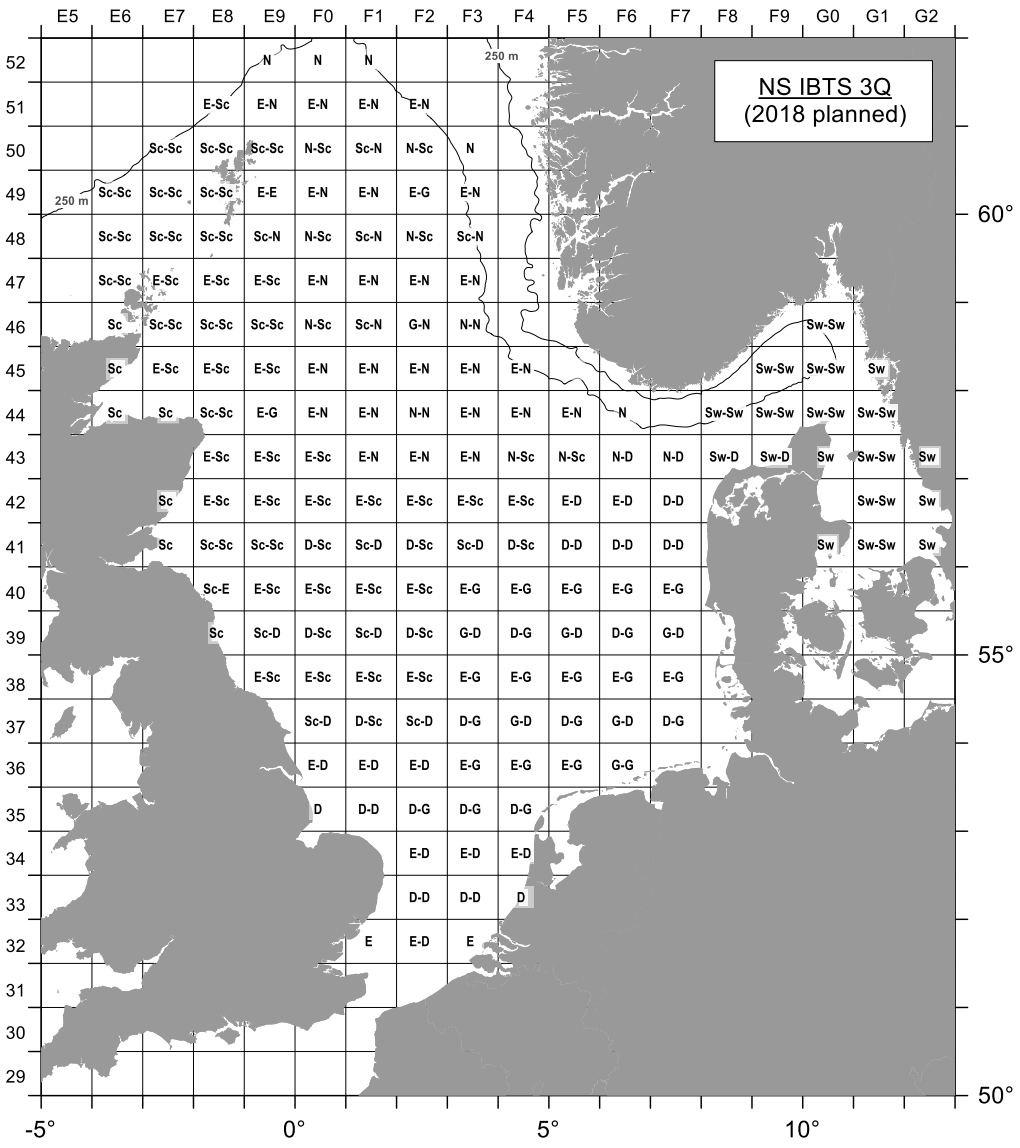


Figure A1.2. NS-IBTS Quarter 3 Survey Grid for all participants (D: Denmark, E: England, G: Germany, N: Norway, Sc: Scotland, Sw: Sweden).

Annex 2: History of the IBTSWG survey and manual

History of the survey

Objectives and procedures

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

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

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

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

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

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

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

Table A2.1 shows the timeline of significant events in the history of the IBTS and Table A2.2 shows the history of how the surveys have been carried out.

Having evolved from a herring survey, where only data on pelagic species were collected, the IBTS survey dataset is now made up of data collected on all finfish species. However, this current level of sampling has evolved gradually. In the manual revision VI, sampling was defined by two groups, 'standard' and 'closed bycatch' (ICES, 1999). Because all participants now sample all finfish species in one way or another, these have not been defined in this revision.

Coverage of the whole survey area was almost complete for every quarter of the years 1991–1996. In quarters 2 and 4 in 1997, however, the total effort was at a much lower level and limited to the contributions of a few nations. Since 1997, the surveys have been conducted in quarters 1 and 3 only.

In 2006, the French began to carry out additional tows in the Eastern English Channel in quarter 1 as part of the standard IBTS survey. This proved successful and, from 2007, the RV 'Thalassa' carried out 8 GOV trawls and 20 MIK stations. During the IBTSWG in 2009, Roundfish Area 10 was created to cover these new stations fished by France and the Netherlands.

The Skagerrak and Kattegat are typically fished by Sweden, who sample more than once in every rectangle, while west of Shetland, which has a high proportion of untrawlable ground and requires special groundgear, is surveyed by Scotland.

After a previous major reallocation in 1991, only small adjustments were made over the years until 2015 (Tables A.2.1 and A.2.2). Further adaptation of the allocation of rectangles for the quarter 1 survey were implemented in 2016 to address new constraints, e.g. reduction in available survey time for some vessels. The number of rectangles sampled by two different nations has been kept as high as possible to ensure comprehensive coverage of the entire survey area, in case of technical, weather, or other problems keeping one of the vessels from sampling the allocated rectangles.

Since the beginning of the century, a number of countries have noted that the gear parameter tables within the historic North Sea IBTS survey manuals had been difficult to adhere to when trawling. Between 2007 and 2010, an analysis was carried out to assess whether new tables or a new definition of the standard parameters for towing were needed. Ultimately, during the 2010 working group, it was decided that the standard tow would be redefined with achievable gear parameters. In an effort to quantify the drift in national specifications, a study was initiated at the IBTSWG in 2012 (ICES 2012a, proposed ToR e). A detailed trawl gear questionnaire template was drafted, covering all aspects of GOV construction/rigging at IBTSWG 2013 and subsequently circulated to all GOV countries. In revision IX of the manual, the old warp out to headline height and doorspread plots have been removed and replaced with plots of headline height and doorspread corresponding to depth, which should be used as a guide for achieving optimum gear geometry (Figure 2.7; ICES, 2013). It should be noted that Norway has not been able to achieve gear parameters within these limits, but their gear performance is considered normal for their gear. Similarly, Sweden has had difficulties in achieving gear parameters to fit the plots, but the performance is consistent over the years and considered normal for the gear.

Table A2.1. Chronology of the International Bottom-Trawl Survey (overview).

1960–1961	Spring and autumn trawl surveys to map distribution of herring.
1966	International Young Herring Survey (IYHS): Annual surveys in the southern and central North Sea established to obtain recruitment indices for the combined North Sea herring stocks.
1969	Skagerrak and Kattegat included in survey area.
1970s	Several different survey trawls being used by various institutes carrying out surveys in the North Sea, Skagerrak and Kattegat; e.g. the Dutch Herring Trawl, GOV, Herring Trawl.
1974	Northern North Sea included in survey area to collect data for gadoids.
1975	Recommendation for participants in IYHS to use Isaacs–Kidd midwater net to fish for herring larvae at night.
1976	Some nations start to fish 30-minute tows in order to reduce gear damage and increase numbers of hauls per day.
1977	IYHS Working Group and Gadoid I-Group Working Group recommend that all participants change to ½ hour tow duration. Working groups also recommend that, from 1978, the GOV trawl be the standard gear for future surveys. At least four countries were to use this gear in 1978, with other participants changing over to the GOV at the earliest possible time.
1981	Survey was renamed the International Young Fish Survey (IYFS).
1983	All Quarter 1 participants use standard GOV.
1984	ICES 'Working Group on Young Herring Surveys' and the 'Gadoid 1-Group Working Group' were combined to form the International Young Fish Survey (IYFS) Working Group (ICES, 1981b).
1990	IYFS WG proposed to combine the IYFS and other national surveys into Quarterly Coordinated Surveys in the North Sea, Skagerrak and Kattegat, which were to be called the International Bottom-Trawl Surveys (IBTS).
1991–1996	Quarterly surveys undertaken.
1992	All participating countries now using GOV as standard survey gear for all quarters.
1997	National financial constraints reduce coordinated surveys to quarter 1 and quarter 3 with target coverage of 2 hauls per ICES rectangle per survey.
1998	Scotland takes delivery of new vessel, Scotia III in time for Q3 survey in this year. Marks a significant step change with tow duration, standardized to 30 minutes from this point onwards, which is now in line with all other survey participants. Also change of gear for SCO Q3 survey, changing from 48ft Aberdeen trawl to GOV again, standardizing with all other survey participants.
2001	Western Areas IBTS coordinated surveys first manual produced.
2008	France extend Q1 survey area into the Eastern English Channel.
2009	Norway unable to participate in Q3 IBTS. Eastern English Channel area cover by France recognized as new Roundfish Area (RFA) 10.
2011	Start of regular collection of marine litter data from GOV trawl. 2011q3 Sweden starts using R/V Dana instead of R/V Argos.
2013	Minor reallocation of rectangles between Norway, Scotland, and Germany.

2015	Netherlands vessel out of commission; chartered Cefas's vessel Endeavour. France assisted by sampling 5 rectangles in the Channel area (30F0, 30F1, 29F0, 29F1, 28F0) and other nations were also asked to assist with coverage. Reduction in days-at-sea for Germany; other nations assisted with rectangle coverage. Extreme weather resulted in poor coverage of survey area. Slight reallocation of rectangles for the Q3 tow duration experiment. Norway began sampling rectangles 52E9, 52F0, and 52F1 in the Q3 survey.
2016	Norway began sampling rectangles 52E9, 52F0, and 52F1 in the Q1 survey. The Netherlands used Cefas' vessel, Endeavour, for their survey. Reduction in days-at-sea for Germany; other nations assisted with rectangle coverage. Slight reallocation of rectangles for the Q3 tow duration experiment. Some countries started sampling collection of otoliths by haul.
2017	Major reallocation of rectangles in the Q1 survey (see IBTS WG 2017 Report for details). Norway used Cefas' vessel, Endeavour, for the Q1 survey and began using a new vessel, the Kristine Bonnevie, for the Q3 survey.
2018	All countries committed to collecting otoliths by haul instead of roundfish areas.

Table A2.2. History of the North Sea IBTS surveys (overview).

Year(s)		Frequency	Region	Fishing gear used	Pelagic gear (larvae)	Tow duration	Survey name	ICES WG	Reference
From	to					[min]			
1960	1961	twice annually							ICES. 1963. International Young Herring Surveys. Report of Working Group meeting in IJmuiden, 26-27 March, 1963. ICES CM 1963/Herring Committee:101
1965	1968	annually	Southern/ central North Sea			60	International Young Herring Survey	WG on Young Herring Surveys	
1969		annually	Southern/ central North Sea, Skagerrak, Kattegat			60			
1974		annually	Entire North Sea, Skagerrak, Kattegat	various		60			
1975		annually			MIK as standard for larvae	60			
1976		annually				30 (some) / 60			
1977		annually		GOV recommended as standard		30 (all except one country) / 60			ICES. 1977. Report of the Working Group on North Sea Young Herring Surveys. ICES CM 1977/H:11
1978		annually		GOV used by 4 vessels		30 (all except one country) / 60			

Year(s)		Frequency	Region	Fishing gear used	Pelagic gear (larvae)	Tow duration	Survey name	ICES WG	Reference
From	to					[min]			
1981		annually				30 (all except one country) / 60	International Young Fish Survey (IYFS)	WG on Young Herring Surveys; Gadoid 1-Group WG	
1983	current			GOV used by all nations on Q1 and all but one nation in Q3		30 (all except one country) / 60			
1984		annually				30 (all except one country) / 60		IYFS WG	
1991	1996	quarterly				30 (all except one country) / 60	International Bottom-Trawl Survey (IBTS)		ICES CM 1990/H:3, ICES CM 1996/H:01
1997	1998	twice annually				30 (all except one country) / 60			Heessen, H.J.L., J. Dalskov and R.M. Cook. 1997. The International Bottom Trawl Survey in the North Sea, the Skagerrak and Kattegat. ICES CM 1997/Y:31
1998		twice annually		GOV used on all surveys by all participants in all quarters		30 for all surveys from Q3 1998 survey onwards			
1999	2015					30			
2016	2017					30 for Q1/Tow duration experiment in Q3 *			
2018	current					30			

* One tow per rectangle was 30 min duration, the second was 15 min duration.

History of the survey gear

Before the IBTS was coordinated fully, many survey gears were used. In 1960, the Netherlands used a Dutch Herring Trawl. Germany started a survey in the North Sea in 1966 and used a Herring Trawl. In 1967, UK (England) and UK (Scotland) joined and used the Dutch Herring Trawl. By 1969, three differently rigged Dutch Herring Trawls and one Herring Trawl were being used in the North Sea to carry out the herring surveys. As the surveys moved away from concentrating on just herring, a shift happened from herring trawls to a more multipurpose gear. In 1976, six different survey gears were being used by eight different nations. Then, in 1978, one multipurpose gear began to be used by more nations and, by 1983, all nations participating in the quarter 1 IYFS were using the GOV 36/47 (chalut à Grande Ouverture Verticale), albeit with slightly different rigging configurations of the sweep lengths. Since then, the GOV has been the recommended standard gear of the IBTS and by 1992, the GOV was used in all quarters of the IBTS.

Historically, during the first quarter survey, the length of the sweeps depended on the bottom depth:

- Sweeps including back-strops and connectors of a total length of 60 m are used in water depths less than 70 m;
- Sweeps including back-strops and connectors of a total length of 110 m are used in deeper waters.

However, not all countries in Q1 are carrying out these changes (Table A2.3).

The different sweep lengths in Q1 were kept for reasons of consistency over the time-series. The effect of the different sweep lengths was, however, doubted and therefore not copied when the quarterly surveys started in 1991. In Q3, this change of sweep lengths was never applied. In Q3, sweeps including back-strops and connectors of a total length of 60 m are used throughout the survey area, except by Norway in 2011–2013.

Table A2.4 details further deviations from the standard trawl specification.

Table A2.3. Record of the historical change in sweep length during Q1 surveys (Yes = sweep lengths have been altered; No = sweep lengths were constant length).

Year	Denmark	England	France	Germany	Netherlands	Norway	Scotland	Sweden
1985	yes	yes	yes	yes	yes	yes	no	yes
1986	yes	yes	yes	yes	yes	yes	yes	yes
1987	yes	yes	yes	yes	yes	yes	yes	yes
1988	yes	yes	yes	yes	yes	yes	no	yes
1989	yes	yes	yes	yes	yes	yes	no	yes
1990	yes	yes	yes	yes	no	yes	no	yes
1991	yes	no	yes	yes	yes	yes	yes	yes
1992	yes	no	yes	yes	yes	yes	no	yes
1993	yes	no	no	yes	no	yes	no	yes
1994	yes	no	no	yes	no	yes	no	yes
1995	yes	no	no	yes	no	yes	no	yes
1996	yes	no	no	yes	no	yes	no	yes
1997	yes	no	no	yes	no	yes	no	yes
1998	yes	no	no	yes	no	yes	no	yes
1999	yes	no	no	yes	no	yes	no	yes
2000	yes	no	no	yes	no	yes	no	yes
2001	yes	no	no	yes	no	yes	no	yes
2002	yes	no	no	yes	no	yes	no	yes
2003	yes	no	no	yes	no	yes	no	yes
2004	yes	no	no	yes	no	yes	no	yes
2005	yes	no	no	yes	no	yes	no	yes
2006	yes	no	no	yes	no	yes	no	yes
2007	yes	no	no	yes	no	yes	no	yes
2008	yes	no	no	yes	no	yes	no	yes
2009	yes	no	no	yes	no	yes	no	yes
2010	yes	no	no	yes	no	yes	no	yes
2011	yes	no	no	yes	no	yes	no	no
2012	yes	no	no	yes	no	yes	no	yes
2013	yes	no	no	no	no	yes	yes	yes
2014	yes	no	no	no	no	yes	no	yes
2015	no	no	no	no	no	yes	no	yes
2016	no	no	no	no	no	yes	no	yes
2017	no	no	no	no	no	yes	no	yes
2018	no	no	no	no	no	yes	no	yes

Table A2.4. Deviations from the standard trawl specification for each country from 2015.

Nation	Twine type	Twine diameter	Cutting rates	Guard mesh or tearing strips	Quarter mesh	Mesh & netting panel sizes
DEN	PA	Thicker	Wing tips & top wing 2nd section	Lower wing tip & FL in 4mm DBL	No	Last panel & 120mm EXT
ENG	PA	Thicker	Standard	No top guard & belly 10 meshes in 5mm SGL PA	Standard	Extra 100.5 meshes in EXT length
FRA	PA	Thicker	Standard	Belly 10 meshes in 5mm SGL PA	No	Standard
GER	PA	Thicker	Standard	Standard	Standard	Standard
NED	PA	Thicker	Standard	Belly 10 meshes in 5mm SGL PA	Standard	Standard
NOR	PA	Thicker	Diff top/lower wing tips	Wing tip, HL & FL guard	No	Standard
SCO	PE & PA	Thicker	Standard	Belly 10 meshes in 5mm SGL PE	Standard	Standard
SWE	PE	Thicker	Standard	HL & FL guard in 5mm DBL PE	No	Wing Ext & last panel slightly more meshes

Survey design

The stratification of the survey grid has always been based on ICES statistical rectangles of roughly 30 x 30 nautical miles (one degree longitude x 0.5 degree latitude). Each rectangle is usually sampledwith two hauls by two different countries, if possible. The Skagerrak and Kattegat is sampled by Sweden, who samples more than once in every rectangle, while west of Shetland is surveyed only by Scotland because it has a higher proportion of untrawlable area and requires specialized groundgear.

The design of the quarter 1 survey has gradually changed over the years. In 1974, the survey was still very much a herring survey (ICES, 1974). In that year, the IYHS WG decided to use three strata, which depended on the amount of herring caught in previous years and was, in total, 214 hauls. After some years, this design was dropped and for several years, four hauls per rectangle were made in the southeastern North Sea (between 50°30′ and 57°N, and 4°W and 8°E), the most important area for juvenile herring, while the remaining survey area was sampled with two hauls per rectangle. In the beginning of 1991, part of the research vessel effort from quarter 1 was shifted to the other quarters and, from that year, the target was to have at least two hauls per rectangle over the whole survey area.

The allocation of stations to IBTS participants has changed slightly over the years. The last major reallocations occurred in 1991 and 2017, but since then, the survey has attempted to keep at least one vessel in every subarea in which it had fished in the most recent years. This stipulation was relaxed for the Q1 survey in 2016 because of new constraints, e.g. the reduction of available survey time for some vessels. The current quarter 1 allocation of the different nations is shown in Figure A1.1, while the quarter 3 surveys are in Figures A1.2. For a more detailed history of stations sampled by country, data can be downloaded from the ICES Data Centre DATRAS database and plotted by country and year.

For the quarter 2 and 4 surveys, three different grids were introduced (ICES, 1990): the 'coarse' grid, based on the English Groundfish Surveys, which covers half of the rectangles in the North Sea; the ‘complementary coarse grid’, which covers the half not completed by England; and a grid that consists of all the neighbouring rectangles in a certain area, as used, for example, in the Scottish Groundfish Surveys. The idea was

that at least four vessels should participate in every quarter: one vessel should fish the coarse grid, one the complementary coarse grid, one all the rectangles in the southern half of the North Sea, and one in the Northern half. In this way, all rectangles would be fished twice by two different vessels. Only the quarter 3 surveys have had this coverage since 1997.

Initially, one-hour trawl tows were made, but in 1976, some participants changed to 30-minute tows. This change was, in part, due to the gadoid outburst, which contributed to increased catches, to allow nations the opportunity to carry out more hauls in a day and to reduce gear damage. Following this cut in towing time, a recommendation was made at the IYHS- and Gadoid I-Group working groups in 1977; all countries (with the exception of Scotland) reduced the standard haul duration in 1978 to 30 minutes. Scotland continued to carry out one-hour hauls until 1998, when they changed to a new vessel and standardized tows to 30 minutes.

In 2015 and 2016, a tow duration experiment was conducted during the Q3 survey, where one tow was kept at 30-min duration and the other was reduced to 15 minutes; the Skagerrak and Kattegat were not included in the experiment. Countries conducted additional tows where time permitted. The background for the experiment is detailed in the IBTSWG Report 2015, and the results in the IBTSWG Reports 2016 and 2017 (ICES 2015a, 2016, 2017a).

Fishing is usually limited to daylight hours, i.e. from 15 min before sunrise to 15 min after sunset, but countries that initially did not participate in the sampling of herring larvae in the 1st quarter fished at night until 1999. Nations initially sampled roundfish and herring otoliths according to the statistical rectangle allocation in Figures A2.1 and A2.2.

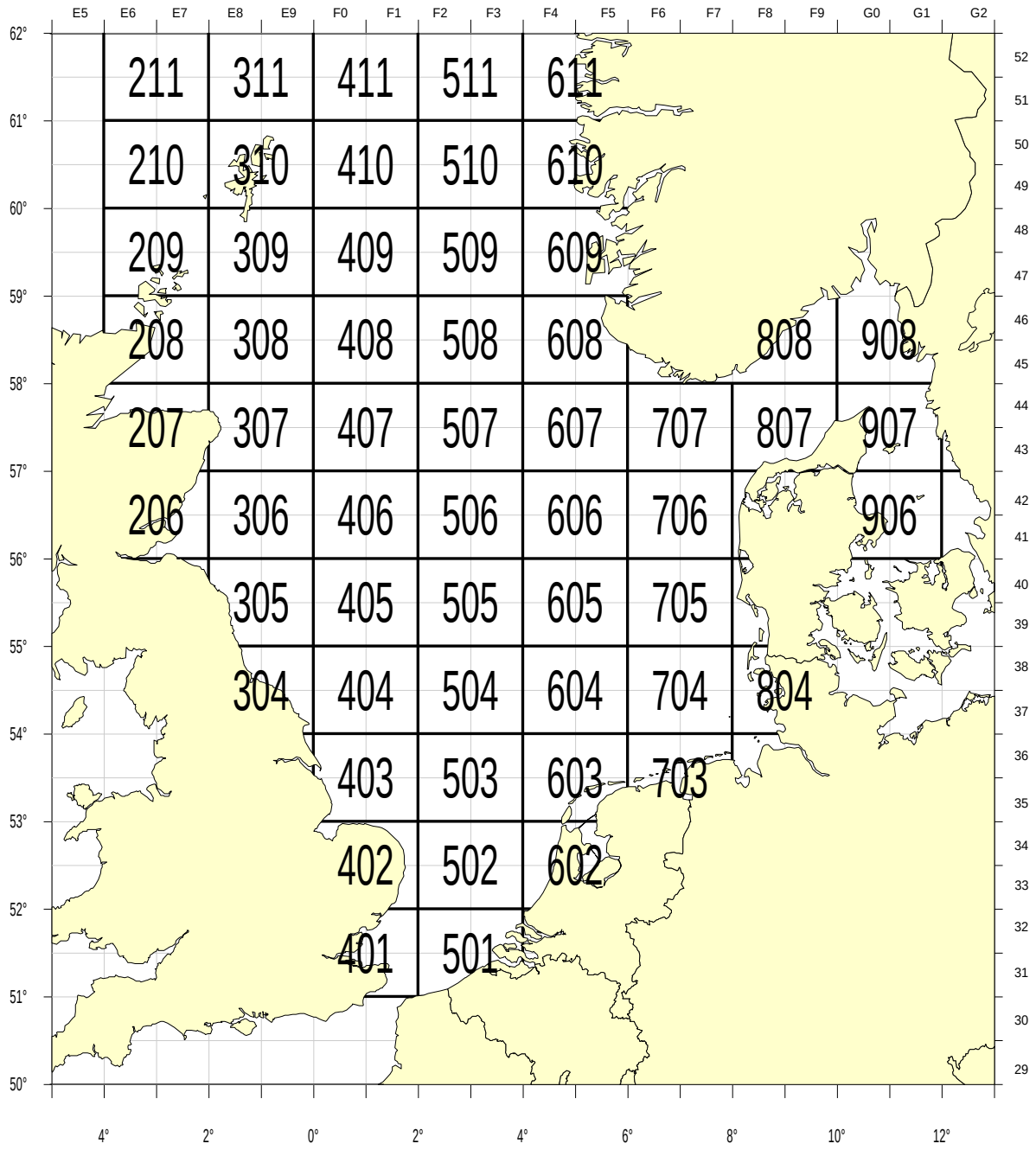


Figure A2.1. Otolith sampling areas for herring from the beginning of the survey until 1982 and, for roundfish, until 1979.

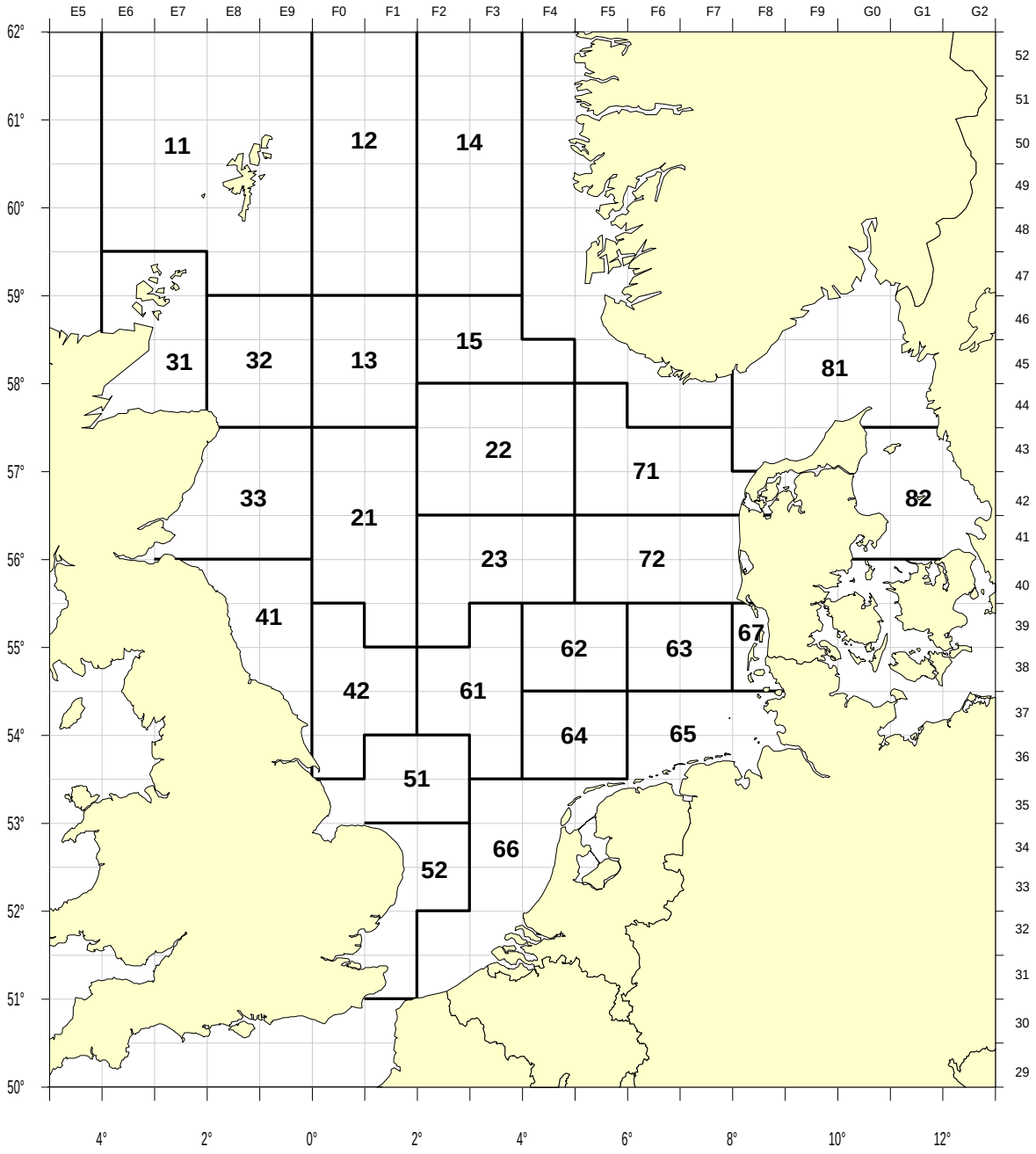


Figure A2.2. Herring Sampling Areas used for the period 1983–1990.

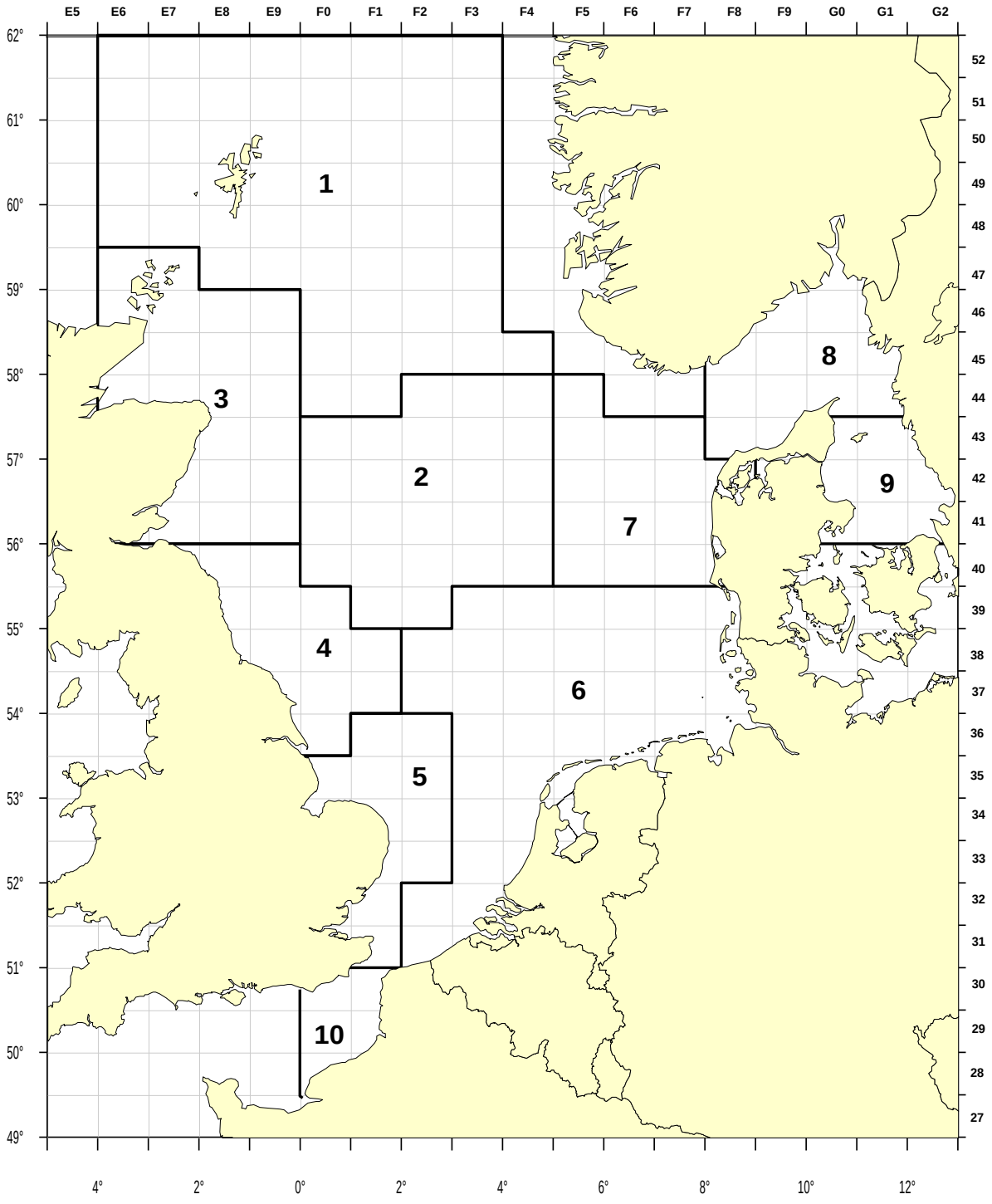


Figure A2.3. Standard Roundfish Areas used for roundfish since 1980, for all standard species since 1991. Additional RFA 10 was added in 2009; rectangles 52E9, 52F0, and 52F1 were only routinely sampled from 2015 quarter 3. IBTSWG asked in 2015 the ICES Data Centre to include rectangle 44F6 in all DATRAS products extending RFA 7, but this update has not been implemented yet. The current application of the roundfish areas is described in the document: NS-IBTS indices calculation procedure (2013), available at: http://www.ices.dk/marine-data/Documents/DATRAS/Indices_Calculation_Steps_IBTS.pdf.

History of the survey manual

The International Bottom Trawl Survey Working Group, formerly known as the International Young Fish Survey Working Group, has the responsibility of coordinating various research vessel surveys conducted within certain ICES areas. The first survey to be coordinated was the International Young Fish Survey (IYFS), which was conducted in the North Sea and Skagerrak/Kattegat in February of each year, starting in the late 1960s. A procedural manual was produced for the use of scientists involved in this survey (ICES, 1981a). In 1991, this cooperative programme was expanded to include the three other quarter surveys in the North Sea and Skagerrak/Kattegat. This necessitated major alterations to the manual (ICES, 1992). Table A2.5 shows the history of the North Sea manual, revised as international cooperation developed.

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

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

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

A separate manual for the western and southern waters was originally produced for the IBTS meeting in Dublin in 2002 (ICES, 2002), was updated in 2010, and is now separately available. Also during 2002, other major revisions were required to the North Sea manual (the seventh revision) and these were completed in 2004.

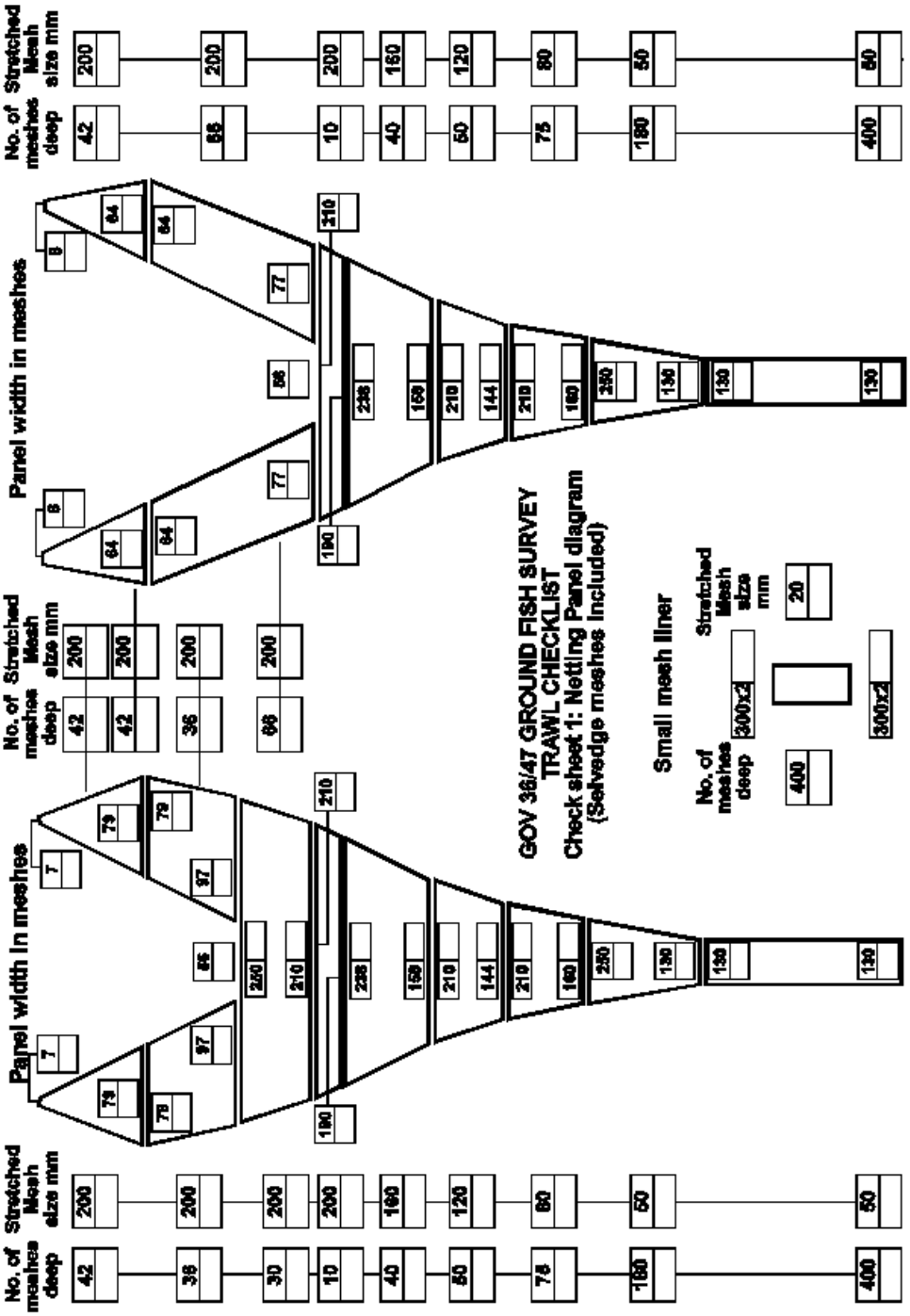
In 2012, the procedure for deploying the MIK net was removed from the IBTS manual and a new MIK-dedicated manual was produced. This is available from the ICES website (SISP 2).

An external review of the manual in 2012 led to revision VII, which clarified survey guidelines, preserved the survey history, and provided more detail on national gear specifics and protocols prior to, during, and following a survey. In 2019, an erroreous update to Version 10 was published, having exactly the same text as the 2015 Version IX.

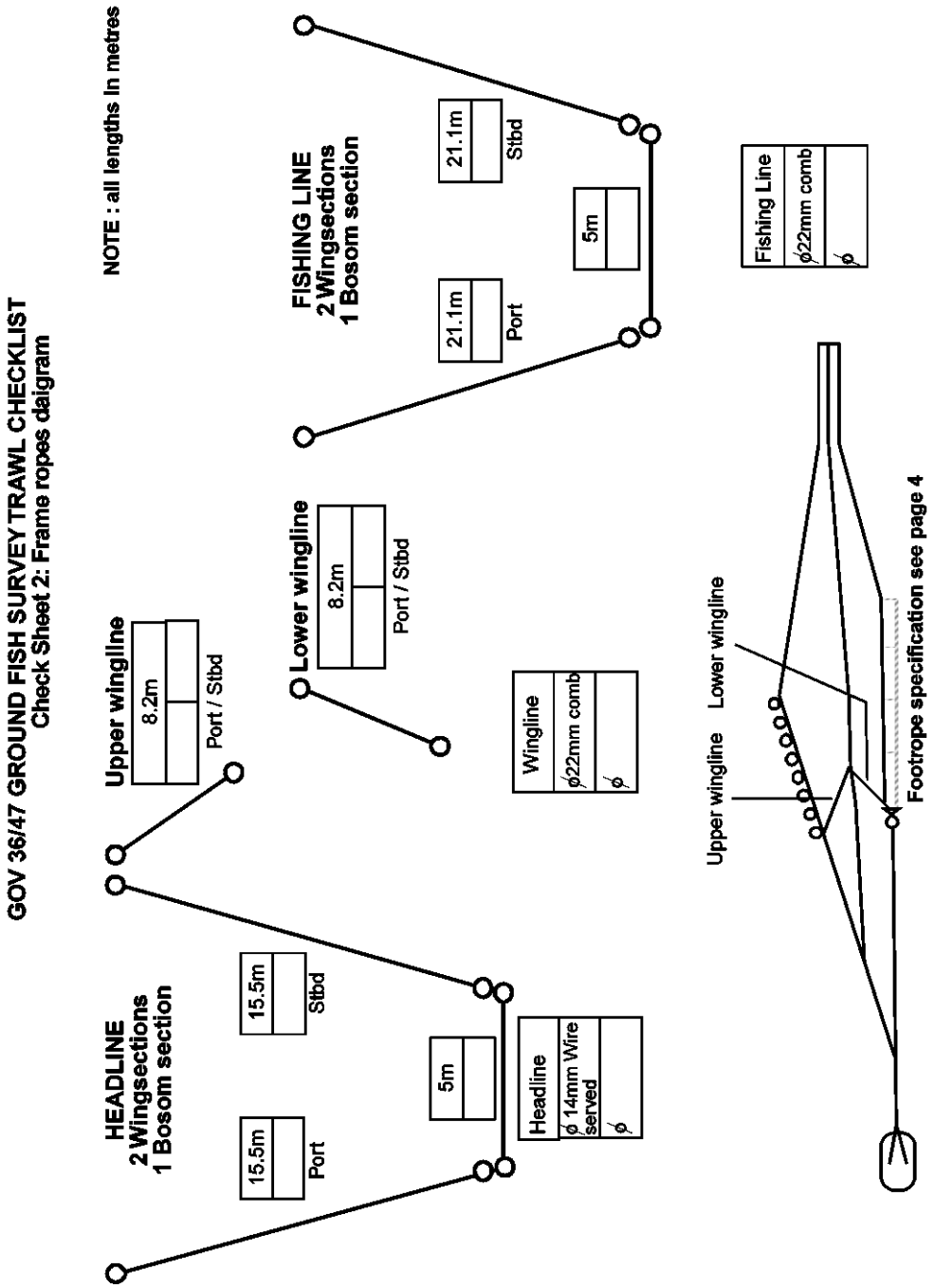
Table A2.5. History of the North Sea Survey Manuals revisions.

YEAR OF PUBLICATION	VERSION	SURVEY NAME	REFERENCE
1978	I	North Sea Young Fish Surveys	Manual for the ICES North Sea Young Fish Surveys, 1. edition. A. Corten (Ref. #/ citation unknown)
1981	II	International Young Fish Survey (IYFS)	Manual for the International Young Fish Surveys in the North Sea, Skagerrak and Kattegat. ICES CM 1981/H:9
1986	III	IYFS	Manual of the International Young Fish Survey in the North Sea, Skagerrak and Kattegat, 3rd revision. ICES CM 1986/H:2
1992	IV	IBTS	Manual for the International Bottom Trawl Surveys. Revision IV, Addendum to ICES CM 1992/H: 3
1996	V	IBTS	Manual for the International Bottom Trawl Surveys. Revision V, Addendum to ICES CM 1996/H:1
1999	VI	IBTS	Manual for the International Bottom Trawl Surveys. Revision VI, ICES CM 1999/D:2
2004	VII	IBTS	Manual for the International Bottom Trawl Surveys. Revision VII, ICES CM 2006/RMC:03
2012	VIII	IBTS	ICES. 2012c. Manual for the International Bottom Trawl Surveys. Series of ICES Survey Protocols. SISP 1-IBTS VIII. 68 pp. ICES. 2012d. Manual for the Midwater Ring Net sampling during IBTS Q1. Revision 1. 16 p.
2013		MIK	ICES. 2013b. Manual for the Midwater Ring Net sampling during IBTS Q1. Series of ICES Survey Protocols. SISP 2-MIK 2. 18 pp.
2015	IX	IBTS	ICES. 2015c. Manual for the International Bottom Trawl Surveys. Series of ICES Survey Protocols. SISP 10-IBTS IX. 86 pp
2019	10	IBTS	ICES. 2019. Manual for the International Bottom Trawl Surveys. Series of ICES Survey Protocols. SISP 10, Version 10. 86 pp.

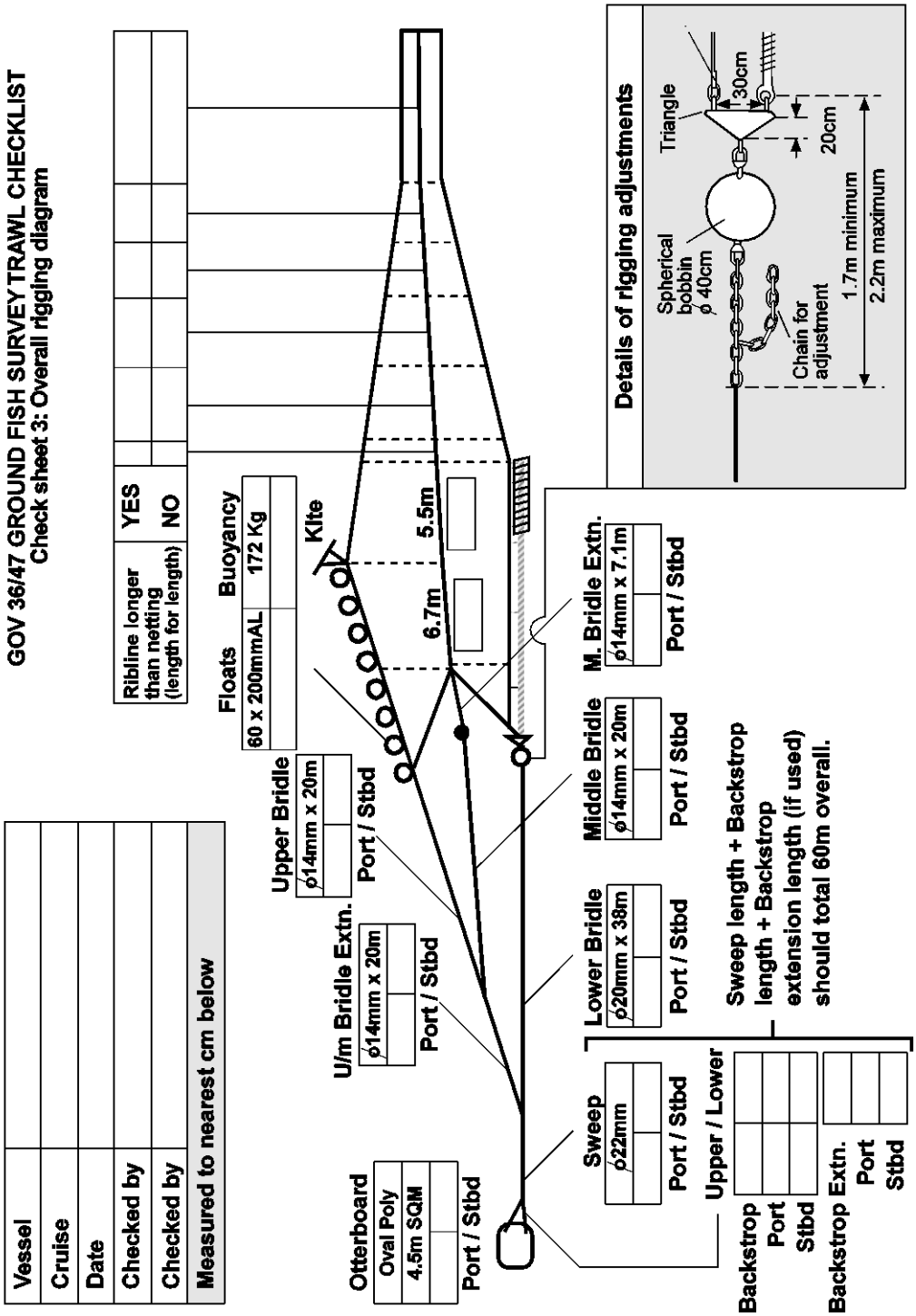
Annex 3: IBTS standard gear check sheet 1



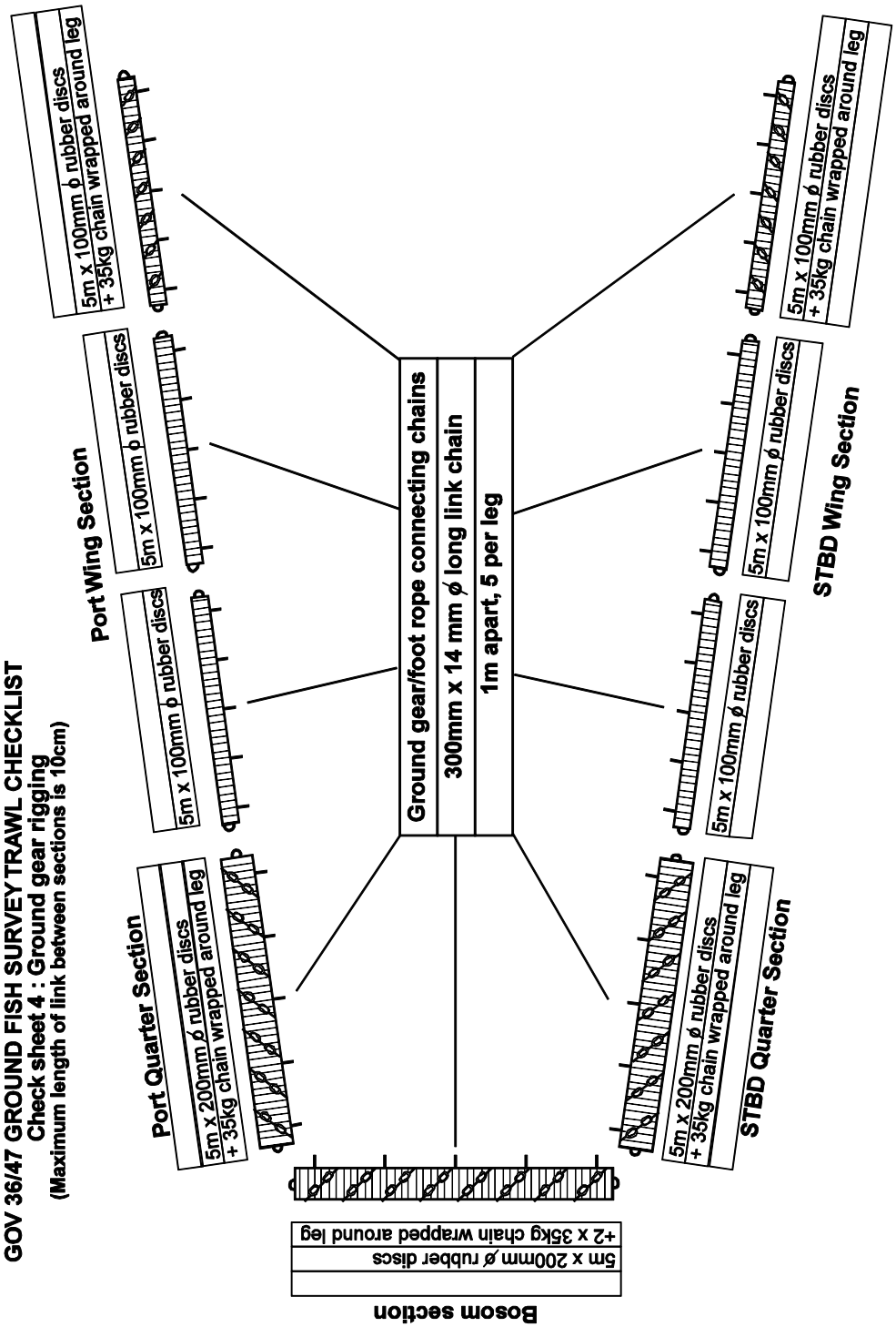
Annex 4: IBTS standard gear check sheet 2



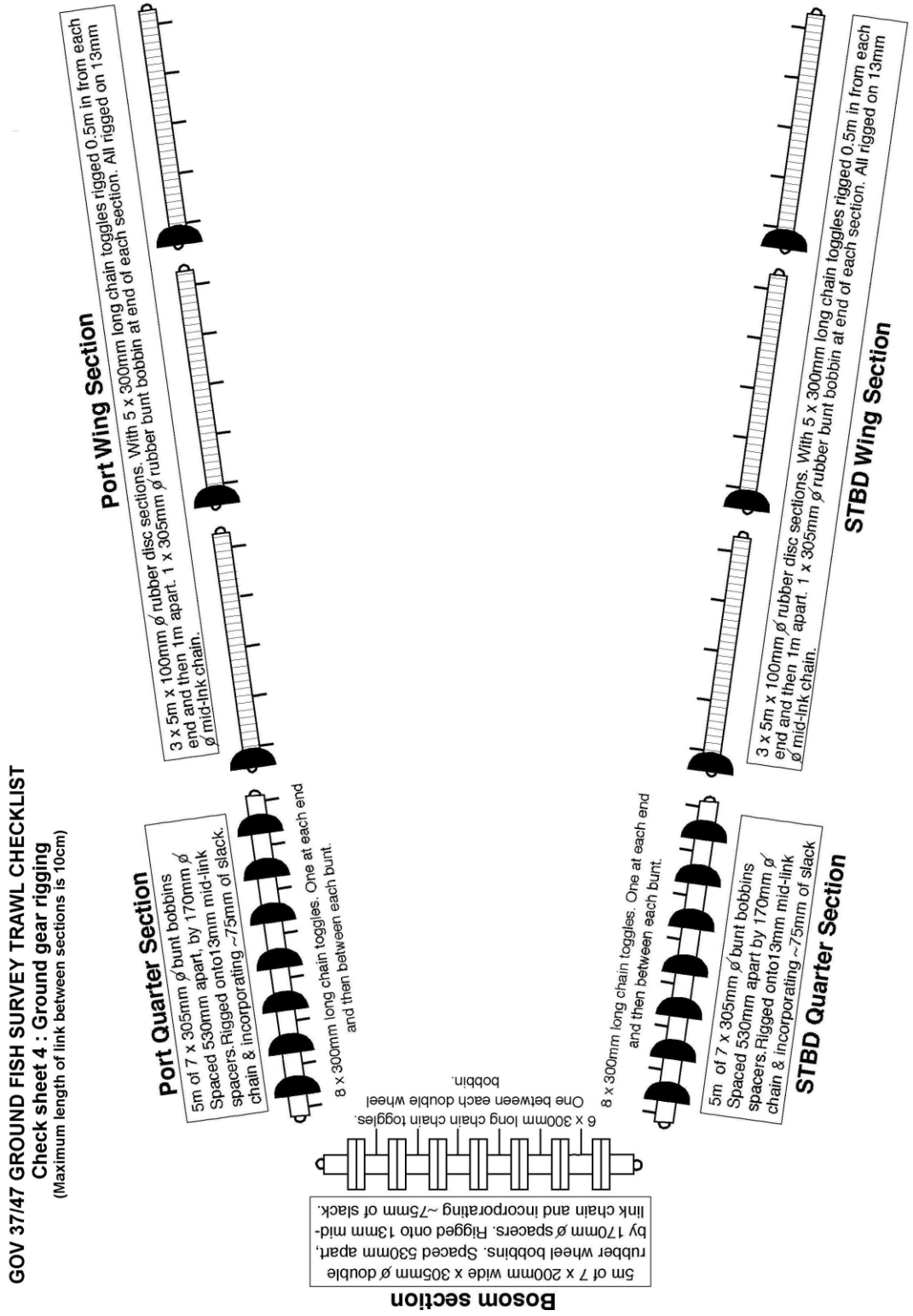
Annex 5: IBTS standard gear check sheet 3



Annex 6a: IBTS standard gear check sheet 4 – Groundgear A



Annex 6b: IBTS standard gear check sheet 4 – Groundgear B



Annex 7: Net plans and gear components

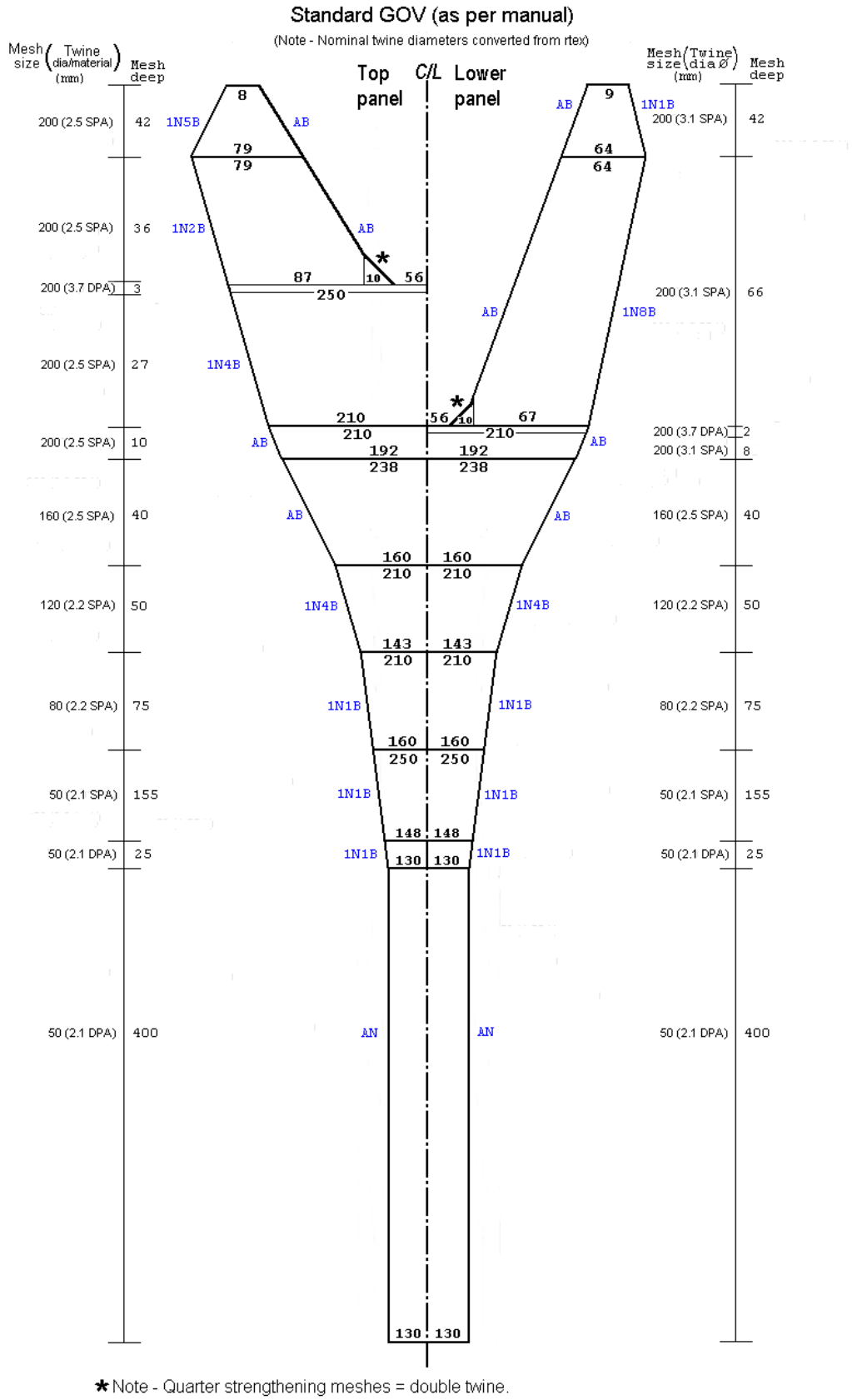


Figure A7.1. GOV net plan as per Manual for the International Bottom-Trawl Surveys.

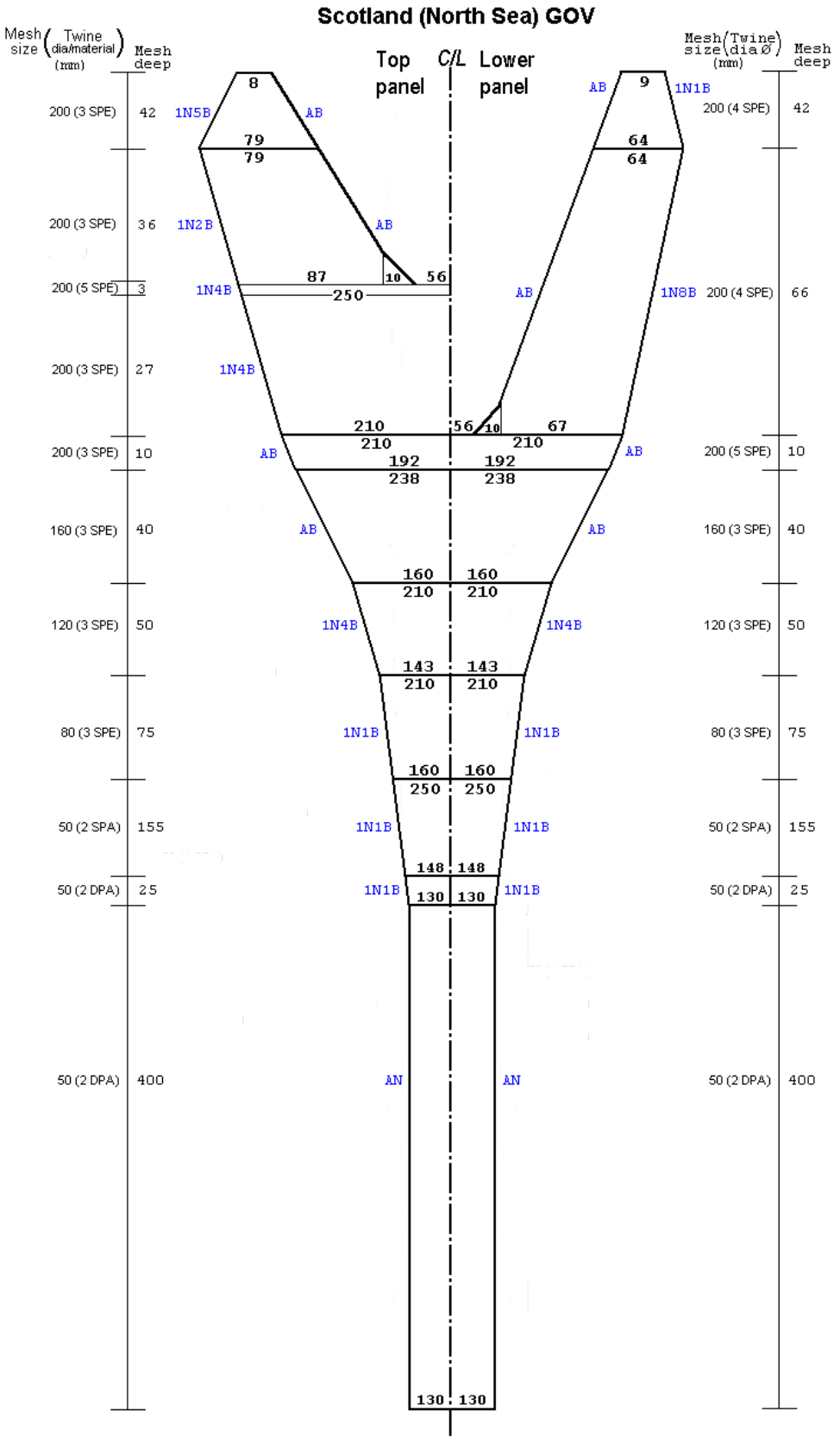


Figure A7.2. UK Scotland (SCO) North Sea GOV net plan.

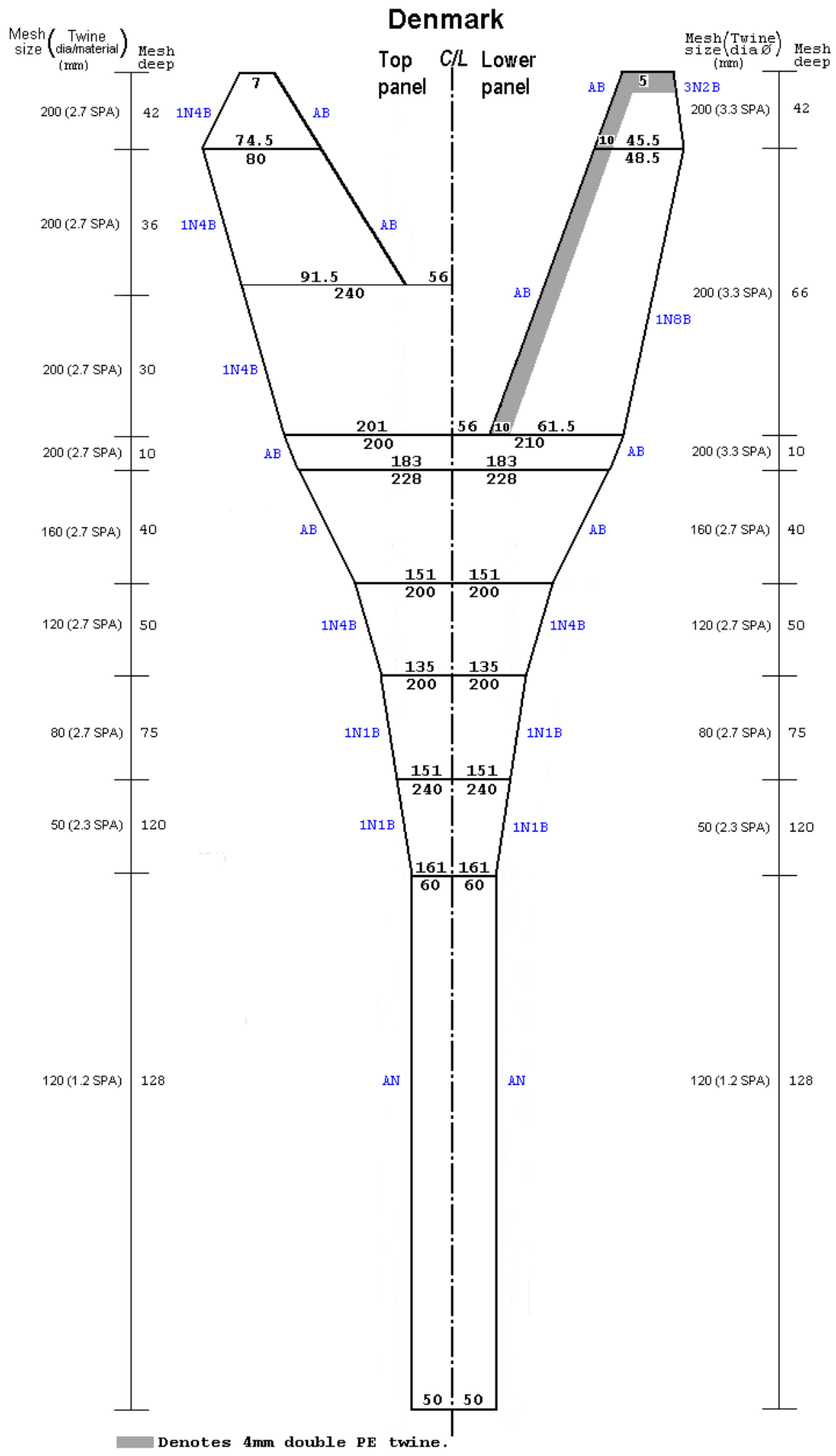
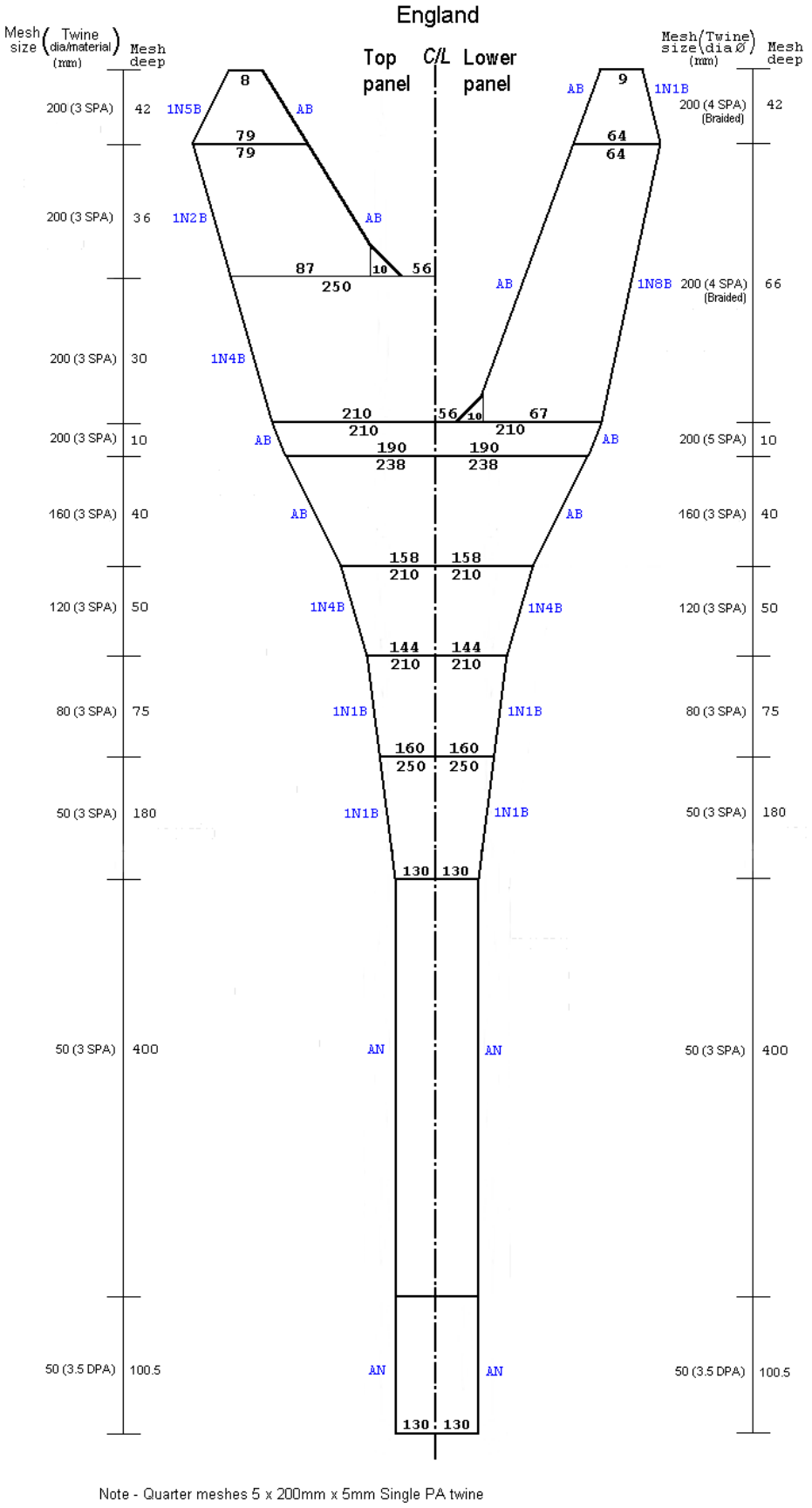


Figure A7.3. Denmark (DEN) GOV net plan.



Note - Quarter meshes 5 x 200mm x 5mm Single PA twine

Figure A7.4. UK England (ENG) GOV net plan.

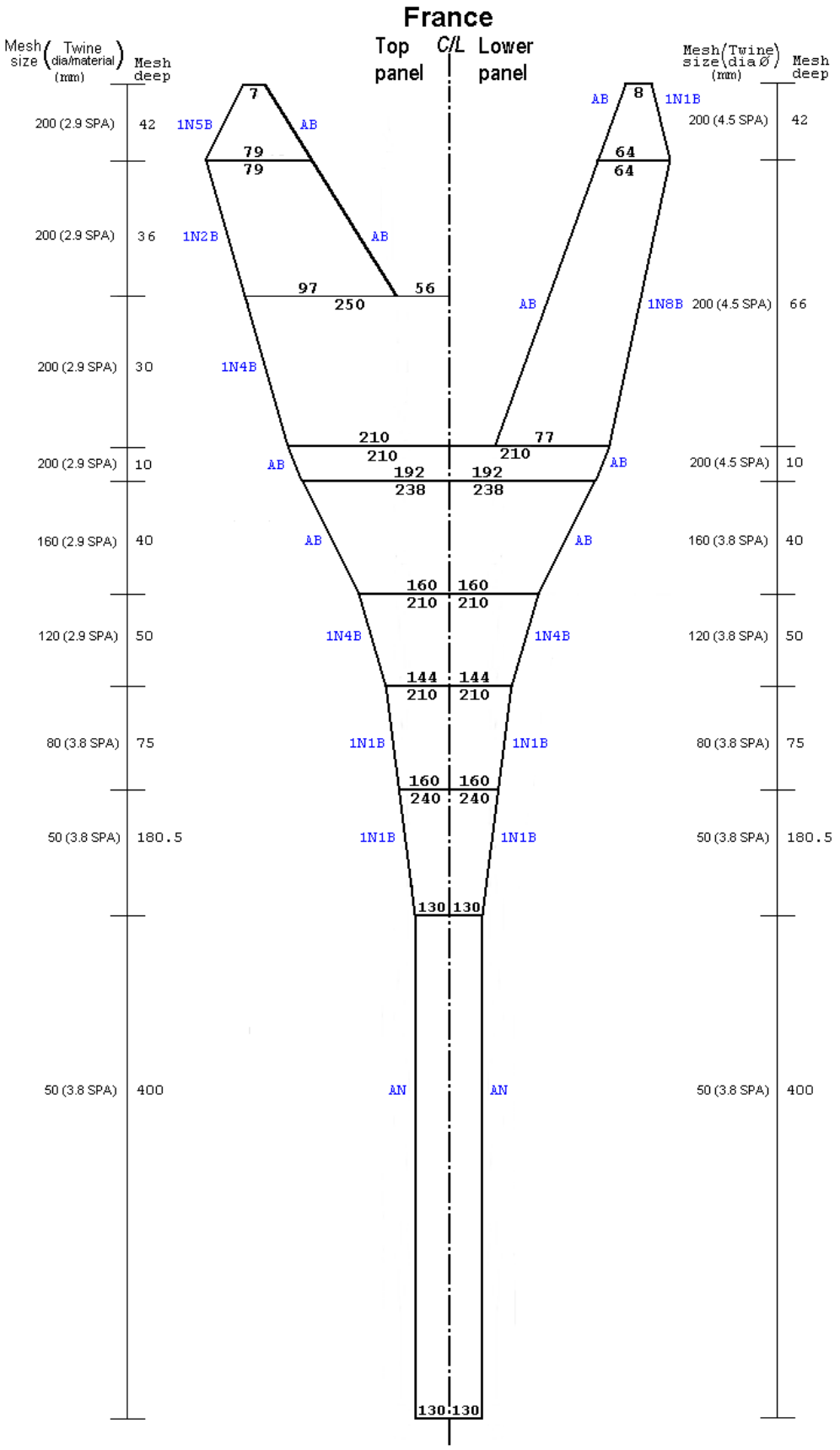
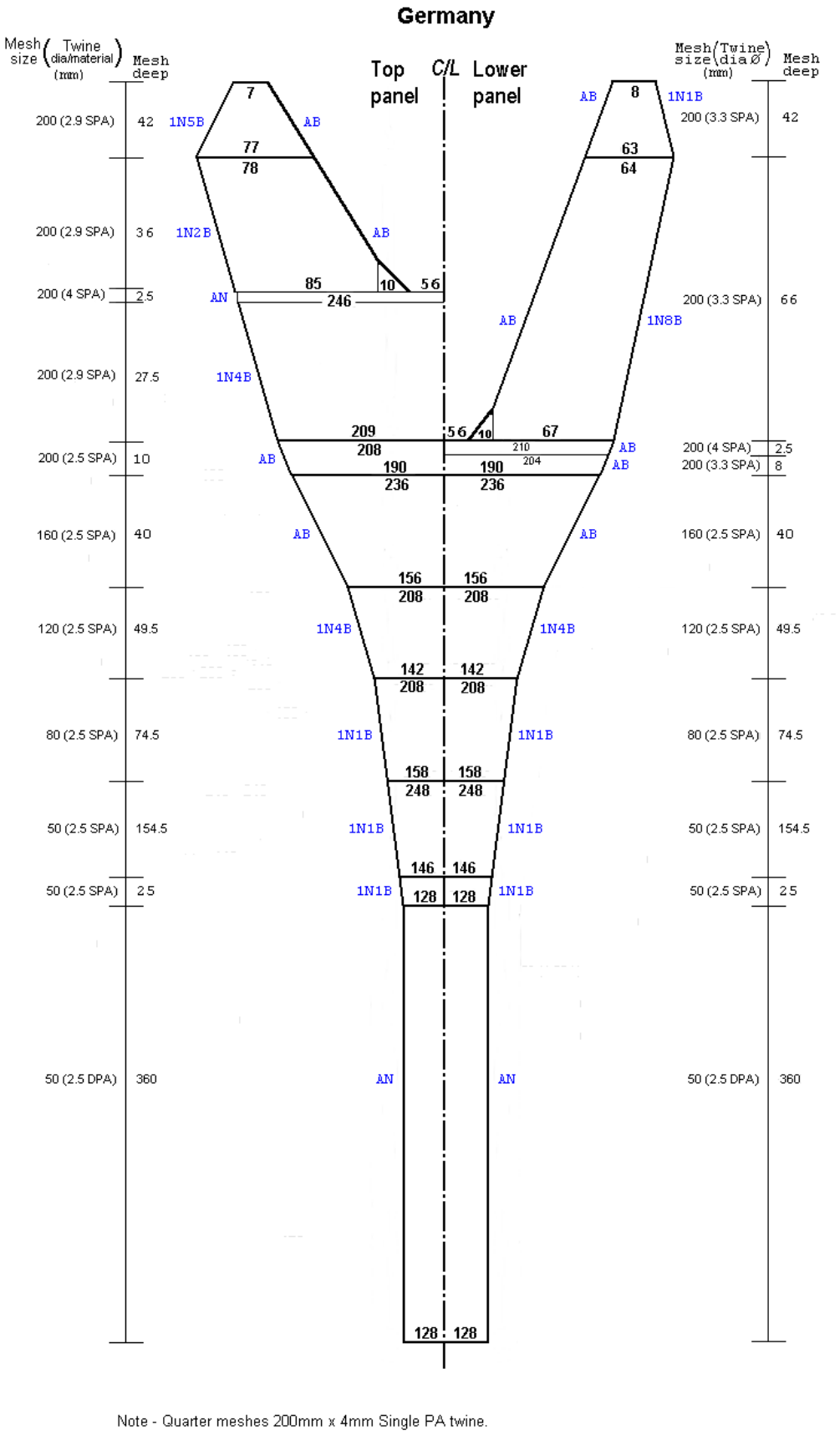
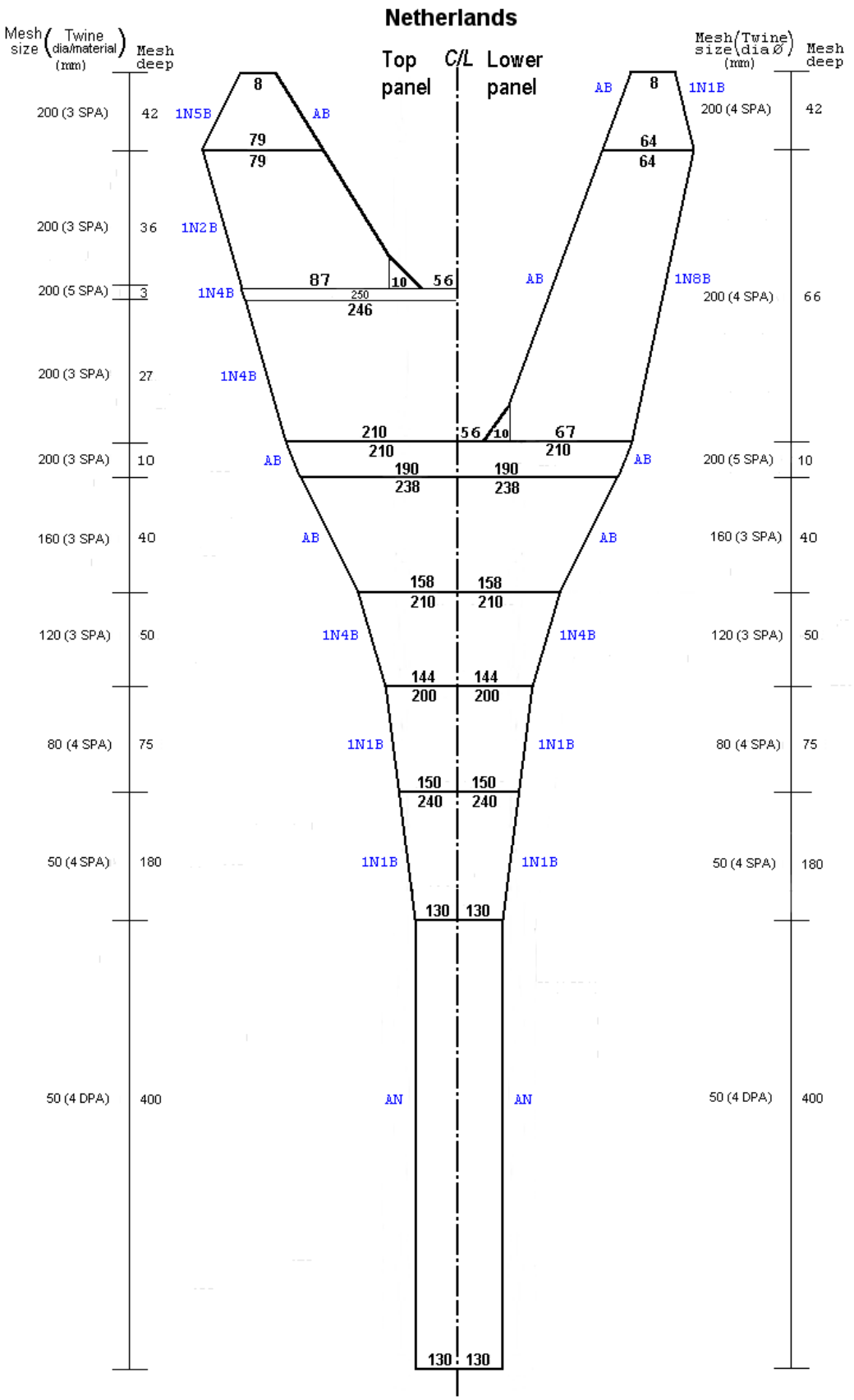


Figure A7.5. France (FRA) GOV net plan.



Note - Quarter meshes 200mm x 4mm Single PA twine.

Figure A7.6. Germany (GER) GOV net plan.



Note - Quarter meshes 200mm x 5mm Single PA twine.

Figure A7.7. Netherlands (NED) GOV net plan.

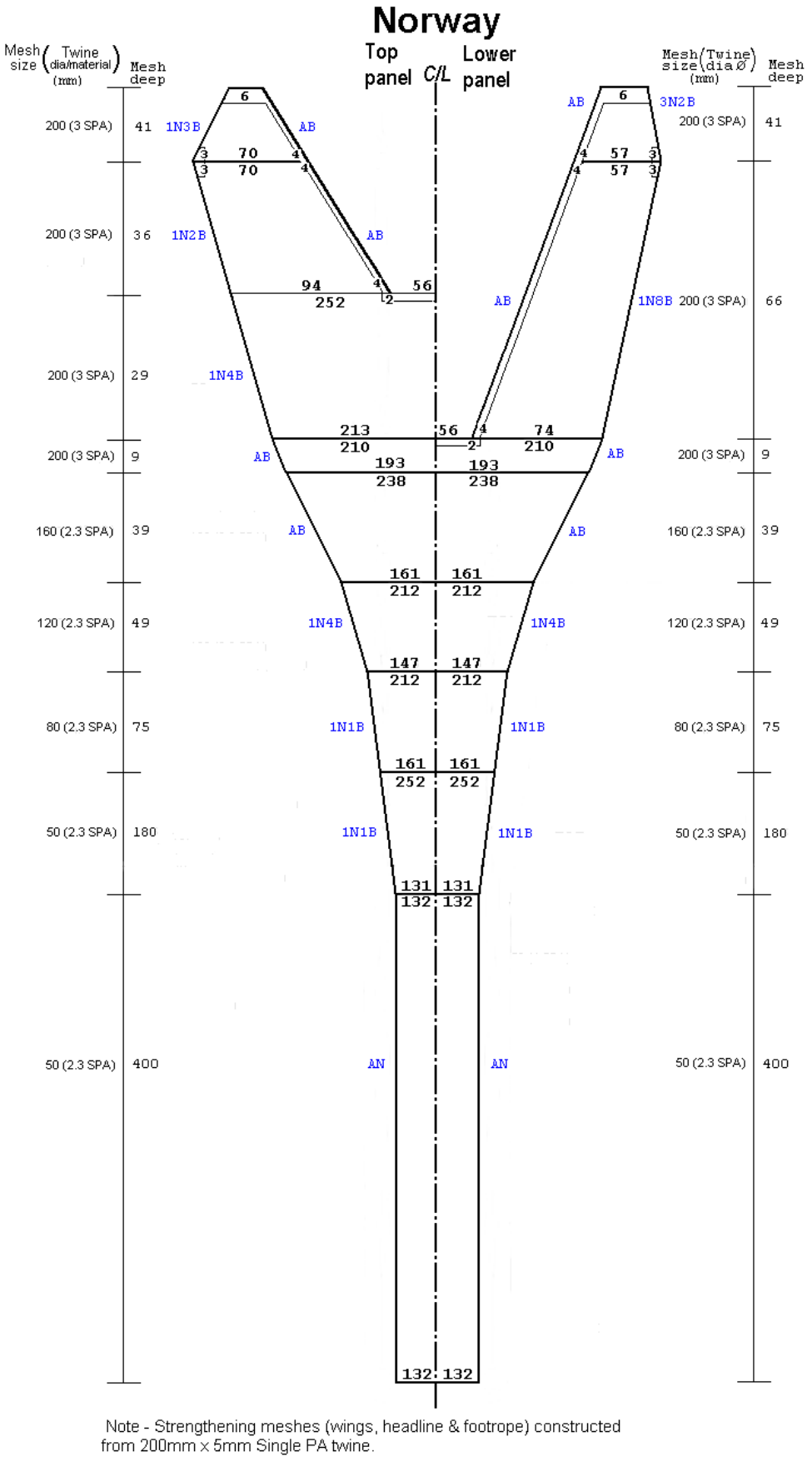


Figure A7.8. Norway (NOR) GOV net plan.

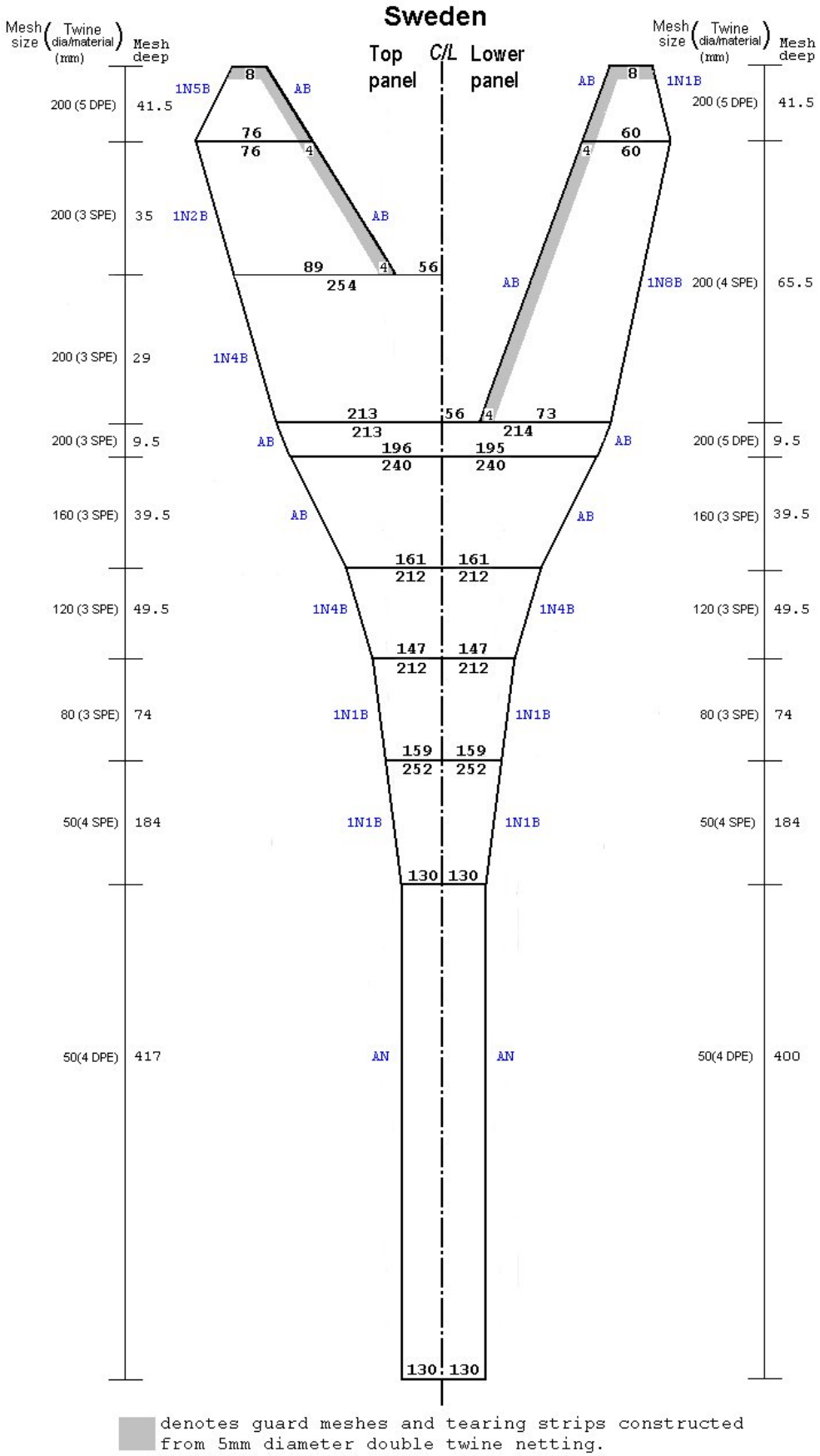


Figure A7.9. Sweden (SWE) GOV net plan.

Table A7.1. Codend liner and twine area calculations (Column 1 is standard rigging as per Manual for the International Bottom-Trawl Surveys).

CODEND LINER AND TWINE AREA CALCULATIONS	STANDARD	UK (SCOTLAND)	UK (ENGLAND)	FRANCE	GERMANY	NORWAY	SWEDEN	DENMARK	NETHERLANDS
Codend liner									
Number of meshes in circumference	600	600	600	600	410	600	600	600	600
Length – Number of meshes	400	400	404	400	400	399.5	410	600	400
Nominal twine diameter (mm)	1.03	1.8	1.02	4	2.5	1.6	N/R	1.2	1.8
Trawl twine area calculations									
Main trawl body - Top & lower tapered panels combined (m^2)	86	102	107	121	91	87	119	87	118
Straight section - 2 panels (m^2)	22	42	18	40	46	24	87	4	83
Codend liner – 2 panels (m^2)	10	18	10	19	16	15	18	17	17

Table A7.2. Trawl roping and framelines (Column 1 is standard rigging as per Manual for the International Bottom-Trawl Surveys).

Trawl roping and framelines	Standard	UK (Scotland)	UK (England)	France	Germany	Norway	Sweden	Denmark	Netherlands
Middle bridle extension									
Length (m)	7.1	7.1	7.08	7.1	6.5	7.1	8.38	7.1	7.1
Diameter (mm)	14	14	20	16	14	14	20	22	14
Material	Wire	Wire	Combi	Combi	Wire	Wire	Combi	Combi	Wire
Middle bridle adjuster chain									
used (Y/N) and Min (m) / Max (m)	No info	N	N	Y (N/R)	Y (0.6 to 1.0)	N	N	Y (N/R)	N
Bolt rope 1st section									
Length (m)	6.7	6.7	6.7	6.7	6.7	6.7	7.04	6.7	6.7
Diameter (mm)	20	22	20	18	20	20	16	20	22
Material	Combi	Combi	Combi	Combi	Combi	Combi	Combi	Combi	Combi
Bolt rope 2nd section									
Length (m)	5.55	5.55	5.5	5.5	5.55	5.55	9.28	5.5	5.55
Diameter (mm)	20	22	20	18	20	20	16	20	22
Material	Combi	Combi	Combi	Combi	Combi	Combi	Combi	Combi	Combi
Selvedge rope									
Length (m)	*L for L	49.4	N/R	48.6	47.7	N/R	28.65	N/R	20.4
Diameter (mm)	22	20		20	24	20	20		20
Material	Nylon	Polysteel & nylon		Nylon	Combi+ nylon	Nylon	Polyprop		Polyprop

Trawl roping and framelines	Standard	UK (Scotland)	UK (England)	France	Germany	Norway	Sweden	Denmark	Netherlands
Headline									
Length (m)	36	36	36.1	36	36.2	36	37.67	39.4	36
Diameter (mm)	14	22	18	14	14	14	22	22	14
Material	Wire wrapped	Combi	Wire	Wire	Wire wrapped	Wire wrapped	Combi	Combi	Wire
Footrope									
Length (m)	47.2	47.2	47.2	45.8	47.4	47.2	48.9	52.8	47
Diameter (mm)	22	22	20	22	24	22	24	13	22
Material	Combi	Combi	Combi	Combi	Combi	Combi	Combi	Chain	Combi
Upper wing-line									
Length (m)	8.2	8.2	7.7	8.2	8.2	8.2	8.05	8.2	8.2
Diameter (mm)	20	22	18	18	22	22	24	20	22
Material	Combi	Combi	Combi	Combi	Combi	Combi	Combi	Combi	Combi
Lower wing-line									
Length (m)	8.2	8.2	7.75	8.2	8.2	8.2	8.07	8.2	8.2
Diameter (mm)	20	22	18	18	22	22	24	20	22
Material	Combi	Combi	Combi	Combi	Combi	Combi	Combi	Combi	Combi

* Note: L for L = Bolt rope rigged length for length along the selvedge.

Table A7.3. Flotation and kite (Column 1 is standard rigging as per Manual for the International Bottom-Trawl Surveys).

FLOTATION AND KITE.	STANDARD	UK (SCOTLAND)	UK (ENGLAND)	FRANCE	GERMANY	NORWAY	SWEDEN	DENMARK	NETHERLANDS
Flotation total number (and diameter in mm)	60 (200)	60 (200)	60 (200)	60 (200)	70 (200)	60 (200)	22 (270)	89 (150)	60 (200)
Total buoyancy (in kg)	172	148.2	174	180	178.5	153.6	187	150	171.6
Is kite used (Y/N)	Y	Y	Y	Y - NS only	Y	Y	Y	Y	Y
If Y - dimension (L x W; in m) and material (+ attached to headline)	0.85 x 0.85 Aluminium (frame)	0.85 x 0.85 Aluminium (frame)	0.6 x 0.6 Aluminium (frame)	0.85 x 0.85 Aluminium (frame)	0.85 x 0.85 Aluminium (no frame)	0.85 x 0.85 Aluminium (frame)	0.85 x 0.85 Aluminium (ropes only)	0.85 x 0.85 Aluminium (ropes only)	1.0 x 1.0 Ply Wood (ropes only)
Integrated kite flotation Total number and (diameter in mm)	5 (200)	5 (200)	5 (200)	5 (200)	5 (200) + 1 x 15ltr fender	5 (200)	5 (180)	5 (180)	1 x 15 ltr fender

Flotation and kite.	Standard	UK (Scotland)	UK (England)	France	Germany	Norway	Sweden	Denmark	Netherlands
If N									
Number (and diameter in mm) added to compensate for kite	N/A	N/A	N/A	12 (200)	N/A	N/A	N/A	N/A	N/A

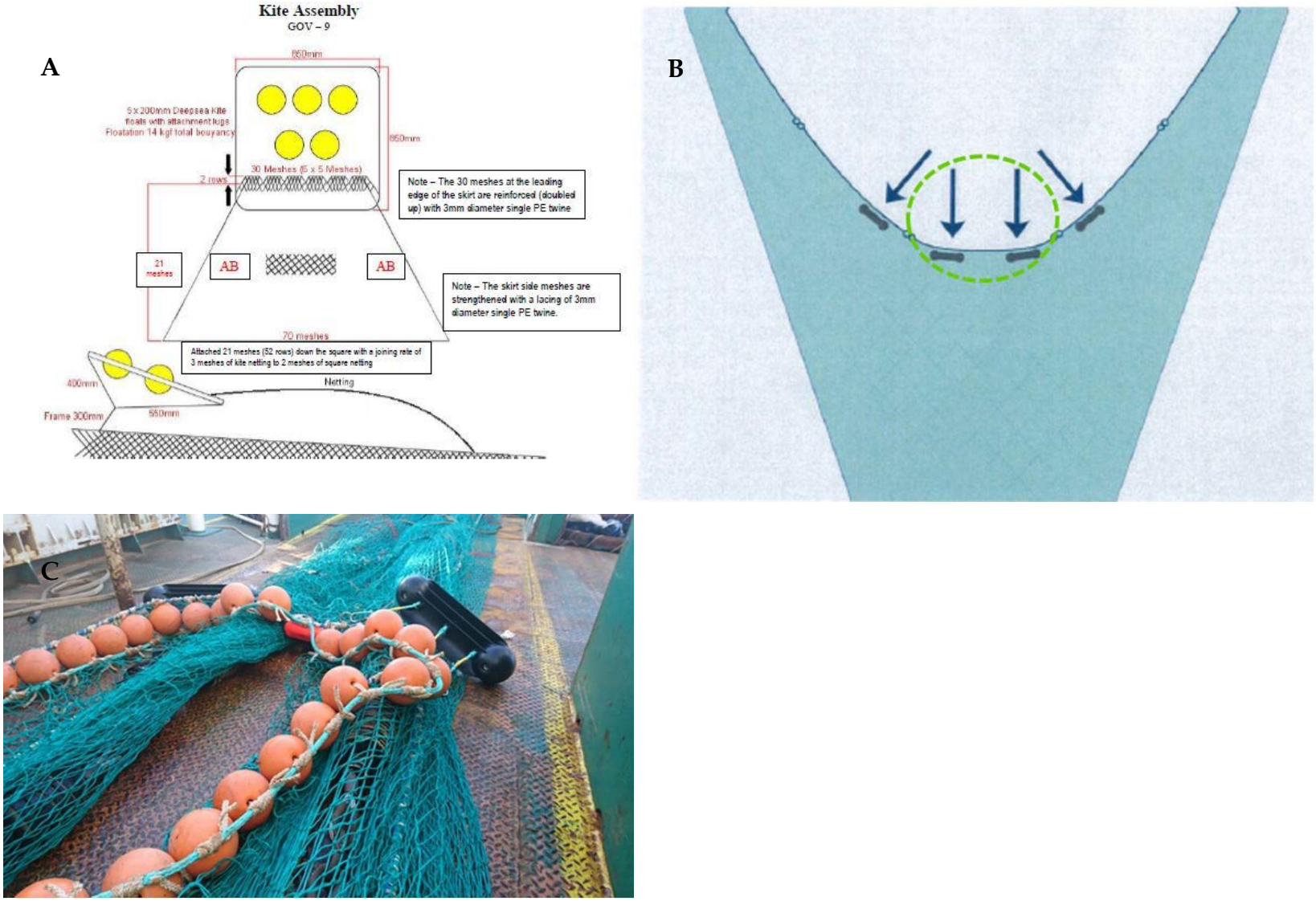


Figure A7.10. Schematic and images of: A) GOV kite rigging; B) and C) Vonin flyer rigging.

Table A7.4. Otterboard specification (Column 1 is standard rigging as per Manual for the International Bottom-Trawl Surveys).

Otterboard specification	Standard	UK (Scotland)	UK (England)	France	Germany	Norway	Sweden	Denmark	Netherlands
Otterboards									P
Type	Polyvalent	Polyvalent	Polyvalent	Polyvalent	Polyvalent	Polyvalent	Vee Doors	Polyvalent	olyvalent
Otterboards									
Surface area (m^2)	4.5	4.46	6.2	4.46	4.5	4.46	5.57	4.5	4.5
Otterboards									
Weight in air (kg)	No info	1100	1500	1280	1500	1075	1080	N/R	1100

Table A7.5. Ground gear and adjuster chain assembly (Column 1 is standard rigging as per Manual for the International Bottom-Trawl Surveys).

Ground gear and adjuster chain assembly	Standard	UK (Scotland)	UK (England)	France	Germany	Norway	Sweden	Denmark	Netherlands
Ground Gear A Total length (m) Total weight in air (kg)	45 to 45.8 705	45 949	45 1025	46 N/R	45.55 N/R	47 705	48.55 N/R	52.6 N/R	45.8 705
Bosom section Length (m), (diameter mm) and material.	5 (200) Disc	5 (200) Disc	5 (200) Disc	5 (200) Disc	5.05 (200) Disc	5 (200) Disc	5.05 (200) Disc	5 (200) Disc	5 (200) Disc
Quarter sections Length (m), (diameter mm) and material.	10 (200) Disc	10 (200) Disc	10(200) Disc	10(200) Disc	10.1 (200) Disc	10 (200) Disc	10.1 (200) Disc	10.2 (200) Disc	10.2 (200) Disc
Wing sections Length (m), (diameter mm) and material	30 (100) Disc	30 (100) Disc	30(100) Disc	30(100) Disc	30.4 (200) Disc	30 (200) Disc	33.4 (100) Disc	37.4 (100) Disc	30.6 (200) Disc
Mounted onto Diameter (mm) and material.	18 Wire	13 L/L Chain	22 Wire	14 L/L Chain	18 Wire	20mm Wire & 16mm M/L chain	18 Wire	20 Wire	13 L/L Chain
Ground gear B Total length (m) or alternative Total weight in air (kg)	45 849	45 840	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bosom section Length (m),	5 (305) Bobbins	5 (305) Bobbins	--	--	--	--	--	--	--

Ground gear and adjuster chain assembly	Standard	UK (Scotland)	UK (England)	France	Germany	Norway	Sweden	Denmark	Netherlands
(diameter mm) and material.									
Quarter sections Length (m), (diameter mm) and material.	10 (305) ½ Bobbins	10 (305) ½ Bobbins	--	--	--	--	--	--	--
Wing sections Length (m), (diameter mm) and material.	30 (150) Disc	30 (150) Disc	--	--	--	--	--	--	--
Wingend sections Length (m), (diameter mm) and material.	N/A	N/A	--	--	--	--	--	--	--
Mounted onto Diameter (mm) and material.	13 M/L chain	13 M/L chain	--	--	--	--	--	--	--
Adjuster chain assembly									
If fixed – total length (m).	N/A	2.2	2.0	N/A	2.15	1.8(Q3 only)	1.1	1.5	1.6
If adjusted Length Min (m)/Max (m).	1.7 – 2.2	N/A	N/A	2.3 - 2.8	N/A	1.7 – 2.2	N/A	N/A	1.6 or 1.7
Ground gear A Bobbin type, diameter (mm)/ weight (kg) and material.	400/no info Steel spherical	400/48 Steel spherical	400/48 Steel spherical	400/51 Steel spherical	400/N/R Steel spherical	200/N/R Half bunt rubber	305/N/R Half bunt rubber	305/11.8 Half bunt rubber	40 /20 Half bunt rubber

Ground gear and adjuster chain assembly	Standard	UK (Scotland)	UK (England)	France	Germany	Norway	Sweden	Denmark	Netherlands
Ground gear B or alternative Bobbin type, diameter (mm)/ weight (kg) and material.	400/no info Steel spherical	400/48 Steel round	N/A	N/A	N/A	350/N/R Half bunt rubber	N/A	N/A	N/A
Adjuster chain Diameter (mm) & chain construction	No info	16 M/L chain	N/R	16 M/L chain	13 Chain	N/R	16 L/L chain	16 Chain	16 M/L chain

Table A7.6. Wire rig (Column 1 is standard rigging as per Manual for the International Bottom-Trawl Surveys).

Wire rig	Standard	UK (Scotland)	UK (England)	France	Germany	Norway	Sweden	Denmark	Netherlands
Warp diameter (mm)	No info	28	26	22	28	N/R	20	20	28
Upper backstrop	Included in sweep length								
Length (m)		4.57	3.05	3.12	3.0	3.1	N/A	N/R	3.0
Diameter (mm)		16	16	16	24	N/R			16
Material		L/L chain	Chain	Chain	Wire	wire			L/L chain
Lower backstrop	Included in sweep length								
Length (m)		4.57	3.05	3.12	3.2	3.1	N/A	N/R	3.0
Diameter (mm)		16	16	16	24	N/R			16
Material		L/L chain	Chain	Chain	Wire	wire			L/L chain
Middle backstrop	Included in sweep length								
Length (m)		N/A	N/A	N/A	N/A	4.5	N/A	N/A	N/A
Diameter (mm)						N/R			
Material						wire			
Backstrop extension	Included in sweep length								
Length (m)		8.53	6.71	9.1	6.5	12	13	N/R	10
Diameter (mm)		20	16	22	26	N/R	28		20
Material		Wire	Chain	Chain	Wire	wire	Combi		L/L chain
Short sweep									
Length (m)	* Max 60	47	50	50	50	50	49.4	60	50
Diameter (mm)	22	26	22	22	22	22	22	N/R	26
Material	Wire	Wire	Wire	Wire	Wire	Wire	Combi	N/R	Wire
Long sweep									
used (Y/N)	Y	N	N	Y	N	Y	N	Y Q1 only	N
If Y - Depth change made (m)	> 70	N/A	N/A	> 120	N/A	> 70	N/A	> 70	N/A

Wire rig	Standard	UK (Scotland)	UK (England)	France	Germany	Norway	Sweden	Denmark	Netherlands
Long sweep									
Length (m)	* Max 110	N/A	N/A	100	N/A	100	N/A	110	N/A
Diameter (mm)	22			22		22		N/R	
Material	Wire			Wire		Wire		N/R	
Length of connectors/swivel between sweep and bridles (m)	No info	0.59	N/R	0.472	N/R	0.45	1.1	N/R	N/R
Lower bridle									
Length (m)	38	38	38	38	38.3	38.6	40.3	38.2	38
Diameter (mm)	20	20	22	20	22	20	14 (50)	20	20
Material	Wire	Wire	Wire	Wire	Wire	Wire	Rub-leg	Wire	Wire
Upper bridle 1st section									
Length (m)	20	20	20	20	20.1	20	20	20	20
Diameter (mm)	14	14	16	14	14	14	20	14	14
Material	Wire	wire	Wire	Wire	Wire	Wire	Combi	Wire	Wire
Upper bridle 2nd section									
Length (m)	20	20	20	20	20.1	20	20	20	20
Diameter (mm)	14	14	16	14	14	14	20	14	14
Material	Wire	Wire	Wire	Wire	Wire	Wire	Combi	Wire	Wire
Middle bridle									
Length (m)	20	20	20	20	20.1	20	20	20	20
Diameter (mm)	14	14	16	14	14	14	20	14	14
Material	Wire	Wire	Wire	Wire	Wire	Wire	Combi	Wire	Wire

Wire rig	Standard	UK (Scotland)	UK (England)	France	Germany	Norway	Sweden	Denmark	Netherlands
Length of connectors/swivel between 1st upper bridle & mid/2nd upper bridles (m).	No info	0.38	N/R	0.01	N/R	0.35	0.05	N/R	N/R

* Note – Standard manual specifies sweep length + backstrop + backstrop extension length should total 60 m (short) or 110 m (long) overall.

Annex 8: National-specific net opening, doorspread, and wingspread definitions

General guidance with average recommended upper and lower limits of vertical net opening and doorspread in relation to depth.

1st Quarter:

Table A8.1. Valid hauls performed by the different countries on North Sea IBTS Q1.

Q1	Sweeps lngt.	2016	2017	2018	2019
Denmark	60	41	43	49	47
France	50	67	62	61	54
Germany	50	48	73	44	43
Netherlands	60	53	55	56	64
Norway	60	12	5	7	-
	110	47	39	48	47
Scotland	47	60	61	60	62
Sweden	60	29	32	30	29
	110	17	15	17	16

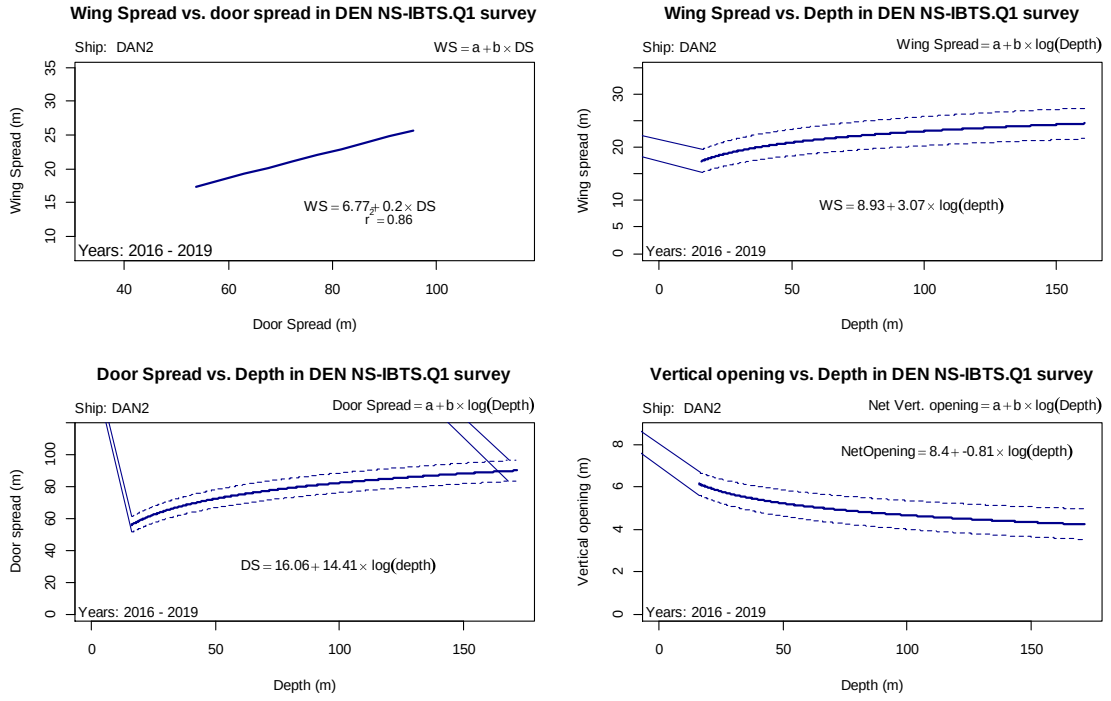


Figure A8.1. Information on the behaviour of the gear from Denmark NS-IBTS on Danish surveys. Graphs showing only the lines of the regressions used with the confidence intervals made using data between 2016–2019. All surveys weremperformed on the R/V *Dana*.

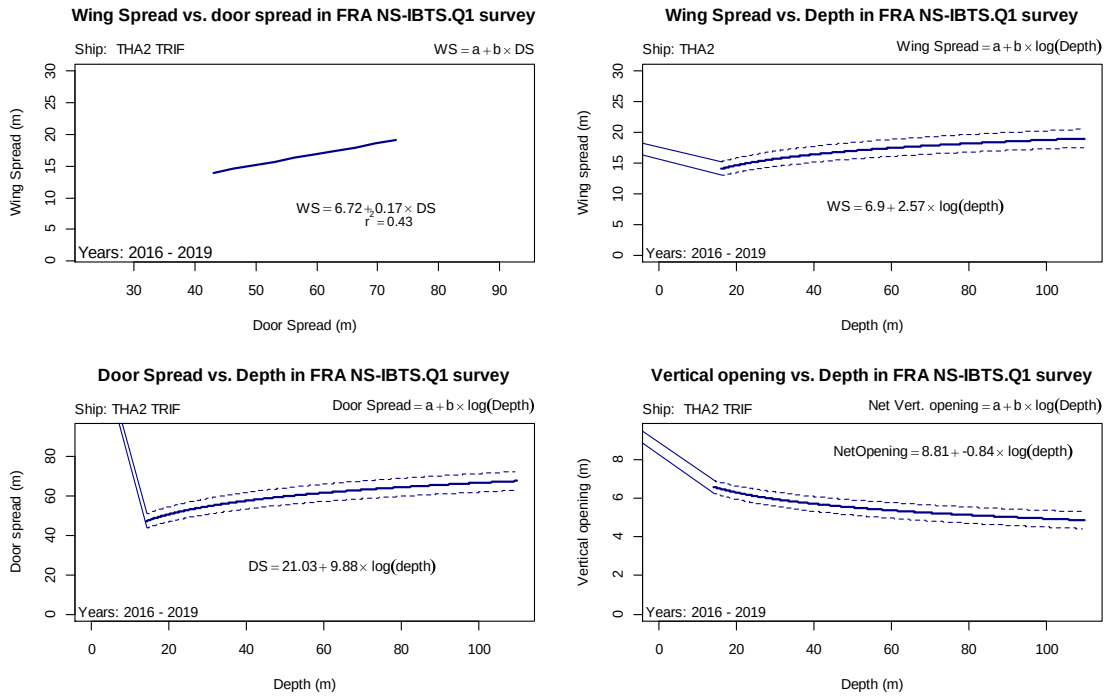


Figure A8.2. Information on the behaviour of the gear from NS-IBTS on French surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2016–2019. (The survey was performed by R/V *Thalassa,* except in 5 hauls in 2018, when it was performed by R/V *Tridens*).

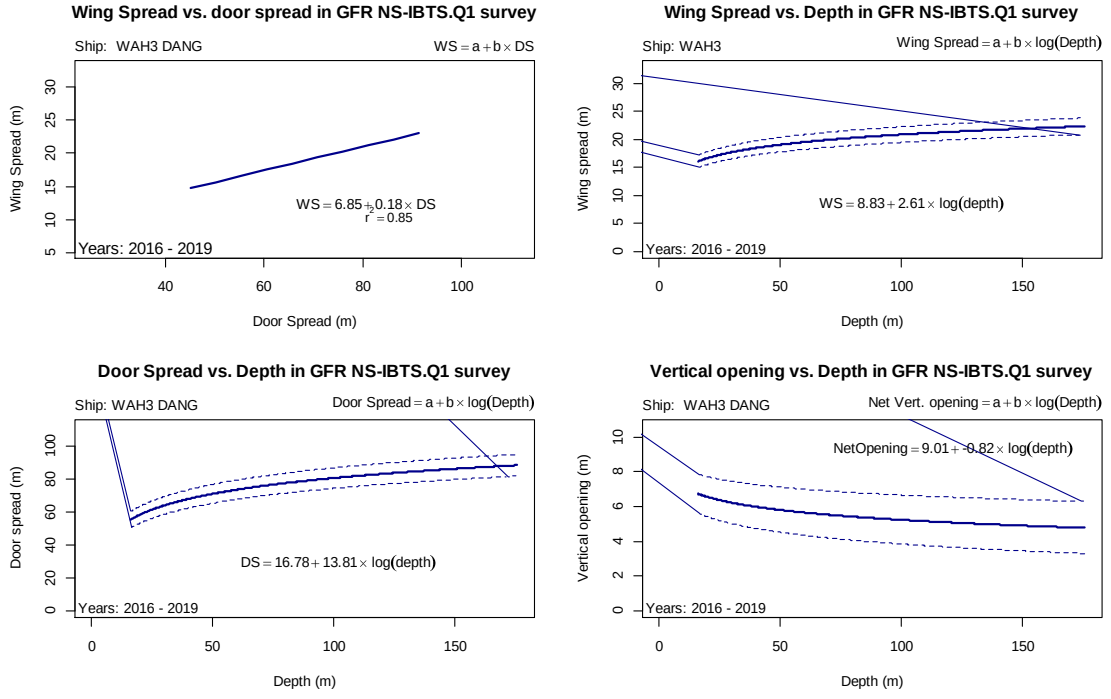


Figure A8.3. Information on the behaviour of the gear from NS-IBTS on Germany surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2016–2019. Surveys were performed on the R/V *Walther Herwig III,* except in 2019, when it was performed on the R/V *Dana*.

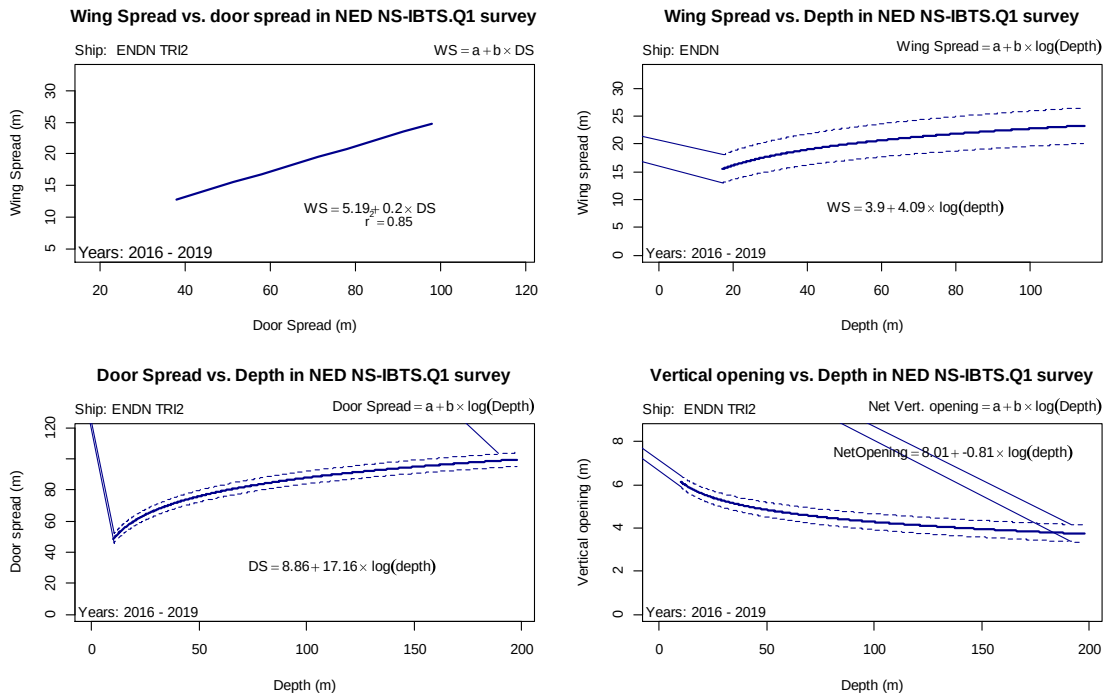


Figure A8.4. Information on the behaviour of the gear from NS-IBTS on Dutch surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2016–2019. Surveys were performed on the R/V *CEFAS Endeavour* in 2016 and R/V *Tridens* from 2017).

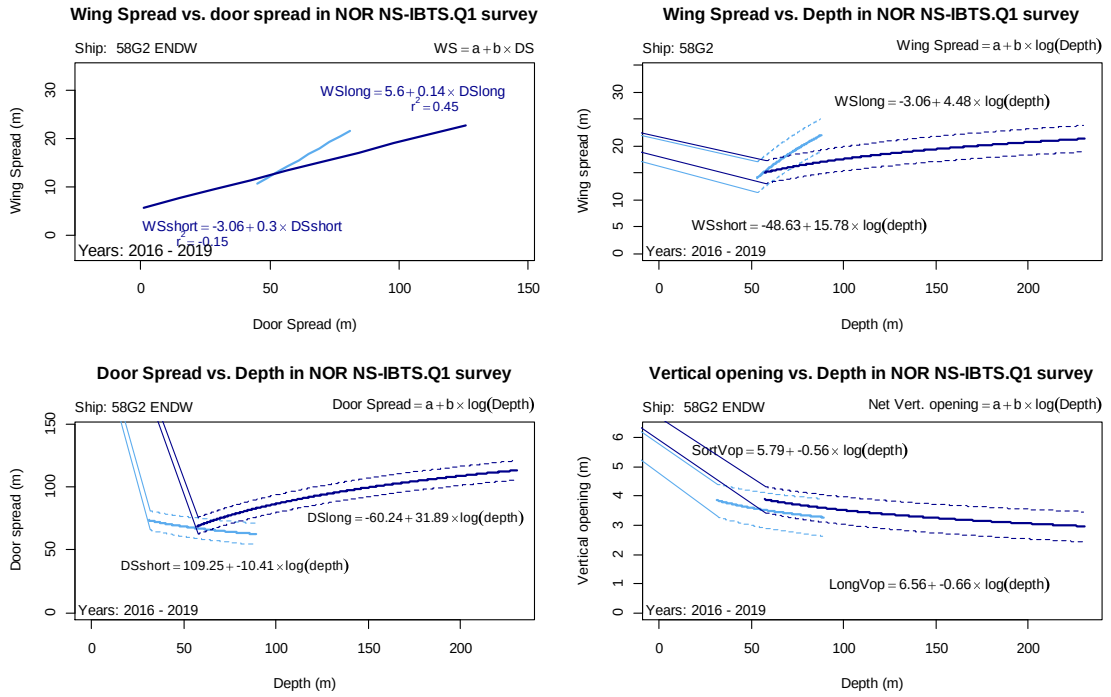


Figure A8.5. Information on the behaviour of the gear from NS-IBTS on Norwegian surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2016–2019. Surveys were performed on the R/V *G.O. Sars*, except in 2017, when it was performed on the R/V *CEFAS Endeavour*.

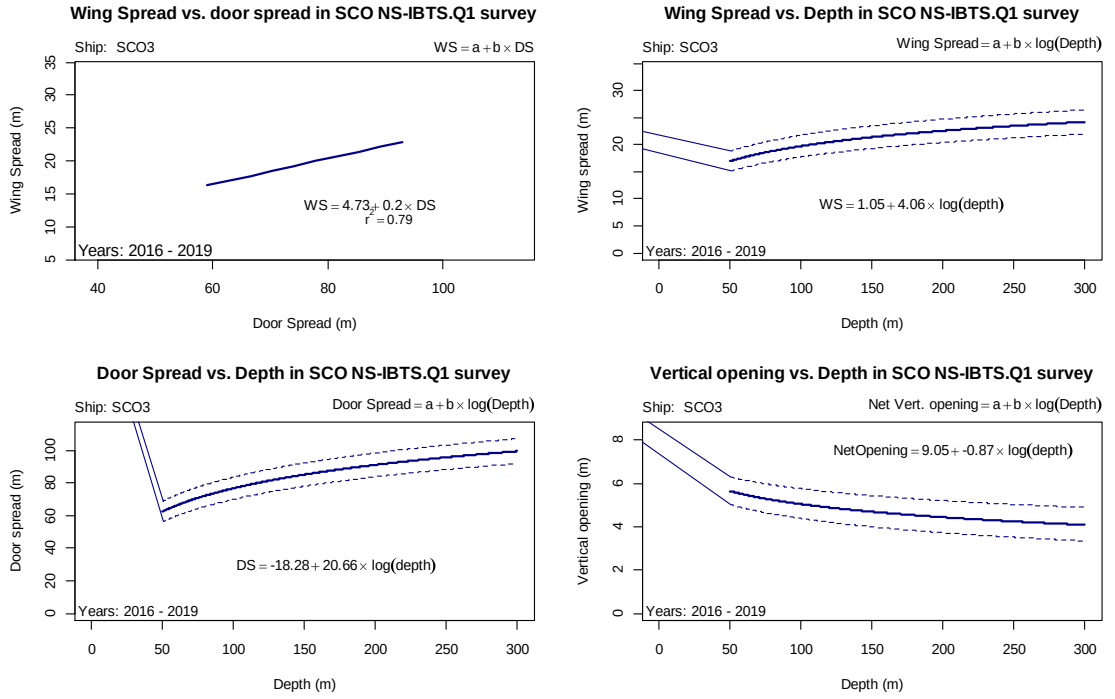


Figure A8.6. Information on the behaviour of the gear from NS-IBTS on Scottish surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2016–2019. All surveys were performed on the R/V *Scotia III*.

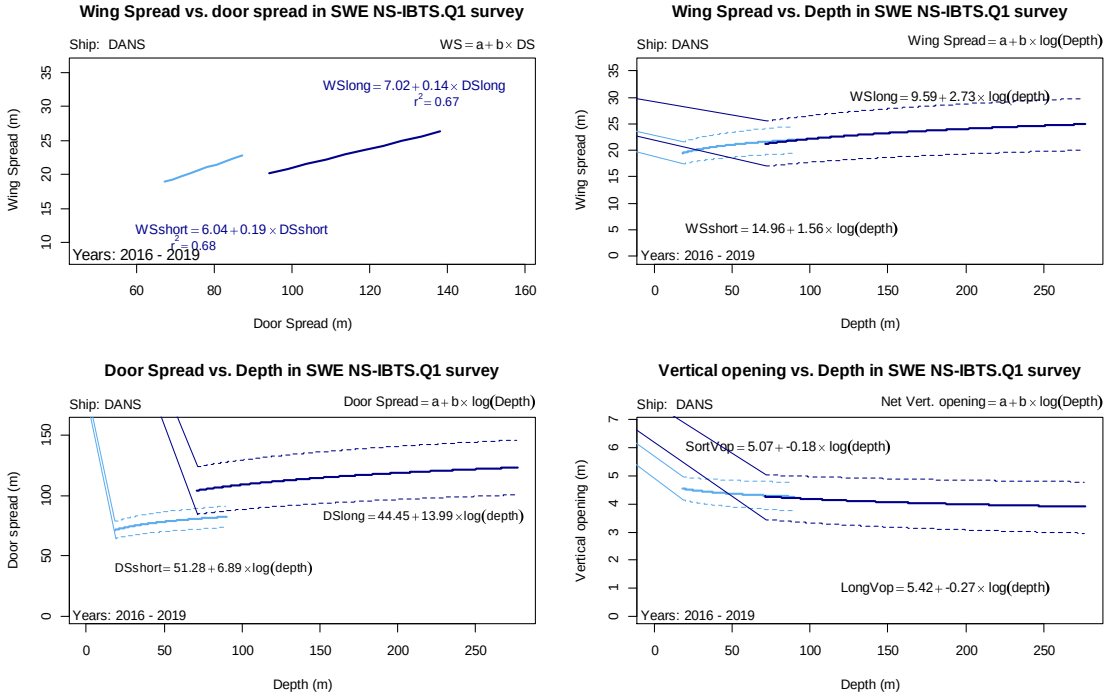


Figure A8.7. Information on the behaviour of the gear from NS-IBTS on Swedish surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2016–2019. Surveys were performed on the R/V *Dana*.

3rd Quarter:

Table A8.2. Valid hauls performed by the different vessels/countries on North Sea IBTS Q3.

Q3	Sweeps lngt	2014	2015	2016	2017	2018	2019
Denmark	60	51	59	60	52	55	53
England	40	74	78	78	78	78	77
Germany	50	29	33	33	32	31	31
Norway	60	47	59	74	59	61	60
Scotland	47	87	94	100	82	98	90
Sweden	60	45	46	45	46	45	46

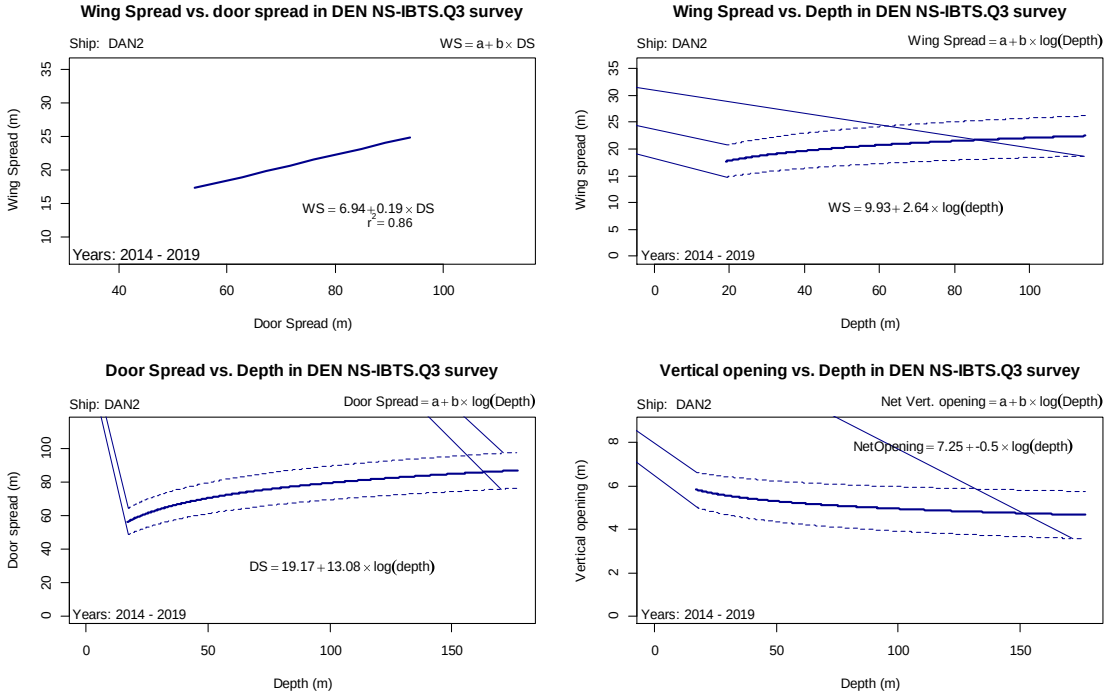


Figure A8.7. Information on the behaviour of the gear from NS-IBTS on Danish surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2014–2019. All surveys were performed on R/V *Dana*.

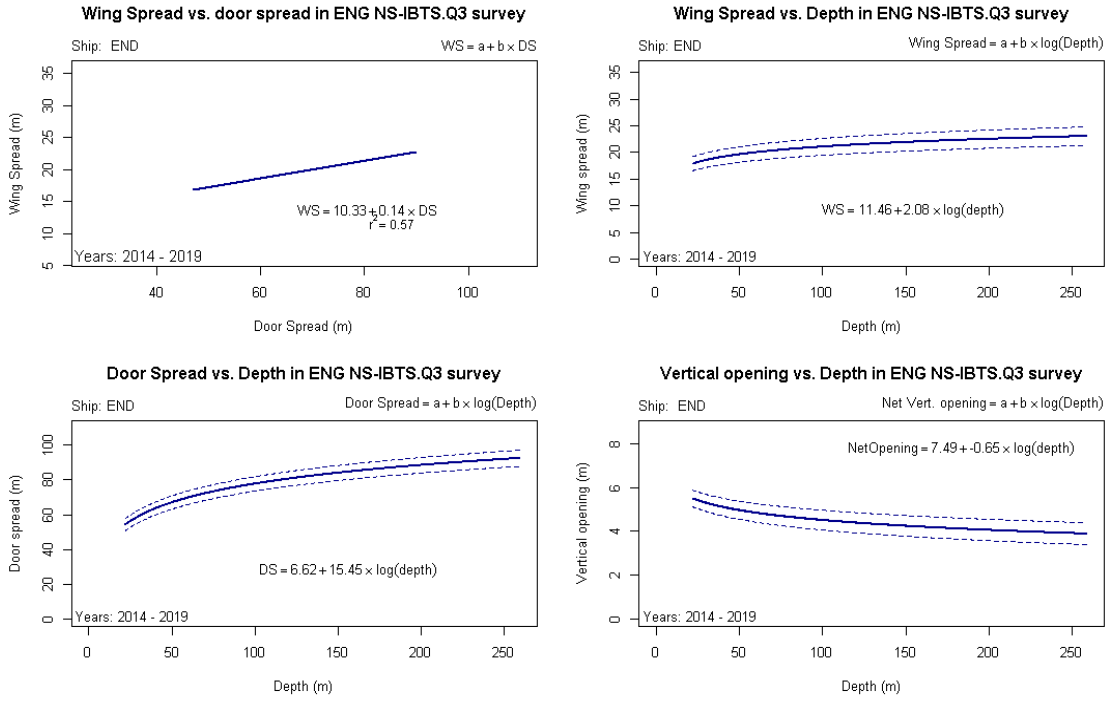


Figure A8.8. Information on the behaviour of the gear from NS-IBTS on Quarter 3 English surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2014–2019. All surveys were performed on R/V *CEFAS Endeavour*.

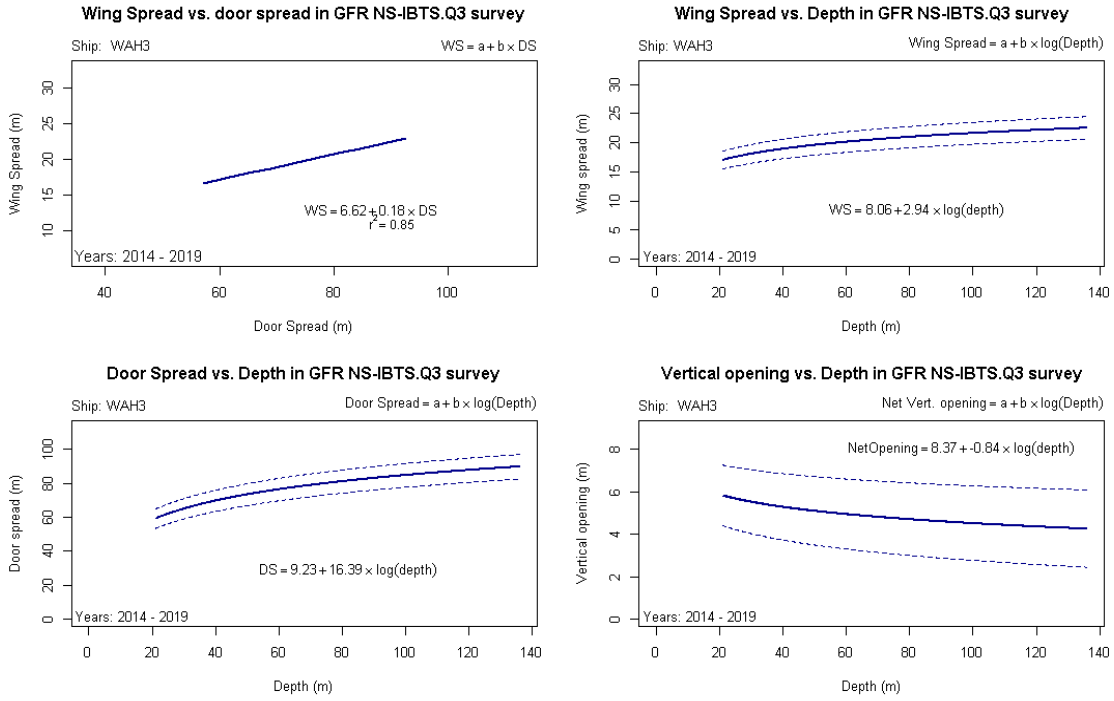


Figure A8.9. Information on the behaviour of the gear from NS-IBTS on Quarter 3 German surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2014–2019. All surveys were performed on R/V *CEFAS Walter Herwig III*.

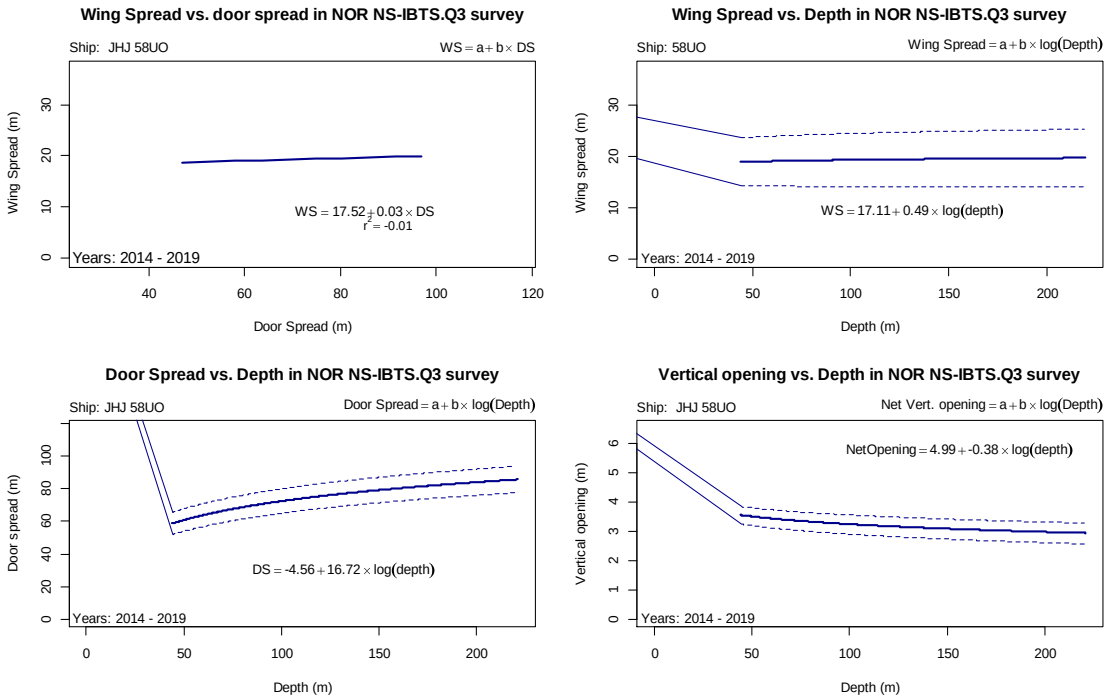


Figure A8.11. Information on the behaviour of the gear from NS-IBTS on Quarter 3 Norwegian surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2014–2019. Surveys were performed on the R/V *Johan Hjort* in 2014–2016 and on the R/V *Kristine Bonnevie* in 2017–2019.

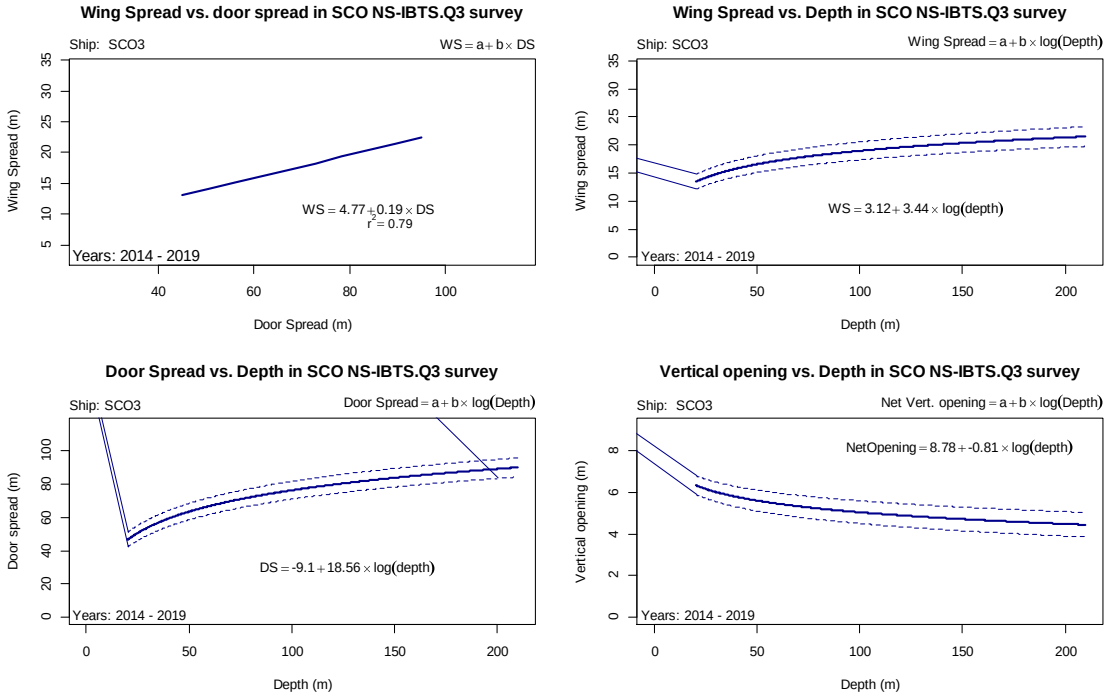


Figure A8.10. Information on the behaviour of the gear from NS-IBTS on Quarter 3 Scottish surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2014–2019. All surveys were performed on the R/V *Scotia III*.

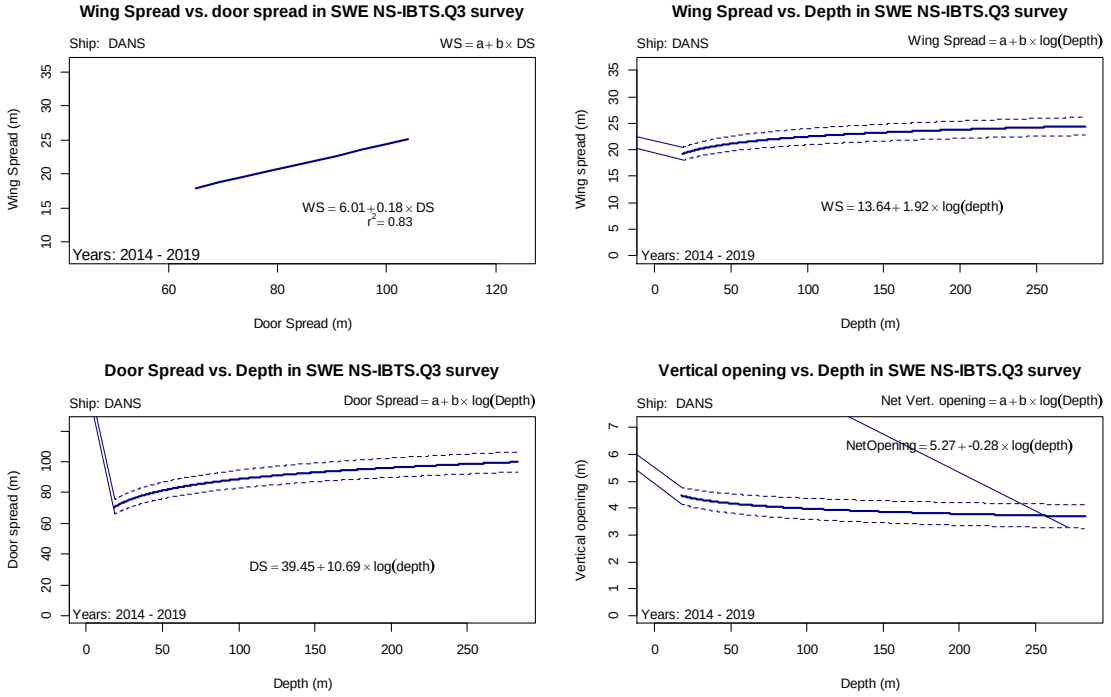


Figure A8.13. Information on the behaviour of the gear from NS-IBTS on Quarter 3 Swedish surveys. Graphs showing only the lines of the regressions used with the confidence intervals were made using data between 2014–2019. All surveys were performed on the R/V *Dana*.

Annex 9: Finfish (flatfish and roundfish) maturity key

For updated maturity keys of finfish, see the report from the 2018 Workshop for Advancing Sexual Maturity Staging in Fish (WKASMSF): https://www.ices.dk/community/Documents/WKASMSF%20Report%202018.pdf

Annex 10: Four stage maturity key for skates and rays (*Rajidae*)

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

Annex 11: Data formats for collection of marine litter

Litter overview			
A: Plastic	**B: Sanitary waste**	**C: Metals**	**Related size category**
A1. Bottle	B1. diapers	C1. Cans (food)	A: <5*5 cm= 25 cm^2
A2. Sheet	B2. cotton buds	C2. Cans (beverage)	B: <10*10 cm= 100 cm^2
A3. Bag	B3. cigarette butts	C3. Fishing related	C: <20*20 cm= 400 cm^2
A4. Caps/ lids	B4. condoms	C4. Drums	D: <50*50 cm= 2500 cm^2
A5. Fishing line (monofilamen	B5. syringes	C5. appliances	E: <100*100 cm= 10000 cm^2= 1 m^2
A6. Fishing line (entangled)	B6. sanitary towels/ tampon	C6. car parts	F: >100*100 cm = 10000 cm^2= 1 m^2
A7. Synthetic rope	B7. other	C7. cables	
A8. Fishing net		C8. other	
A9. Cable ties			
A10. Strapping band			
A11. crates and containers			
A12. other			
D: Rubber	**E: Glass/ Ceramics**	**F: Natural products**	**G: Miscellaneous**
D1. Boots	E1. Jar	F1. Wood (processed)	G1. Clothing/ rags
D2. Balloons	E2. Bottle	F2. Rope	G2. Shoes
D3. bobbins (fishing)	E3. piece	F3. Paper/ cardboard	G3. other
D4. tyre	E4. other	F4. pallets	
D5. glove		F5. other	
D6. other			

Figure A11.1. Litter reporting format C-TS.

Litter overview			
A: Plastic	**B: Metals**		**Related size category**
A1. Bottle	**B1.** Cans (food)		**A:** <5*5 cm= 25 cm^2
A2. Sheet	**B2.** Cans (beverage)		**B:** <10*10 cm= 100 cm^2
A3. Bag	**B3.** Fishing related		**C:** <20*20 cm= 400 cm^2
A4. Caps/ lids	**B4.** Drums		**D:** <50*50 cm= 2500 cm^2
A5. Monofilament	**B5.** Appliances		**E:** <100*100 cm= 10000 cm^2= 1 m^2
A6. Entangled filaments	**B6.** Car parts		**F:** >100*100 cm = 10000 cm2= 1 m2
A7. Synthetic rope	**B7.** Cables		
A8. Fishing net	**B8.** Other		
A9. Cable ties			
A10. Strapping band			
A11. Crates and containers			
A12. Diapers			
A13. Sanitary towel/tampon			
A14. Other			
C: Rubber	**D: Glass/ Ceramics**	**E: Natural products**	**F: Miscellaneous**
C1. Boots	**D1.** Jar	**E1.** Wood (processed)	**F1.** Clothing/ rags
C2. Balloons	**D2.** Bottle	**E2.** Rope	**F2.** Shoes
C3. Bobbins (fishing)	**D3.** Piece	**E3.** Paper/ cardboard	**F3.** Other
C4. Tyre	**D4.** Other	**E4.** Pallets	
C5. Glove		**E5.** Other	
C6. Other			

Figure A11.2. Litter reporting format C-TS-rev (updated according to the guidelines of WGML 2018).

Annex 12: Haul information

Explanations of the various field names and data types can be found on the ICES web page: https://datras.ices.dk/Data_products/ReportingFormat.aspx.

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	DataType	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

Record Type HH				
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

Annex 13: Length frequency information

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

Annex 14: Sex Maturity Age-Length Key (SMALK)

N.B. When sending information on herring in the first 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

Annex 15: Litter information

Record Type LT				
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	Survey	20	✓	Char
7	Reserved1	10		char
8	Reserved2	10		char
9	StNo	6	✓	char
10	HaulNo	6	✓	int
11	Year	4	✓	char
12	LTREF	10	✓	char
13	PARAM	20	✓	char
14	LTSZC	4		char
15	UnitWgt	15		char
16	LT_Weight	10		decimal4
17	UnitItem	15		char
18	LT_Items	10		int
19	LTSRC	5		char
20	TYPPL	5		char
21	LTPRP	20		char

Annex 16: Area type codes: Sampling areas and standard areas for the calculation of abundance indices

AREA TYPE CODES

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

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

Annex 17: Length splits used to provide preliminary numbers-at-age

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

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