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Report of the Study Group on the Development of Fishery-based Forecasts (SGDFF)

27–30 January 2004
Ostend, Belgium

International Council for the Exploration of the Sea

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1 INTRODUCTION

1.1 Participants

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1.2 Terms of reference

It was decided at the 91st Annual Science Conference in 2003 that:

The Study Group on the Development of Fishery-based Forecasts [SGDFF] (Chair: P. Marchal, France) will meet in Ostend, Belgium, from 27-30 January 2004 to:

a) further develop, test and apply appropriate model(s) for fishery-based forecasts;
b) define, in consultation with the Chairs of Working Groups on the Assessment of Demersal Stocks in the North Sea and Skagerrak, the Assessment of Northern Shelf Demersal Stocks, the Assessment of Southern Shelf Demersal Stocks, the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim, and *Nephrops* Stocks, workable groupings of fishing voyages at the most appropriate aggregation level (fleet, fishery or metier);
c) compile, for recent years, effort data and the international catch-at-age data as specified in b). The Group should consider fisheries exploiting stocks assessed by the Working Groups referred to in b).

SGDFF will report by 6 February 2004 for the attention of ACFM and the Resource Management Committee

1.3 Interpretation of the Terms of reference

Term of reference a) is addressed in Section 5, which summarises development of models since the 2003 meeting of this SG along with a discussion of possible future developments.

Progress with regard to Terms of reference b) and c) is summarised for each geographic area in Sections 3 and 4 respectively. Term of reference c) was the subject of much discussion at the SG meeting, particularly in relation to whether or not the compilation of data should be a task of this SG. A number of issues were raised in relation to this point. These included the following:

- The timing of the meeting so early in the year meant that 2003 data were not yet available for most stocks/areas, so it was only practical to work with data for 2002. This in turn limited the usefulness of running forecasts using these data.

- A group (or groups) dedicated to data compilation would require a different range of expertise to that of the present SG. Such groups would also need to reflect the different timings of the relevant assessment WGs, perhaps implying a series of area-based groups which would meet prior to the parent assessment WG

- There is a risk of both redundancy and duplication if this SG compiles data and then this task is repeated by the assessment WG.

- The present group is constituted as a Study Group rather than a Working Group. This implies a group with a limited lifespan which is intended to deal with a specific issue. In contrast, data compilation is by nature a routine task.

Overall the SG felt that the ideal approach would be for assessment WGs to modify the way in which they compile data in order that it is available on a fleet or fishery basis. The role of this SG would then be to act as technical support to the WGs in relation to fleet and fishery issues.

2 OVERVIEW

2.1 Background

For some years now, there is general recognition amongst scientists and managers that fisheries management should move from a stock-based to a fishery-based approach, taking into account the technical interactions between fisheries and the linkage between species that are concurrently being exploited by the same fishery(ies).

In 2001, the European Commission asked ICES to start compiling catch-at-age data disaggregated by fishery, to develop software that would be more suitable to perform fishery-based forecasts, and to revise the format of the ICES advice, with the aim of taking into consideration the above mentioned technical interactions.

In 2002, WGNSSK made a first attempt to compile a database with catch-at-age data disaggregated by fishery, but this database was incomplete (ICES, 2003a). Also in 2002, STECF provided the MTAC software and made the first attempts to calculate mixed-species TACs (MSTAC) for the North Sea.

In 2003, SGDFF was established. The main task of SGDFF was to (a) provide fleet and fishery definitions, (b) further explore and improve the MTAC model, and (c) advise on a database structure and data exchange format for the mixed-species and multi-fleet forecasts. Also in 2003, WGNSSK provided a sensitivity analysis of the MTAC model. ACFM however, rejected the use of MTAC for advisory purposes, mostly based on the argument that the data were inadequate (ICES, 2003b). Despite the concerns of ACFM, later on in 2003, STECF made a new attempt to calculate MSTAC for both the North Sea and the Irish Sea.

At the 2003 ICES Annual Science Conference, ACFM suggested that, in addition to its current tasks (identification of fisheries, methodological studies, etc.), SGDFF should start playing a key role in the data compilation process, and that one of its main tasks should be to prepare and update the database of catch-at-age data by fleet/metier/fishery, which could then be used by the area-based assessment WGs in their fishery-based analyses. This is reflected in the TOR for the 2003 SGDFF meeting (see section 1.2.). However, as explained in section 1.3., SGDFF has serious reservations on this approach.

2.2 Links with other groups

In its Terms of reference, SGDFF was explicitly aimed at providing inputs to a selection of assessment WGs: WGNSSK, WGNSDS, WGSSDS, WGNEPH, WGHMM. As detailed in section 1.3, there has been a shift in the type of inputs this SG could provide. Thus, the group was of the opinion that it was not in a position to compile timely data sets, which could be used by assessment WGs, but rather to provide a technical support to these WGs.

The technical support supplied by SGDFF is not only directed to assessment WGs. Contacts have been or will be made between SGDFF, on the one hand, and the ICES PGCCDBS (Planning Group on Commercial Catch, Discards and Biological Sampling), SGFI (Study Group on the Incorporation of Additional Information from the Fishing Industry into Fish Stock Assessments) and SGLTA (Study Group for Long-Term Advice).

The relevance of deriving fishery-disaggregated landings-at-age and discards-at-age data is closely related to the quality of the sampling design under which the institutes have collected the raw data. Some comments in relation to this issue are given in Section 4.2.

Initial contacts have been made between the chairs of SGFI and SGDFF, and it was agreed that a member of SGDFF will present progress made in developing fishery-based forecasts during the forthcoming SGFI meeting.

Finally, SGLTA will review the progress made by SGDFF, and this group will also serve as an interface between SGDFF and a large number of assessment WGs (AFWG, HAWG, NWWG, WGNPBW, WGNSDS, WGBFAS, WGNSSK, WGSSDS, WGHMM, WGMHSA, WGNEPH, WGPAND). In particular, the work carried out under the

auspices of SGDFF will be introduced to the chairs of these assessment WGs, and the group of chairs will have a forum to discuss and decide on the implementation in the course of WG meetings in 2004.

2.3 Models available

Last years report discusses two fishery-based models, namely the MTAC and the SMP (Short-term Multi species/multi fleets stock and catch Projections). The MTAC program has been discussed extensively elsewhere in this report and last years report.

The SMP program for the demersal fisheries of the North Sea (ICES, 2003c) has been further developed since last years meeting. A summary description of the SMP model is given in WD1.

Developments of fishery-based models, which takes into account the behaviour of fishers (fishers reaction to management measures) is under development in various EU-funded projects, such as EASE (European advisory system evaluation), TECTAC (Technological developments and tactical adaptations of important EU fleets), EFIMAS (Operational evaluation tools for fisheries management options). One example is the ISIS-model (Integration of Spatial Information for Simulation to evaluate the impact of management measures on FISHeries; Mahévas and Pelletier, 2003) which focuses on spatial aspects of fisheries management, but which contains all aspects of metiers structure and management. Another example is TEMAS (Analysis of Technical Management Measures) (Sparre, 2003) which is constructed as an extension of the existing ICES models. The TEMAS models applies the "Random Utility Model" to describe the behaviour of fishers. The TEMAS model is a bio-economic model, which accounts for the development of technical efficiency, build on the fishery-based model by Ulrich et al (2002). Incorporation of fishers behaviour in fishery-based models, is only possible when economic aspects are accounted for.

However, the TEMAS and ISIS models are under development, and not yet operational in full scale. Obviously, there are data problems with the implementation.

Finally, it should be mentioned that the advisory committee of the EAFE (The European Association of Fisheries Economists) has developed a bio-economic model, which derives the economic consequences of the ACFM-advice. This involves the conversion of TACs into efforts of fleet segments (EAFE; 2002).

3 DEFINE WORKABLE GROUPINGS OF FISHING VOYAGES

3.1 North Sea, Skagerrak and Eastern Channel

Assessment of stocks within the North Sea area (incorporating elements of IIIa, IV, VIa and VIId) are covered by several assessment working groups. Demersal stocks are assessed by WGNSSK. North sea herring (IV and VIId, divided into sub stocks) are assessed by HAWG as are sprat in VIId. Mackerel and horse mackerel are covered by WGMHSA. *Nephrops* stocks are assessed by WGNEPH, whilst *Crangon* fisheries are monitored by WGCRAN and salmon stocks are monitored by WGNAS. It should also be noted that assessment areas and TAC areas do not necessarily match up (e.g. although plaice are assessed separately for VIId and VIIe, the TAC applies to the combined areas).

Major shifts in fisheries appear to have occurred in 2001 and 2002 following changes to regulations governing mesh sizes for towed gears. The fraction of cod retained on board can now only exceed 5% when using nets with meshes greater than or equal to 120mm. This has resulted in a large number of vessels converting to *Nephrops* fishing with an 80mm net in 2002.

It was hoped that each country would have defined its fisheries and provided catch-at-age data by fishery for this meeting. These data were not available from each country due to difficulties with staff time. Valuable lessons have been learnt from those institutes which had progressed with the definitions of fisheries and it is anticipated that this task should now be relatively straight-forward. It is hoped that the compilation of catch-at-age data by fishery will be completed in time for WGNSSK (September 04).

A summary of the state of fishery definitions by country follows. Fleets are defined according to EU data regulation 1639/2001.

Belgium

Compared to the previous meeting of SGDFF, little progress has been made in Belgium on the actual definition of metiers and fisheries. The Sea Fisheries Department (SFD), however, is currently setting up a database with scrutinized landings data by fishing voyage for the years 1991-2002, which could serve as a basis for such an exercise. The SFD plans to use the 3-step approach defined by SGDFF in 2003 (SGDFF, 2003), and to identify metiers and fisheries for the Belgian fishing fleet operating in, amongst others, the North Sea and the Eastern English Channel.

The current state of Belgian fishery definitions remains unchanged from those used to create the fishery data submitted to STECF in 2003 and a description of the protocol follows. In view of the general knowledge on the Belgian fishing fleet and its operational characteristics, it can be expected that the overall number of metiers might be rather small: (a) 3-5 flatfish directed fisheries, all using beam trawls, but with different action radiuses depending on vessel size and engine power, (b) a mixed, primarily *Nephrops*-directed fishery, using different types of gear, but all operating in the same geographical area, (c) a brown shrimp (*Crangon crangon*) directed fishery, using light beam trawls, in the Belgian and Dutch coastal waters, (d) a small number of primarily roundfish or roundfish-*Nephrops* directed fisheries, using single or twin-rig otter trawls, and (e) a coastal fishery, using static gears. The fisheries described under (d) and (e) however, are likely to comprise very small numbers of voyages only, mostly because the number of fishing vessels operating those types of gears is limited (2-3 vessels in each category).

Denmark

Danish fisheries were defined in accordance to the units used for the national data sampling scheme. The fishery definitions use combinations of gear type, mesh size and landings composition from individual trips.

The defined fisheries are:

- Demersal trawl: bottom trawl and mesh size >=100 mm
- Danish seine: Danish and Scottish seine, all mesh sizes
- *Nephrops* trawl: bottom trawl and mesh size 70-99 mm
- Pandalus trawl: bottom trawl and 35-69 mm mesh size and a catch of industrial species less than 5% and max 500 kg herring.
- Beam trawl: beam trawl and mesh >=80 mm
- Cod-fixed gear: fixed gear and cod as the economically most important species
- Sole-fixed gear: fixed gear and sole as the economically most important species
- Hake-fixed gear: fixed gear and hake as the economically most important species
- Turbot-fixed gear: fixed gear and turbot as the economically most important species
- Plaice-fixed gear: fixed gear and plaice as the economically most important species
- Industrial: trawl and mesh size <32 mm with industrial species catch
- Brown shrimps: beam trawl and brown shrimp as the economically most important species
- Hooks: hooks applied
- Stake net: stake net applied
- Herring Purse seine: purse seine used and herring as the economically most important species

- Herring Trawl: trawl used and herring as the economically most important species
- Mackerel Purse seine: Purse seine and mackerel as the economically most important species
- Mackerel Trawl: Trawl and mackerel as the economically most important species
- Other: all other fisheries and trips without logbooks (mainly small vessels)

An alternative procedure for defining Danish fisheries has been presented in WD2. However, due to time constraints, the group could not evaluate how operational the alternative fishery definition was, with regards to fishery-based data compilation and analyses.

France

There are three French fleets fishing in areas IV and VIId:

- Large otter-trawlers harvesting saithe in a single-species fishery in the Northern North Sea (IVa).
- Medium otter-trawlers (24-40 m) harvesting a mixture of species (whiting, red mullet, squid, plaice, cod) in the Southern North Sea (IVc) and the Eastern Channel (VIId). This fleet practices different fisheries through the year. It may also seasonally use different gears to target specific species (e.g. dredges for scallops). The analysis of the different fisheries/métiers practiced by this fleet is under way
- Small gillnetters (6-18 m) targeting sole and plaice in IVc and VIId. This fleet may also seasonally use different gears to target specific species (e.g. dredges for scallops). The analysis of the different fisheries/métiers practiced by this fleet is under way

Germany

The German fishing activities were classified into 7 fishing units according to gear types, namely dredges (DRB), demersal seines (DS, Scottish and Danish seines), gillnet (GN), demersal otter trawl board (OTB, single and pair trawled), pelagic otter trawl board (OTM, single and pair trawled), and small (TBB<221 kw) and big beam trawls (TBB≥221 kw). Further identifications of fisheries targeting a specific catch composition were not made.

Netherlands

A preliminary analysis aimed at classification of different fisheries using beam trawl gears has been carried out, using logbook data for 2002. Only trips which had denoted beam trawl (TBB) were used in the analysis. Data comprised logbook records at the ICES rectangle level and consisted of weight and commercial value by species. A Hierarchical clustering technique was then applied to the catch proportions (in terms of value) of the corresponding main commercial species. The analysis gave five distinct fisheries which were then related to external variables as mesh size and home harbour. The fisheries could not easily be labelled and a confrontation of the results with experts from the fishing industry is still outstanding.

The catch-at-age data that was provided to SGDFF was not directly related to the fisheries definitions as the market sampling that is carried out cannot yield estimates of catch-at-age by subcategory of the sampled fleet. This is mainly due to the absence of market category (sales slips) information on individual trips. Therefore, the catch-at-age data was delivered for the whole beam trawl fleet as a whole, but the landings-at-age were supplemented with estimates of discards-at-age. The number of discards trips on which these estimates were based were thought to be (very) low, so the accuracy of these estimates is also likely to be low. For roundfish species, two fleets could be distinguished based on gear: beam trawl and otter trawl, however it was assumed that the same market category composition applied to both gears.

Norway

The Norwegian fisheries are mainly defined by gear type since there is a specific target species assemblages for each gear. A problem with the Norwegian catch data (based on sale slips) is that the mesh size is not recorded for trawls and gillnets. Thus, some catch composition criteria have to be used to subdivide certain gear types (gillnet and bottom trawl). In the future, licence information from individual vessels will be used in addition to gear type and catch

composition to refine the fishery definitions. At the time being, fishery-based catch-at-age information is only available for North Sea saithe (four fisheries in 2002).

UK (England and Wales)

Although progress has been made and several fishery units defined, the list of fisheries has yet to be completed. The procedure for fishery definition is as follows. Data comprise log book records at the ICES rectangle level and consist of weight and commercial value by species. These data were extracted for 2000-2002 and analysed for each year separately. Data were subdivided into the broad fishing fleets based on vessel and gear type as defined in EU data regulation 1639/2001. A Hierarchical clustering technique was then applied to the catch proportions (in terms of value) of the corresponding main commercial species for each fleet. The clustering results are then used to inform the definition of fisheries which are defined by gear type, mesh size and species composition. Final fishery definitions and catch-at-age data will be ready in time for WGNSSK 2004.

UK (Scotland)

Preliminary analyses have been carried out on trip data for 2000-2002 for the determination of fisheries and were presented as a working paper to the SG [WD3]. The full range of 87 species was reduced to 30 species by combining those species with less than 500 tonnes per year. Cluster analyses were performed on catch composition over all gear types, resulting in 12 fisheries. The resulting clusters were analysed by gear type and whilst some clusters match closely to a single gear type, other clusters are much harder to define by gear alone. Fishery definitions and catch-at-age data from Scottish data will be ready in time for WGNSSK 2004.

3.2 Northern Shelf

The WGNSDS assessments are divided principally between the West of Scotland (Division VIa) and the Irish Sea (Division VIIa). The assessment for Anglerfish covers a larger area including Division IIIa, Subarea IV, and Subarea VI. Megrim is assessed in Subarea VI and haddock assessments are considered separately for Divisions VIa and VIb (Rockall).

The northern shelf component of the catch of Hake in considered in the Northern hake assessment (Subarea II, Division IIIa, Subareas IV, VI and VII, and Divisions VIIIa, b, d) conducted by the WGHMM. *Nephrops* in Division VIa is considered in the assessment of *Nephrops* in Management Area C, and conducted by the WGNEPH. *Nephrops* in Division VIIa is considered in the assessment of *Nephrops* in Management Area J (Functional Units 14 & 15), and conducted by the WGNEPH.

UK (England and Wales) fishery definitions for this area have not been updated from those within the current fleet database of STECF. However, data are available from log books on the resolution of individual hauls and these data will be analysed using the same protocol as those analyses performed on the North Sea data. Fishery definitions and catch-at-age data by fishery will be available in time for the meeting of WGNSDS in 2004.

For the UK (Scotland) analyses of the determination of fisheries, such as the preliminary clustering analyses carried out on North Sea trip data for 2000-2002, have not been conducted for the Northern Shelf. Priority has been given to conducting the analysis for the North Sea. A similar analysis for the Northern Shelf will be undertaken once the North Sea analysis is completed.

The current definitions of the UK(Northern Ireland) fisheries remain unchanged from those used by STECF in 2003 to calculate MSTAC for the Irish Sea. Fishing activities are defined into fisheries/fleets based on gear type and area for individual voyages. The SGDFF (2003) guidelines for defining workable groupings of fishing voyages consisted of combining analyses of catch profiles with expert knowledge. In terms of the latter, efforts have been made to seek industry contribution in developing the expert knowledge. Representatives of the N Ireland fishing industry considered the current fisheries/fleet definitions used as adequate. However, they expressed concerns that the mixed-species approach will impede the opportunistic reaction of the fishermen, in terms of fishing practices, towards a change in species composition in catches. The importance of parity of the input data of the mixed-species models was also highlighted, and that this approach will be devalued if there is no consistency in the quality of the input data, in terms of discard estimates and misreporting by fishery/fleet. Further defining the less strongly targeted fisheries, i.e., the N Irish light otter trawlers and twin-otter trawlers into possible métiers do, however, merit further investigation.

In Ireland clustering fishery units by objective methods of analysis based on trip-related data is not currently possible. This is because of a lack of resolution in the catch data currently available to the Irish Marine Institute. Improved

resolution in the logbook data is expected in the future and it is then intended to conduct clustering analyses. In the interim definitions of the Irish fisheries remain unchanged from those used by STECF in 2003 to calculate MSTAC for the Irish Sea.

Fleet and fishery definitions for the Northern Shelf are currently based broadly on gear type and area (West of Scotland or Irish Sea only). Some division of fleets within particular gear types is possible based on catch compositions. This has been achieved based on analyses of catch compositions by vessel and month. The relative proportion of particular species within the catch has been used to define thresholds above or below which vessels were assigned into particular fisheries for each month. The choice of threshold is a subjective decision based upon an estimate of the point at which the relative value of particular species would have influenced a decision to target that species.

West of Scotland - Fleets and fisheries

The demersal fisheries in the waters to the west of Scotland are largely taken by Scottish and Irish trawl fisheries exploiting cod, haddock, whiting, saithe, *Nephrops*, anglerfish megrim, hake and deepwater species. The Scottish fleets are categorised into a Light Trawl fleet, a Heavy Trawl fleet (based on vessel size and power) and *Nephrops* trawlers. The Irish fleet is a light trawl fleet targeting anglerfish, hake, megrim and other gadoids mainly on the Stanton Bank and on the slope northwest of Ireland. This fleet uses a mesh size of 80 mm or greater. French demersal trawlers have traditionally taken a high proportion of the total landings from this area. The French fleet fishing in the West of Scotland is referred to as fishing unit 16. It is sub-divided into 3 fisheries. The most important fishery in 2002 was exploiting deep-water stocks (mainly blue ling, roundnose grenadier and black scabbardfish). The two remaining fisheries are an otter-trawl fishery targeting benthic species (monkfish and megrim) and a mixed gillnet fishery exploiting benthic species, hake and gadoids. The French fleet fishing in the Irish Sea is of lesser importance. It mainly consists of trawlers targeting gadoids or *Nephrops*.

A more detailed description is given in the ACFM report of October 2003 (ICES, 2003b).

The fishery definitions suggested by SGDFF are given in Table 3.2.1.

West of Scotland – Fleet dynamics

Scottish vessels have traditionally fished around Solan, Rising Ground, Butt of Lewis, Inner and Outer Hebrides, South Minch and Clyde. Scottish seiners, fish similar areas to the trawl fleet. The development of a directed fishery for anglerfish has led to marked changes in the way the Scottish fleet operates. Part of this is a change in the distribution of fishing effort; the development of a directed fishery having led to effort shifting away from traditional round-fish fisheries in inshore areas to more offshore areas and deeper waters. The expansion in area and depth range fished has been accompanied by the development of specific trawls and vessels to exploit the stock.

Since 1996 there has been an increase in the number of vessels using twin rigs in the Irish fleet. As a result of recent technical measures, the Irish otter trawl fleet previously using gear with 90mm mesh began using gear with 100mm with square mesh panels. Gadoids have previously been caught by vessels using *Nephrops* trawls with a mesh size of 70–100 mm, and reporting >35% of landings by weight as *Nephrops*.

The minimum mesh size for vessels fishing for cod in this area was changed from 100 mm to 120 mm from the start of 2002 under EU regulations regarding the cod recovery plan (Commission Regulation EC 2056/2001), with a one-year derogation of 110 mm for vessels targeting other species. The UK implemented a national regulation in the late summer of 2000, requiring the mandatory fitting of a square mesh panel in certain towed gears. These measures are likely to have affected gear selectivity, particularly for gadoids.

Regulations were implemented in early 2003 to restrict effort. Vessels with mesh sizes greater than 100mm can spend no more than nine days per month fishing in VIa, whilst vessels using gear with mesh size of between 70-90mm can spend 25 days per month at sea. In 2003 in order to avoid the more restrictive EU effort regulation, Scottish and Irish vessels using 100mm mesh size to target *Nephrops* may have reduced the mesh size of the codend to less than 100mm.

There have been changes to the fleet composition in the last two years with about ten vessels decommissioned and four new vessels joining the fleet.

Irish Sea (ICES Division VIIa) - Fleets and fisheries

Demersal stocks in the Irish Sea are fished mainly by fleets from Northern Ireland, England & Wales, Ireland and Belgium. Some vessels from Scotland fish in the northern Irish Sea whilst some French vessels fish in the southern Irish Sea. The French fleet fishing in the Irish Sea is of lesser importance. It mainly consists of trawlers targeting gadoids.

The main fleet sectors are the *Nephrops* fleets using 70-80mm single or twin otter trawls, whitefish trawlers using 100-120mm mesh otter and mid-water trawls and seine nets, and beam trawlers using 80mm mesh. Small landings have traditionally been recorded for pair-trawlers and fixed gears such as gillnets, tangle nets and long-lines. Within some gear types the catch composition by species can be used to identify fleet segments targeting particular species (e.g. *Nephrops* directed otter trawl).

Highly targeted fisheries (>70% of target species groups) are those for flatfish using beam trawls, those for *Nephrops* using single *Nephrops* trawls and those for gadoids using seine net, midwater trawls, gillnets and pair trawls. Less strongly targeted fisheries include Irish otter trawlers, English & Welsh otter trawlers and Northern Irish light otter trawlers and twin-otter trawlers. Scottish and French trawlers record mostly catches of gadoids.

The fishery definitions suggested by SGDFF are given in Table 3.2.1.

Irish Sea – Fleet dynamics

The fisheries for cod, whiting, *Nephrops* and flatfish are relatively long-established. A targeted trawl fishery on haddock became established following a rapid growth of the stock in mid-1990s in the western Irish Sea where the fishery is centred. The main fleet targeting cod is the Northern Ireland midwater trawl fleet. The remaining cod catch is spread amongst the different otter trawl, beam trawl and gillnet fleets. In recent years the catch of cod by gillnets has become increasingly important and is now a major component of the Irish cod catch. A 10-week closure of the cod spawning grounds has been in place since 2000. An effect of this has been some switching of midwater trawlers to *Nephrops* fishing to take advantage of a derogation for *Nephrops* trawlers during this period.

The trawl fisheries for whiting grew in the 1970s but have declined substantially since the 1990s. Few whitefish vessels now target whiting due to the decline in abundance of fish above the minimum landing size in the western Irish Sea, the substantial decline in the size of the English and Welsh otter trawl fleet which fished whiting in the eastern Irish Sea, and the increased availability of haddock. *Nephrops* fleets continue to take whiting as a by-catch. The quantities discarded have remained fairly stable whilst landings have declined substantially.

Fishing effort of the Belgian beam trawl fleet varies annually according to sole fishing opportunities in the Irish Sea.

Table 3.2.1 Fishery definitions suggested for Northern Shelf fisheries (West of Scotland and Irish Sea only) based on gear definitions and limited analyses of catch composition.

Country	Fleet (based on gear definition)	Fishery (based on catch composition)	Area(s) where definition applies	
Belgium	All gears		VIa	
	Beam trawl (flatfish directed, > 900 HP)			VIIa
France	Otter trawl (Deepwater species)		VIa	
	Otter trawl (benthic species)		VIa	
	Gillnet (mixed species)		VIa	
	All gears			VIIa
Germany	Otter trawl (mainly targetting saithe)		VIa	
	Pelagic mid-water otter trawl		VIa	
	Gillnets		VIa	
Ireland	Dredge		VIa	VIIa
	Pots		VIa	VIIa
	Gillnets		VIa	VIIa
	Handlines & polelines			VIIa
	Longline		VIa	
	Mid water trawl		VIa	VIIa
	Otter trawl	- Hake, Monkfish and Megrim directed	VIa	
		- *Nephrops* directed	VIa	VIIa
		- Fish directed	VIa	VIIa
	Bottom pair trawl		VIa	VIIa
	Scottish seine		VIa	VIIa
	Beam trawl		VIa	VIIa
Norway	All gears		VIa	
Spain	All gears		VIa	
UK (England & Wales)	Dredge			VIIa
	Gillnets			VIIa
	Longline			VIIa
	Miscellaneous gears (including handline, pots, rod & line, tangle)			VIIa
	Mid water trawl			VIIa
	Nephrops			VIIa
	Otter trawl			VIIa
	Seine			VIIa
	Beam trawl			VIIa
UK (Northern Ireland)	Gill/tangle nets		VIa	VIIa
	Light otter trawl		VIa	VIIa
	Pair trawl			VIIa
	Seine		VIa	VIIa
	Single *Nephrops* trawl		VIa	VIIa
	Single vessel midwater trawl		VIa	VIIa
	Twin *Nephrops* trawl		VIa	VIIa
UK (Scotland)	Heavy Trawl		VIa	VIIa
	Light trawl + multiple trawl demersal (such as twin rigs)		VIa	VIIa
	Nephrops trawl + multiple trawl *Nephrops* (such as twin rigs)		VIa	VIIa
	Pair trawl		VIa	
	Seine net + pair seine		VIa	VIIa

3.3 Southern Shelf

Spain

Spanish trawl fleets distributed along a wide area covering the Western Atlantic Waters (ICES Subareas VI-VII, Divisions VIIIabd and c). These fleets catch a variety of species depending on the gear used, sea area where they operate, base port and landing port. In 2000, 199 units with the following mean technical characteristics composed this fleet:

Gear	Nº of Boats	GRT	Length (m)	HP	KW
Trawl	115	210	29	685	504
Fixed gears	84	188	28	664	489
Total	199	201	29	676	497

Source: Secretaría General de Pesca Marítima (SGPM). Spanish Ministry of Agriculture, Fish and Food (2003)

It is to be noted that not always the same ship operates in the same sea area along the year, depending on its participation on the access rights to each sea area.

In 1985, in order to study the fishing activity related to demersal species in these areas, a set of different Fishery Units (FU) was defined by the ICES Working Group on Fisheries Units in subareas VII and VIII (ICES 1991). Since then, the ICES Assessments' Working Groups (namely: Southern Shelf Demersal Stocks (WGSSDS) and recently Hake, Monk and Megrim Working Group (WGHMM)) have been used these Fishing Units practically unchanged. The other fleets–areas, gears, depths and target species involved were merged in FU 16 called "outsiders". The FU have been defined in Table 3.3.1.

Table 3.3.1 Fishery units defined for the Spanish vessels fishing in the Southern Shelf.

Fishery Unit	Description	Subarea
FU1	Long-line in medium to deep water	VII
FU2	Long-line in shallow water	VII
FU3	Gillnets	VII
FU4	Non-*Nephrops* trawling in medium to deep water	VII
FU5	Non-*Nephrops* trawling in shallow water	VII
FU6	Beam trawling in shallow water	VII
FU8	*Nephrops* trawling in medium to deep water	VII
FU9	*Nephrops* trawling in shallow to medium water	VIII
FU10	Trawling in shallow to medium water	VIII
FU12	Long-line in medium to deep water	VIII
FU13	Gillnets in shallow to medium water	VIII
FU14	Trawling in medium to deep water	VIII
FU15	Miscellaneous	VII & VIII
FU16	Outsiders	IIIa, IV, V & VI
FU00	French unknown	

During the Hake Technical Measures Meeting in October 2003 in Lisbon (EC, 2003a), in order to reflect a more recent description of the Spanish fleets, it was decided to revise the old FUs assignation, as it was found that for FUs 4 and 14 (trawlers in subarea VII and VIII, respectively) was better to split them between Bottom Trawl and Pair Trawl components for both areas.

During SGDFF in January 2003, a first approach to more specifically define Spanish trawl fisheries (see methodology and detailed results in WD4 and WD5) resulted in a number of new fisheries that could be easily include in the ones described in Lisbon. No new definition of long liners and gillnetters were carried out using these methodologies.

However, in relation to these two fishing modalities operating in the different sea areas, numbers-at-age were calculated as national data is well separated in this two modalities. Thus, it was consider to keep them separated although a detailed study should be carried out to decide whether more divisions of this modalities is required and so new fisheries definition could be obtained.

A preliminary identification of fisheries for the Spanish trawl fleets in the European Southern Shelf (except for Basque ports vessels) was carried out using a non-hierarchical cluster analysis (K-mean method) (Castro *et al*., 2004). Analyses

were based on a comprehensive database for the period 2000-2002 describing the Spanish trawl fishery operating in the ICES Subarea VII and Divisions VIIIabd with a coverage of 35.2%. The classification of individual trips based on the species composition of landings resulted in the identification of six catch profiles. The significance and feasibility of those catch profiles were analysed in combination of the knowledge of the fishery and the characteristics of the current Sampling Program. Finally, the following fishery units were proposed:

• Baca trawl VII HKE-NEP: "Baca" bottom trawlers fishing in ICES Subarea VII targeting hake and *Nephrops*.
• Baca trawl VII MEG: "Baca" bottom trawlers fishing in ICES Subarea VII targeting megrim.
• Baca trawl VII HKE: "Baca" bottom trawlers fishing in ICES Subarea VII targeting hake
• Pair trawl VII HKE: Pair trawl trawlers fishing in ICES Subarea VII targeting hake
• Pair trawl VIIIabd HKE: Pair trawl trawlers fishing in ICES Div. VIIIabd targeting hake
• Baca VIIIabd Type I (mixed): "Baca" bottom trawlers fishing ICES Div. VIIIabd targeting a great variety of species (mixed fisheries: monk, hake, cephalopods).

For vessels with base port in the Basque country (Ondarroa and Pasajes), the trawl fleet ("Baca" Otter trawls and Pair trawls with Very High Vertical Opening nets) operating in ICES Division VIIIa, b, d & Subareas VII & VI are studied. The study year was restricted to the year 2002 for accomplishing this year 2004 SG requirement. All the fishing trips obtained from selling sheets for the fleet described above were used in the analysis. All species were included except for those contributing in less than 0.1 % to the total annual landing.

A principal component analysis (PCA) was carried out to obtain a reduced description of the large data set used and to analyse the relationships between the variables. In a second step, a cluster analysis was carried out on the principal components obtained. The grouping of homogeneous individual trips, based on the species composition of landings, resulted in the preliminary identification of five fisheries analysed in combination of the knowledge of the fishery and the characteristics of the current Sampling Program :

- Baca VIIIabd Type II (mixed): "Baca" bottom trawlers fishing in the ICES Div. VIIIa, b, d targeting a great variety of species (mixed fisheries: pout, cephalopods, anglerfish, hake, horse mackerel…)
- Baca trawl VII ANF-MEG: "Baca" bottom trawlers fishing in the ICES Subarea VII targeting Anglerfish and Megrim.
- VHVO Pair VII trawl HKE: Pair trawlers operating with Very High Vertical Opening nets fishing in Subarea VII targeting Hake.
- VHVO Pair trawl VIIIabd HKE: Pair trawlers operating with Very High Vertical Opening nets fishing in the ICES Div. VIIIa, b, d targeting Hake.
- Baca trawl VI BLI-WIT-HKE-ANF: "Baca" bottom trawlers fishing in the ICES Subarea VI targeting a variety of species specially blue ling, witch and hake but also anglerfish and megrim…

No fixed thresholds were established for the percentage of the species in the landings to define the fisheries because for directed fisheries, percentage of target species were distinctly high in relation to the rest of the species. For future analysis, it would be desirable to established fix thresholds to check whether knowledge of the fisheries matches the thresholds analytical approach. The percentage of some of the species assessed in the WGHMM and WGNEPH in relation to the total landings by fishery is presented in Table 3.3.2.

Table 3.3.2 Percentage of landings of some of the species assessed in the WGHMM and WGNEPH in relation to the total landings deployed by each of the new fisheries described above.

Fishery	Gear	Target species	% landings by Stock					
			Northern HKE	ANF VII + VIIIabd	MEG VII + VIIIabd	NEP VII*	NEP VIIIab**	All the rest
Baca trawl VI BLI-WIT-HKE-ANF	Otter bottom trawl	Blue ling, Witch, Hake & Angler	9	(+)	(+)	(+)	(+)	81
Baca trawl VII HKE	Otter bottom trawl	Hake	82	2	3	1		12
Baca trawl VII MEG	Otter bottom trawl	Megrim	7	27	50	0.2		16.8
Baca trawl VII HKE-NEP	Otter bottom trawl	Hake & *Nephrops*	52	20	2	8		18
Baca trawl VII ANF-MEG	Otter bottom trawl	Anglerfish & Megrim	13	28	23			36
Pair trawl VII HKE	Pair trawl	Hake	94	1	1			4
VHVO Pair VII trawl HKE	Pair trawl with VHVO nets	Hake	84	1	0.1			14.9
Baca VIIIabd Type I (mixed)	Otter bottom trawl	Mixed	22	26	7		3	42
Baca VIIIabd Type II (mixed)	Otter bottom trawl	Mixed	10	6	2			82
Pair trawl VIIIabd HKE	Pair trawl	Hake	97	1			0	2
VHVO Pair trawl VIIIabd HKE	Pair trawl with VHVO nets	Hake	90	3	1			6

* Functional Units: 16 (Porcupine Bank) and 20-22 (Celtic Sea).

** Functional Units: 23-24 (Bay of Biscay).

\+ Catches of these species on those sea areas do not belong to Subarea/Divisions VII/VIIIabd but to Subarea VI

The correspondence between the preliminary Spanish trawl fishery definition and the classification carried out during the STECF Lisbon meeting (EC, 2003a) is also presented in Table 3.3.3.

Table 3.3.3 Correspondence between the Spanish trawl fishery definitions given in SGDFF04 and EC (2003a)

Hake Technical measures meeting October 2003 (Lisbon)				**SGDFF 2004**			
Fishing Unit	**Area**	**Gear**	**Target species**	**Fishery**	**Area**	**Gear**	**Target species**
1+16	VI-VII	Long Line	Hake	No redefined			
3+16	VI-VII	Gillnets	Hake	No redefined			
4+16	VI-VII	Otter bottom trawl	Hake	Baca trawl VII HKE	VII	Otter bottom trawl	Hake
				Baca trawl VII HKE-NEP	VII	Otter bottom trawl	Hake + mixed
4+16	VI-VII	Otter bottom trawl	Non-Hake	Baca trawl VI BLI-WIT-HKE-ANF	VI	Otter bottom trawl	Blue ling + Witch + Hake + Anglers
				Baca trawl VII MEG	VII	Otter bottom trawl	Megrim
				Baca trawlVII ANF-MEG	VII	Otter bottom trawl	Anglers and Megrim
				Pair trawl VII HKE	VII	Pair trawl	Hake
4	VII	Pair trawl	Hake	VHVO Pair VII trawl HKE	VII	Pair trawl with VHVO nets	Hake
12	VIIIabd	Long Line	Hake	No redefined			
13	VIIIabd	Gillnets	Hake	No redefined			
14	VIIIabd	Otter bottom trawl	Non-Hake	Baca VIIIabd Type I (mixed)	VIIIabd	Otter bottom trawl	Mixed
				Baca VIIIabd Type II (mixed)	VIIIabd	Otter bottom trawl	Mixed
				Pair trawl VIIIabd HKE	VIIIabd	Pair trawl	Hake
14	VIIIabd	Pair trawl	Hake	VHVO Pair trawl VIIIabd HKE	VIIIabd	Pair trawl with VHVO nets	Hake

The main differences between the two classifications are:

Otter bottom Trawls in all sea areas: distinction between fleets targeting on hake, blue ling, witch, megrim, anglerfish, purely mixed fishery or a combination of all these. Such an increased in number of fisheries was needed due to the very different fishing tactics and consequently catches composition. For instance: the very different catch composition of Baca trawl operating in VIIIabd made necessary a distinction between Type I (purely mixed with slight larger component of Hake and Anglerfish in the landings) and Type II (purely mixed with a larger component of Pout in the landings)

Pair trawls: distinction, for the same sea area, between Pair trawls and Pair trawls operating with Very High Vertical Opening nets although both of them target Hake. However, it was considered that the very distinct characteristics of the gears used were enough justification to establish two different fisheries.

France

The same classification carried out during the Hake Technical Measures (STECF, 2003) meeting in Lisbon in October 2003 was used to define French fisheries in SGDFF 2004.

The French log-books available to IFREMER for the years 2000-2002 were analysed on a daily basis (fishing sequence). Depending of the area and the gear used, each of these fishing sequence was allocated in a "métier"

according to various thresholds of target species (or group of species) contributing to the total landings from this fishing sequence.

For the Bottom Trawl fishery, in subarea VII or VIII, the relative contribution of Benthic species (Anglerfish, Megrim and cuckoo Ray), Gadoids (Cod, Whiting, Haddock…) and *Nephrops* have been tested against thresholds of 20%, 40% and 10%, respectively.

If Benthic species > 20 % and Gadoids <= 40% and *Nephrops* <= 10%, then the fishing sequence is allocated in the métier: Bottom Trawl in subarea X targeting Benthic species,

If Benthic species <= 20 % and Gadoids > 40% and *Nephrops* <= 10%, then the fishing sequence is allocated in the métier: Bottom Trawl in subarea X targeting Gadoids species,

If Benthic species <= 20 % and Gadoids <= 40% and *Nephrops* > 10%, then the fishing sequence is allocated in the métier: Bottom Trawl in subarea X targeting *Nephrops*,

If none of the thresholds is reached, then the métier is: Bottom Trawl in subarea X targeting Other species.

If, in a fishing sequence, two thresholds are reached simultaneously, then the métier is called mixed and its name relates to the two target species (same if the three thresholds are reached simultaneously).

For simplification, these mixed métiers have been merged according to the following rule:

All the mixed métiers with *Nephrops* are merged in a *Nephrops* mixed metier; the mixed métier Benthic + Gadoids is merged in the Gadoids métier. Given the very high degree of targeting in the Gadoids fishery, very few fishing sequences show thresholds reached for two target species simultaneously. Due to their low occurrence, these rare fishing sequences have been put, arbitrarily, in the métier 'Other' rather than in a 'Gadoids mixed' métier.

For the Gillnet fishery, in subarea VII or VIII, the relative contribution of Benthic species (Anglerfish, Megrim and cuckoo Ray), Hake and Sole have been tested against a threshold of 30%.

If Benthic species > 30 % and Hake <= 30% and Sole <= 30%, then the fishing sequence is allocated in the métier: Gillnet in subarea X targeting Benthic species,

If Benthic species <= 30 % and Hake > 30% and Sole <= 30%, then the fishing sequence is allocated in the métier: Gillnet in subarea X targeting Hake,

If Benthic species <= 30 % and Hake <= 30% and Sole > 30%, then the fishing sequence is allocated in the métier: Gillnet in subarea X targeting Sole,

If none of the thresholds is reached, then the métier is: Gillnet in subarea X targeting Other species.

Given the very high degree of targeting in this fishery, very few fishing sequences show thresholds reached for two target species simultaneously. Due to their low occurrence, these rare fishing sequences have been put, arbitrarily, in the métier 'Other' rather than in a 'mixed' métier.

The previous FU16 (called 'outsiders') comprises information from Bottom Trawlers operating in subareas V and VI and some (very few) information from Gillnetters operating in this area.

The unclassified fishing sequence was put in a métier 'other gear, other species' and it appears under the FU25.

Summary of the métier (within each Fishery Unit) used to describe the French fishery of Gillnetters and Trawlers in the Atlantic waters (subareas V, VI, VII and VIII excluding Division VIId) are presented in the following Table 3.3.4.

Table 3.3.4 Summary of the métier (within each Fishery Unit) used to describe the French fishery of Gillnetters and Trawlers in the Atlantic waters (subareas V, VI, VII and VIII excluding Division VIId)

FU	Area	Gear	Target species
4	VII	Bottom trawl	Benthic
5	VII	Bottom trawl	Gadoids
5	VII	Bottom trawl	Other
8	VII	Bottom trawl	*Nephrops*
8	VII	Bottom trawl	*Nephrops* mixed
9	VIII	Bottom trawl	*Nephrops*
9	VIII	Bottom trawl	*Nephrops* mixed
10	VIII	Bottom trawl	Gadoids
10	VIII	Bottom trawl	Other
14	VIII	Bottom trawl	Benthic
16	V-VI	Bottom trawl	Benthic
16	V-VI	Bottom trawl	Other (Deep)
16	V-VI	Gillnets	Mixed
25	VII-VIII	Other trawls	Other
3	VII	Gillnets	Anglerfish
3	VII	Gillnets	Hake
3	VII	Gillnets	Sole
3	VII	Gillnets	Other
13	VIII	Gillnets	Anglerfish
13	VIII	Gillnets	Hake
13	VIII	Gillnets	Sole
13	VIII	Gillnets	Other

Given that a vessel could have several métiers in a same year, it is not possible to provide a precise fleet description (number of vessels and characteristics) in each of the defined métier. Furthermore, the computation was based on the available log-books only. For the fishery in area VI and VII, the available information can be considered as a representative sample of the whole fishery. This is surely not the case in the Bay of Biscay and the information given by the available log-books should be considered as a biased sample (since available information is rather scarce for the smallest boats).

Ireland

Irish demersal fisheries operating in the areas assessed by the WGSSDS can be characterised geographically into fisheries operating in the Celtic Sea (Divisions VIIf, g & h) and those operating in the West and South West of Ireland (Divisions VIIj & k, VIIb & c).

The Celtic Sea (Divisions VIIf, g & h)

The main target species in this fishery are anglerfish, megrim, cod, whiting, plaice and sole. The main gears used are otter trawls, seine nets and gillnets. The fishery mainly takes place in VIIg on the Smalls, Nymph Bank and Labadie Banks. The main ports are Dunmore East, Union Hall, Kinsale, Kilmore Quay and Helvick. The main by-catch species are haddock, hake, anglerfish, saithe and lemon sole. Since the late 1990's haddock landings have become increasingly more important. Recently, there has also been an important spring fishery targeting cod and whiting in VIIg these fisheries have attracted vessels from elsewhere. The Irish fleet that operates in this area is mainly made up of inshore multi-purpose vessels (15-25m) which spend 5-10 days at sea. In recent years several newly built vessels entered the

Irish fleet. There has been a rise in the number of Irish vessels switching to seine nets in recent years. These vessels are mainly targeting whiting and haddock and receive higher prices because of the good quality of the fish.

The West and South West of Ireland (Divisions VIIj & k, VIIb & c)

The main target species are anglerfish, megrim, hake, whiting, haddock, sole, plaice and cod. The main gears used are otter trawls, twin-rig otter trawls, seine nets and gillnets. The fishery mainly takes place in VIIb, VIIj and on the Porcupine Bank. The main ports are Castletownbere, Dingle, Union Hall and Rossaveal. The main by-catch species are saithe, lemon sole, gurnard and John dory. Haddock substantially during the late 1990's following a series of good recruitments in the mid 1990's. The Irish fleet that operates in this area is mainly inshore (15-20m) and offshore (>20m) multi-purpose vessels which spend 5-10 days at sea. The inshore vessels primarily target sole, turbot and plaice in the bays. The offshore vessels target whiting and haddock on the shelf using trawls and seines. The larger offshore vessels primarily target anglerfish and megrim on the continental shelf slope in VIIj, VIIb & VIIc. There has been a rise in the number of vessels, particularly in Castletownbere, switching to seine gear in recent years. In recent years several newly built vessels entered the Irish fleet and several modern second-hand vessels have recently joined the fleet. There has also been an increase in the number of twin-rig trawlers in the area.

Clustering fishery units by objective methods of analysis based on trip-related data is not currently possible for the Irish fisheries. Fleet definitions are therefore based broadly on gear type and area, with some further division into fisheries within particular gear types based on catch compositions (these issues are further described in Section 3.2).landings have increased

Belgium

Belgium has several flatfish-directed fisheries in the Southern Shelf area, targeting sole, plaice and lemon sole in VIIf,g (with important by-catches of rays, cod, monk, etc.); sole and plaice in VIIh,j,k; and sole in VIIIa,b. Vessels taking part in these fisheries are mostly large beam trawlers with engine powers exceeding 900 HP. Vessels often shift between these areas (and the Irish Sea, VIIa), even during the same voyage, depending on quota availability and catch opportunities.

4 EVALUATION OF DATA QUALITY AND DATA FORMATS

4.1 Evaluation of the data formats available

4.1.1 Formats suggested by SGDFF03

SGDFF 2003 provided data formats for three mandatory files and one optional file. Since then, this format has been applied to German, Danish and Dutch data. Based on the experience from that exercise, the group evaluated the formats and encountered problems with the use of the formats and differences of interpretation due to unclear descriptions. Following this discussion SGDFF proposes some slight revisions of the data formats, and some more precise specifications. The revised data formats plus specifications are given below. These formats have to be used, by country, for all TAC species of which the national catch is above a certain threshold percentage of the TAC; for example the data collection regulation (EU Regulation 1639/2001) states that data should be given if the catch is above 5% of the TAC. The optional data file on length-at-age is not further discussed, but in case it is used, the same header information should be given (according to the same specifications) as in the mandatory catch data file, except for the last line.

Mandatory Catch data

Catch data include total catch weight for a fishery and an optional catch-at-age matrix. Information is organised in a header section giving the fishery description, total catch weight and sampling specific data. The header section is followed by a data section giving catch-at-age information, if available.

Header information:

- ID (this is a unique identifier; e.g. the combination of country, year, quarter, fishing unit, mesh size range, fishery or metier, and area; this is free text with a maximum of 40 characters without space)

- COUNTRY (this should be given according to the code list provided in Appendix 2)

- YEAR (this should be given in four digits)

- QUARTER (this should be given as one digit)

- GEAR (gear should be given according to the code list provided in Appendix 3, which follows the EU data regulation 1639/2001)

- MESH_SIZE_RANGE (the mesh size range should be given according to the code list provided in Appendix 4, which follows the Council regulation 850/98)

- FISHERY (species complex and gear) or métier (species complex, gear and vessel characteristics) (this is free text with a maximum of 40 characters without space; this specification may include e.g. target species, roundfish area or quarter) (a fishery can encompass, e.g. more than one mesh size range; in this case separate records have to be provided, e.g. one for each mesh size range, with the same fishery identification)

- AREA (the ICES division or subarea should be given according to the code list provided in Appendix 5)

- SPECIES (the species should be given according to the code list provided in Appendix 6, which follows the Council Regulation EC 2287/2003)

- LANDINGS (estimated landings in tonnes should be given; if age based information is present, this quantity should correspond to the sum of products)

- DISCARDS (estimated discards in tonnes should be given; if age based information is present, this quantity should correspond to the sum of products)

- NO_SAMPLES_LANDINGS (the number of samples should be given that relate to landings only; a number should be given only if it relates to this fishery only; otherwise "–1" should be given)

- NO_LENGTH_MEASUREMENTS_LANDINGS (the number of length measurements should be given that relate to landings only; a number should be given only if it relates to this fishery only; otherwise "–1" should be given)

- NO_AGE_MEASUREMENTS_LANDINGS (the number of age measurements should be given that relate to landings only; a number should be given only if it relates to this fishery only; otherwise "–1" should be given)

- NO_SAMPLES_DISCARDS (the number of samples should be given that relate to discards only; a number should be given only if it relates to this fishery only; otherwise "–1" should be given)

- NO_LENGTH_MEASUREMENTS_DISCARDS (the number of length measurements should be given that relate to discards only; a number should be given only if it relates to this fishery only; otherwise "–1" should be given)

- NO_AGE_MEASUREMENTS_DISCARDS (the number of age measurements should be given that relate to discards only; a number should be given only if it relates to this fishery only; otherwise "–1" should be given)

- NO_SAMPLES_CATCH (a number of samples should be given here if it relates to catch, i.e. landings and discards; a number should be given only if it relates to this fishery only; otherwise "–1" should be given)

- NO_LENGTH_MEASUREMENTS_CATCH (a number of length measurements should be given here if it relates to catch, i.e. landings and discards; a number should be given only if it relates to this fishery only; otherwise "–1" should be given)

- NO_AGE_MEASUREMENTS_CATCH (a number of age measurements should be given here if it relates to catch, i.e. landings and discards; a number should be given only if it relates to this fishery only; otherwise "–1" should be given)

- MIN_AGE (this is the minimum age in the data section; if minimum age and maximum age are both "–1", no age based data are given; otherwise age data must follow in the data section for each age in the age range MIN_AGE to MAX_AGE; minimum age and maximum age must either both be "-1" or both be not "-1")

- MAX_AGE (this is the true maximum age in the data section (no plus group is allowed); if minimum age and maximum age are both "–1", no age based data are given; otherwise age data must follow in the data section for each age in the age range MIN_AGE to MAX_AGE; minimum age and maximum age must either both be "-1" or both be not "-1")

- Age, No. landed, Wt. landed, Len. landed, No. discard, Wt. discard, Len. discard (this is just a header line; if minimum age and maximum age are both "–1", this line must be present but is ignored and then this is the last line in the record)

Data section:

- Age is a number within the range MIN_AGE to MAX_AGE. No. landed (numbers landed) and No. discard (number discarded) must be given in thousands. Wt. landed (mean weight of landed fish) and Wt. discard (mean weight of discarded fish) must be given in kg. Len. landed (mean length of landed fish) and Len. discard (mean length of discarded fish) must be given in cm; missing values should be given by "-1"; if numbers-at-age are given, both mean weight-at-age and mean length-at-age must be given as well; age based data must be given for all ages consecutively from the minimum age to the maximum age, with number equals "0" if no fish are landed or discarded in this age group; if the number-at-age is "0", "-1" must be given for both mean weight-at-age and mean length-at-age; if no age based information is available, the data section should not be given).

All fields in the header information must be repeated for each set of catch-at-age data for a species. An example of a mandatory catch data record is given below:

ID, SCO.2002.3.OTB.70-79.*NEPHROPS*.4
COUNTRY, SCO
YEAR, 2002
QUARTER, 3
GEAR, Otter
MESH_SIZE_RANGE, 70-79
FISHERY, *NEPHROPS*
AREA, 4
SPECIES, HAD
LANDINGS, 1357
DISCARDS, 789
NO_SAMPLES_LANDING, -1
NO_LENGTH_MEASUREMENTS_LANDINGS, -1
NO_AGE_MEASUREMENTS_LANDINGS, -1
NO_SAMPLES_DISCARDS, -1
NO_LENGTH_MEASUREMENTS_DISCARDS, -1
NO_AGE_MEASUREMENTS_DISCARDS, -1
NO_SAMPLES_CATCH, -1
NO_LENGTH_MEASUREMENTS_CATCH, -1
NO_AGE_MEASUREMENTS_CATCH, -1
MIN_AGE, 4
MAX_AGE, 10
Age, No. landed, Wt. landed, Len. landed, No. discard, Wt. discard, Len. discard
4, 1.4, 5.66, 125.5, -1, -1, -1
5, 0, -1, -1, -1, -1, -1
6, 0.5, 7.34, 135.5, -1, -1, -1
etc.

Mandatory effort data

- ID (this is a unique identifier; e.g. the combination of country, year, quarter, fishing unit, mesh size range, fishery or metier, and area; this is free text with a maximum of 40 characters without space)

- COUNTRY (this should be given according to the code list provided in Appendix 2)
- YEAR (this should be given in four digits)
- QUARTER (this should be given as one digit)
- GEAR (this identifies gear, and should be given according to the code list provided in Appendix 3, which follows the EU data regulation 1639/2001)
- MESH_SIZE_RANGE (the mesh size range should be given according to the code list provided in Appendix 4, which follows the Council regulation 850/98)
- FISHERY (species complex and gear) or métier (species complex, gear and vessel characteristics) (this is free text with a maximum of 40 characters without space; this specification may include e.g. target species, roundfish area or quarter)
- AREA (the ICES division or subarea should be given according to the code list provided in Appendix 5)
- NOMINAL_EFFORT (effort should be given in kWdays, i.e. engine power in kW times days at sea; if nominal effort is not available, "-1" should be given)
- EFFECTIVE_EFFORT (optionally, gear specific effort can be given in other units, to be specified in the next field, than the nominal effort; if effective effort is not available "-1" should be given)
- EFFORT_UNIT (this field should state the unit of effort used for the optional effective effort in the field above; this is free text with a maximum of 40 characters without space; if no effective effort is given, "-1" should be given)

An example of an effort record is given below:

ID, SCO.2001.3.LTRAWL.2
COUNTRY, SCO
YEAR, 2001
QUARTER, 3
GEAR, LIGHT_TRAWL
MESH_SIZE_RANGE, 70-79
FISHERY, *NEPHROPS*
AREA, 4
NOMINAL_EFFORT, 1000
EFFECTIVE_EFFORT, 713
EFFORT_UNIT, hours.hauling.time.x.kW

Mandatory allocation file

The specification of allocation keys may necessitate a multi-stage process, as a list of available allocation keys will not be available until all the national datasets have been submitted. Preferences for allocation keys should be supplied to the ICES data-coordinator in a separate file. The allocation keys may need to be separate for landings and discards. More on the choice of allocation keys is written in section 4.2.

The format of the file would be:

- ID (a unique id; this is the ID used for the fishery without full catch-at-age set)
- ALLOCATION_TYPE (this is the type of allocation; id (I) or descriptive text (T))
- LANDINGS_DISCARD (this is a code for what kind of data to be estimated; landings, discards or both (L/D/B)

- NUMBER_OF_KEY_IDS (this is the number of allocation keys to be used, since several keys can be amalgamated into one)

- KEY_ID (the id(s) of the fishery to be used as an allocation key, or free text describing how to allocate data; if more than one key is to be used, key ids should be separated by a comma).

An example of an allocation file is given below:

ID, ENG.2001.3.TRAWL.2
ALLOCATION_TYPE, I
LANDING_DISCARD, L
KEY_ID,SCO.2001.3.LTRAWL.2

4.1.2 Other fisheries database formats

The SG attempted to evaluate the developments of international fisheries data exchange formats in ICES and the EC/DG14, in relation to fishery-based analyses.

BALTCOM System

ICES is investigating the extent to which the "Baltcom system" (Jansen and Degel, 2003) could be applied generally in the ICES area. The Baltcom database is a haul-by-haul (or by station) database for observer onboard programmes of the Baltic countries. Baltcom thus contains samples which contain all details on gear, fishing operation and catch composition (age distribution of landings and catch). Thus, this international database contains data at the most disaggregated level. To apply it for fishery-based analyses these data should be combined with logbook-data and aggregated to fisheries/metiers level.

European Fisheries Data Collection System (EFDC)

For EFDC, a report on the progress is available (EC; 2003b,c). This report is software-technical report, which focuses on the so-called metadata, that is, data about (basic) data and about the problems involved in transfer of data from member countries to the commission. The report does not give detailed specifications of basic data. Appendix 7 gives a short summary of the European Fisheries Data Collection System (EFDC).

4.2 Sampling procedure in relation to the provision of fishery-based catch-at-age data

Procedures to raise date from sample level to total catch level fall within the remit of the ICES Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS) rather than the present SG. However, the SG notes that the additional stratification imposed by the need to estimate catches at the fleet or fishery level implies additional complexities in terms of data raising, particularly if there is no increase in sampling to account for the increased stratification. The need to estimate age compositions for all strata may mean that it is necessary to establish fill-in rules which define how age compositions for unsampled strata should be estimated from adjacent strata. Where multi-variate analysis techniques such as cluster analysis have been used to explore the definitions of fleets and fisheries, these analyses should also be useful in defining such fill-in rules as they should identify which sampled stratum most closely corresponds to a given unsampled stratum.

The group commented, for the data available, on the current sampling procedure in relation to the provision of fishery-based catch-at-age data, using two criteria:

- Sampling intensity, which refers to the quantity of fish sampled by fishery stratum

- Sampling coverage, which refers to the proportion of landings taken by the fishery sampled relative to the total landings

Sampling intensity has been evaluated for Northern Shelf fisheries (section 4.2.2), while sampling coverage has been evaluated for both the North Sea and the Southern Shelf fisheries (sections 4.2.1. and 4.2.3.).

4.2.1 North Sea, Skagerrak and Eastern Channel

Mandatory data deliveries as specified in the last year's report of SGDFF (ICES, 2003c) were only provided by Denmark, Germany and the Netherlands. Quality and quantity of provided data bases are described below. However, the data available to the study group are not in the amended more detailed format as defined during the meeting and given in section 4.1. Time constraints prevented the update of the available data to conform to the new data format.

Danish landings and effort data for the North Sea and Skagerrak were delivered on the agreed format. Fisheries were defined in accordance to the units used for the national data sampling. The fishery definitions use combinations of gear type, mesh size and landings composition from individual trips.

The defined fisheries are:

- Demersal trawl: bottom trawl and mesh size >=100 mm
- Danish seine: Danish and Scottish seine, all mesh sizes
- *Nephrops* trawl: bottom trawl and mesh size 70-99 mm
- Pandalus trawl: bottom trawl and 35-69 mm mesh size and a catch of industrial species less than 5% and max 500 kg herring.
- Beam trawl: beam trawl and mesh size >=80 mm
- Cod-fixed gear: fixed gear and cod as the economically most important species
- Sole-fixed gear: fixed gear and sole as the economically most important species
- Hake-fixed gear: fixed gear and hake as the economically most important species
- Turbot-fixed gear: fixed gear and turbot as the economically most important species
- Plaice-fixed gear: fixed gear and plaice as the economically most important species
- Industrial: trawl and mesh size <32 mm whit industrial species catch
- Brown shrimps: beam trawl and brown shrimp as the economically most important species
- Hooks: hooks applied
- Stake net: stake net applied
- Herring Purse seine: purse seine used and herring as the economically most important species
- Herring Trawl: trawl used and herring as the economically most important species
- Mackerel Purse seine: Purse seine and mackerel as the economically most important species
- Mackerel Trawl: Trawl and mackerel as the economically most important species
- Other: all other fisheries and trips without logbooks (mainly small vessels)

Landings were given by age group for the species cod, haddock, plaice, haddock and sole. Discard data were not available yet. The Danish sampling system uses area and marked size category as the basic stratification unit to transform landings weight into catch-at-age data. Landings by species and marked size class are available from each individual trip such that catch-at-age data can be derived for each trip and aggregated to fleet level. Such system does

however, make it impossible to give sampling level by individual fleets as required in the exchange format. Effort is given as KWdays.

The German fishing activities were classified into 7 fishing units according to gear types, namely dredges (DRB), demersal seines (DS, Scottish and Danish seines), gillnet (GN), demersal otter trawl board (OTB, single and pair trawled), pelagic otter trawl board (OTM, single and pair trawled), and small (TBB<221 kw) and big beam trawls (TBB≥221 kw). Further identifications of fisheries targeting a specific catch composition were not made. For each of the 7 fishing units and the 7 main species, required data of official landings, working group landings and discards as well as sampling intensities and fishing efforts were selected from the national data bases and provided to the SGDFF. The data are further disaggregated by area (3AN, 4, 6AN, 7D) and quarter for 2002 in the specified formats. While there is lots of new discard estimates in the various fishing units given, assessment relevant data of catch and discards in numbers-at-age and weights-at-age were only obtained for cod caught by otter trawl board during the second quarter 2002 in Division 4 (North Sea) and saithe during all 4 quarters 2002 caught in Division 4. German sampling efforts sum up to 7,337 length measurements and 3,677 age determinations. Table 4.2.1.1. gives an overview of landings by species and fishing unit and indicates availability of assessment relevant biological sampling data.

Table 4.2.1.1 2002 German landings by species in tonnes and in percentage by fishing units. Availability of assessment relevant sampling data by species and fishing units is indicated by bold figures.

FISHING UNIT	COD	HAD	NEP	PLE	POK	SOL	WHG
DRB	0	0	0	0	0	0	0
DS	45.8	23.9	0	2.8	3.1	0	6.4
GN	0.8	0	0	0.1	0	9.9	0
OTB	**48.9**	67.4	76.1	45.9	**96.9**	1.4	72.4
OTM	0	7.1	0	0	0	0	9.1
TBB<221	0.4	0	3.4	9.6	0	16.3	0.2
TBB>=221	4	1.5	20.9	41.5	0	72.4	11.8
Total landing (t)	2107	1091	120	3956	11467	760	347

The Dutch fishing activities were classified into 2 fishing units according to gear types, namely beam trawl (TBB, flat fish and shrimps) and demersal trawls (OTB, twin riggers, single and pair trawlers), both fishing in division 4. Further identifications of fisheries targeting a specific catch composition were not made. For each of the 2 fishing units and the 4 main species, required data of official landings, working group landings and discards, numbers-at-age, weights-at-age, and lengths-at-age, as well as sampling intensities and fishing efforts were selected from the national data bases for 2002 and provided to the SGDFF in the specified formats. Discards in numbers-at-age, weights-at-age, and length-at-age were only obtained for sole, while discards in numbers-at-age could be obtained for plaice. Table 4.2.1.2 gives an overview of landings by species and fishing unit and indicates availability of assessment relevant biological sampling data.

Table 4.2.1.2 Dutch landings by the specified fishing units as percentages of total Dutch landings assessment relevant sampling efforts by fleet, quarter and species.

Fishing unit	PLE	SOL	COD	WHG
TBB	**100**	**100**	**49**	**50**
OTB			**51**	**50**
Total landing (t)	29928	12913	4675	2449

4.2.2 Northern Shelf

Mandatory data requirements specified in ICES(2003c) were only provided by Ireland and UK(Northern Ireland). The coverage and quantity of available landings and sampling data for 2002 were assessed on an area basis, i.e., ICES Division VIa (West of Scotland) and VIIa (Irish Sea). Fisheries for the Northern Shelf were mostly defined by gear type, area and vessel size for individual trips. Catch composition was only used to define *Nephrops* directed fisheries (except for UK(N Ireland)).

The largest proportion of the demersal fisheries in the waters to the west of Scotland is taken by the Scottish fisheries. Since data related to these fisheries were not available to the SG, a detailed assessment of the effort distribution between fisheries/fleets and the coverage and quantity of data, based only on the Irish and N Irish data, was not performed for Division VIa.

An overview of the relative contribution of fisheries/fleets to the landings of assessed species in the Irish Sea is given in Table 4.2.2.1. Landings data were based on official landings statistics. Estimates of unallocated catches and discards are only available for a small number of fisheries. To give an consistent view between countries of fishery contributions to fishing mortality in Division VIIa, these estimates were not included. *Nephrops* are the most important species in terms of landings in the Irish Sea, thus fisheries directed to this species have the highest proportional contribution to the total catch. *Nephrops* landings were divided by fishery, implying the combination of Functional Units used by the WGNEPH. A large number of fisheries exploit the demersal stocks in the Irish Sea; however, only 7 of the 27 fisheries take more than 5% of the total catch of the assessed species.

Estimates of quantities discarded are poorly estimated for Division VIIa. Discard estimates of cod, haddock, plaice and sole are patchy and variable in quality. Time-series and better quality discard data are available for the Irish and N Irish *Nephrops* trawlers, but are limited to whiting and are included in the annual catch data and assessment for the stock.

Table 4.2.2.1 Percentage of total reported landings of ICES Division VIIa cod, haddock, *Nephrops*, plaice, sole and whiting taken by fisheries/fleets in 2002.

Fishery	Fishery description	COD	HAD	NEP	PLE	SOL	WHG	Total
FR_ALL	French otter trawlers	9.1	11.3	<0.1	1.3	0.8	3.9	2.9
BEL_TBB	Belgian beam trawl	10.9	3.6	0	39.7	73.7	4.3	12.3
IR_DRB	Irish dredge	0	0	0	0	0	0	0
IR_GN	Irish gillnet	14.2	0.8	<0.1	0	0.1	2.3	2.7
IR_FPO	Irish pots	0	0	0	0	0	0	0
IR_LHP	Irish hand- & pole-lines	0	0	0	0	0	0	0
IR_OTB	Irish otter trawl	13.9	19.1	7.1	10.0	1.7	31.1	10.2
IR_OTB_ND	Irish *Nephrops* trawl	3.7	3.7	26.7	3.5	0.7	0.7	15.1
IR_PTB	Irish pair trawl	0	0.2	<0.1	<0.1	<0.1	0.9	0.1
IR_SSC	Irish seine net	0.6	5.8	<0.1	0.6	0	3.2	0.8
IR_TBB	Irish beam trawl	2.8	1.5	0	8.6	7.7	1.1	2.2
IR_MWT	Irish midwater trawl	0.2	0.2	0	0	0	0.2	0.1
NI_LOT_3	NI light otter trawls	2.7	3.5	2.1	0.4	0.2	2.4	2.0
NI_PT_12	NI pair trawls	2.3	1.8	0	0.9	0	3.1	0.8
NI_SEI_22	NI seine nets	0.1	0.2	0	0.3	<0.1	0.9	0.1
NI_SNT_13	NI single *Nephrops* trawl	6.6	11.2	50.2	2.5	0.5	4.9	28.4
NI_SVM_10	NI midwater trawl	21.6	19.8	0.1	4.2	0.1	25.5	7.1
NI_TN_14	NI twin *Nephrops* trawl	4.0	6.9	8.4	3.0	0.3	3.4	6.1
SC_LT	Scottish light trawl	0.3	0.8	0.2	0	0	0.7	0.3
SC_NT	Scottish *Nephrops* trawl	0.3	2.4	0.1	0.4	0	1.9	0.4
SC_SEI	Scottish seine net	0.2	2.7	<0.1	0.3	0	2.4	0.4
EW_TBB	E&W beam trawl	0.4	0.2	0	3.0	11.8	0.3	1.3
EW_GN	E&W gillnet	0.5	0	0	0.1	0	<0.1	0.1
EW_LL	E&W longline	0.2	<0.1	0	0	0	<0.1	0
EW_NT	E&W *Nephrops* trawl	0.5	0.1	2.2	3.0	0.4	0.9	1.6
EW_OTB	E&W otter trawl	5.0	4.2	2.8	18.1	1.8	6.1	5.1
EW_other	E&W other	<0.1	0	0	0	0.1	0	0
Total catch (t):		2638	1175	7481	1612	1074	614	14594

The sampling intensity for fisheries, where data were available, was reviewed by expressing the approximate total weight of samples to the total landings by fishery (Table 4.2.2.2). Fisheries are generally well covered by the current sampling procedure in terms of length sampling, and non of the fisheries contributing more than 5% of the landings by species lack length sampling data. Information on age sampling is patchy and was not assessed. Similar coverage of age data, however, is considered less critical in terms of selectivity. The level of sampling related to number of trips or hauls was not investigated. Some of the sampling intensities given are very low for some fisheries and should be evaluated. Possible redistribution of sampling effort between fisheries might be required, but should be weighted by the relative contribution to landings. No essential alterations in sampling procedures could be identified or recommended.

Table 4.2.2.2 Sampling intensity (length measurements) in 2002 depicted by expressed sample weight as a percentage of the total reported landings by fishery for ICES Division VIIa. The availability of sampling data was indicated, where the sampling intensity could not be calculated. No value indicates fisheries contributing <1 t to landings. Discard data were not quantified. Question marks indicate fisheries that contribute to landings, but no sampling information has been provided to the SG.

Fishery	Fishery description	COD	HAD	NEP	PLE	SOL	WHG	Discard
FR_ALL	French otter trawlers	?	?		?	?	?	
BEL_TBB	Belgian beam trawl	Y	N	N	Y	Y	N	Y
IR_DRB	Irish dredge							
IR_GN	Irish gillnet	0.18	0				?	
IR_FPO	Irish pots							
IR_LHP	Irish hand- & pole-lines							
IR_OTB	Irish otter trawl	0.45	0.40	Y	0.15	1.23	0.13	
IR_OTB_ND	Irish *Nephrops* trawl	0.08	0.14	Y	0.02	0.15	0.42	Y
IR_PTB	Irish pair trawl	0	2.81				0	
IR_SSC	Irish seine net	0	0		0		0.16	
IR_TBB	Irish beam trawl	2.73	3.21	N	0.64	0.61		
IR_MWT	Irish midwater trawl	0	0				0	
NI_LOT_3	NI light otter trawls	2.27	0.86	Y	?	?	0.30	
NI_PT_12	NI pair trawls	0	0.25		0		0.27	
NI_SEI_22	NI seine nets	0	0		0		0	
NI_SNT_13	NI single *Nephrops* trawl	1.71	1.18	Y	?	?	0.59	Y
NI_SVM_10	NI midwater trawl	1.00	0.83	N	?	?	0.03	
NI_TN_14	NI twin *Nephrops* trawl	2.72	1.44	Y	?	?	0.83	
SC_LT	Scottish light trawl	?	?	Y			?	
SC_NT	Scottish *Nephrops* trawl	?	?	Y	?		?	
SC_SEI	Scottish seine net	?	?		?		?	
EW_TBB	E&W beam trawl	?	?		?	?	?	
EW_GN	E&W gillnet	?						
EW_LL	E&W longline	?						
EW_NT	E&W *Nephrops* trawl	?	?	Y	?	?	?	
EW_OTB	E&W otter trawl	?	?	Y	?	?	?	
EW_other	E&W other					?		

4.2.3 Southern Shelf

Mandatory data deliveries as specified in ICES(2003c) were only provided by Spain and France.

Spanish fisheries were defined in accordance to the units used for the national data sampling and new analyses presented in this SG (Castro *et al*., 2004; Santurtún *et al*., 2004). The fishery definitions use combinations of gear type, area, port and landings composition from individual trips. Landings were given by age group for the species hake, anglerfish (both species), megrim and *Nephrops*. Discard data were only available for megrim of "Baca trawl VII MEG". ALKs used for structuring catches by ages, obtained under the current sampling program, resulted suitable for all the new fisheries except for Northern hake in "Baca trawl VII MEG".

In the provided data bases, the fisheries for which age-structured information is available represent a high coverage for all stocks except for *Nephrops* in the Bay of Biscay (Table 4.2.3.1). Catches of that stock are lower than that limit established for sampling by the EU Regulation 1639/2001. *Nephrops* data were split by area instead of Functional Units (as is used in WGNEPH) due to the difficulty of allocate properly the correspondent landings in the new fisheries proposed. Due to this fact, no essential alterations in sampling procedures could be identified or recommended.

Table 4.2.3.1 Percentages of 2002 Spanish landings by stock and by fishery units. (The fisheries covered by the National Sampling Program are indicated by bold figures by species).

	Stock percentage landings by fishery					
	HKE NS	MON NS	ANK NS	MEG NS	NEPH VII*	NEPH VIIIab**
Baca Trawl VI	**1.0**					
Gillnet VI	**0.7**					
Long line VI	**0.6**					
Baca trawl VII ANK-MEG	**0.8**	**5.6**	**7.8**	**6.5**	17.2	
Baca Trawl VII HKE	3.4		0.8	0.1	2.9	
Baca Trawl VII HKE-NEP	**8.9**	**16.0**	**4.8**	**0.4**	**71.5**	
Baca Trawl VII MEG	**3.8**	**63.9**	**69.5**	**91.4**	8.4	
Pair Trawl VII	4.2		0.2	0.2		
VHVO Pair Trawl VII	**1.4**	**0.2**	**0.7**	0.2		
Gillnet VII	**7.2**	0.5	0.1	0.2		
Long line VII	**26.3**	0.3	0.8	0.2		
Baca VIIIab Type I	**1.6**	**4.9**	**4.2**	**0.6**		73.7
Baca VIIIab Type II[(d)]	**1.6**	**6.8**	**1.9**	**0.9**		26.4
Pair Trawl VIIIabd	**0.5**		0.3	0.2		
VHVO Pair Trawl VIIIabd[(d)]	**28.9**	**1.7**	**1.0**	0.4		
Gillnet VIIIabd	**8.7**	0.6	0.5	0.4		
Long line VIIIabd	**2.6**	0.4	0.3	0.3		
2002 Spanish Total Catch (t)	23779.1	3698.2	2819.9	8624.0	370.6	33.8
% covered	94.7	98.9	89.9	99.8	71.5	0

* Functional Units: 16 (Porcupine Bank) and 20-22 (Celtic Sea).

** Functional Units: 23-24 (Bay of Biscay).

[(d)] Fishery units with discard sampling.

The market sampling of the French landings is made by fishing units, as defined in section 3.3. Fishing effort and landings at age data, disaggregated by fishing unit, were made available to the SG for the following stocks: Northern hake, Celtic Sea *Nephrops*, Bay of Biscay *Nephrops*, anglerfish in VII and VIII (*Lophius piscatorius* and *Lophius budegassa*). The landings by fishing unit are shown in Table 4.2.3.2.

Table 4.2.3.2 Landings by fishing unit and by stock, as available to SGDFF04. The fishing units for which age-structured information is available have been highlighted.

FU	Area	Gear	Target	HKE_North	LPI_West	LBU_West	COD_Celtic	NEP_Celtic	NEP_Biscay
4	VII	Bottom trawl	Benthic spp.	424	3 916	1 257	408	0	0
5	VII	Bottom trawl	Gadoids	625	2 416	148	5 394	0	0
8	VII	Bottom trawl	*Nephrops*	216	922	386	1 328	5 249	0
9	VIII	Bottom trawl	Nephrops	1 109	223	102	0	0	7 448
10	VIII	Bottom trawl	Gadoids	1 147	88	12	0	0	0
12	VIII	Long line	Hake	52	0	0	0	0	0
14	VIII	Bottom trawl	Benthic spp.	0	1 488	785	0	0	0
16	V-VI	Gill nets	Mixed	234	0	0	0	0	0
25	VII-VIII	Other trawls	Mixed	634	0	0	52	0	0
3	VII	Gill nets	Mixed	4 612	2 146	31	70	0	0
13	VIII	Gill nets	Mixed	2 704	0	0	0	0	0
Total				**11754**	**11198**	**2721**	**7252**	**5249**	**7448**
Total sampled				**5635**	**11198**	**2721**	**6722**	**5249**	**7448**
% sampled				**48%**	**100%**	**100%**	**93%**	**100%**	**100%**

For most stocks, the sampling covers most, if not all the fishing units contributing to the total landings. For hake however, one important fishing unit (FU 3) is not covered. For this stock, discard information is available for FU 9 and 10.

5 MODEL DEVELOPMENT ISSUES

At its previous meeting the SG reviewed the models available to perform mixed-fishery forecasts and identified the MTAC approach as the only tool available for use to advice which accounted for mixed-species effects based on single-species assessments and advice. Even so, the SG was unable to endorse MTAC as a standard tool for mixed species

forecasts, due to problems associated with numerical stability and absence of appropriate testing and documentation. Intersessional work has resolved these issues (Vinther *et al*, 2003), and the approach was tested further during WGNSSK 2003, and used again during a European Commission meeting on mixed fisheries in October 2003 (EC, 2003d).

While the SG's earlier concerns about the MTAC approach have been addressed, the SG still considered that it would be useful to discuss possible future development of mixed species models, both in terms of identifying and possibly correcting limitations of the MTAC approach, and also considering longer-term, more strategic developments of mixed-species forecast models.

5.1 MTAC and Relative Stability

A practical limitation of the MTAC approach within a European context is the limitations on quota flexibility imposed by the concept of Relative Stability. This is a basic tenet of the European Common Fisheries Policy which means that annual fishing opportunities are allocated to nations on the basis of fixed allocation keys. It is much more straightforward to define fishing opportunities in terms of a total TAC than in terms of fishing effort hence relative stability is usually expressed as national shares of a total TAC. MTAC adjusts individual fleet effort factors in order to arrive at overall mixed-species TACs. This can mean that the implied national shares of these mixed-species TACs do not correspond to relative stability allocations. This in turn can lead to problems with the credibility of the values and their acceptance by national administrations.

To address these issues, the SG considered whether it would be desirable to include national quota shares as an additional constraint within the MTAC program. The MTAC approach is by nature a compromise. It is used to derive TAC advice using fleet-based catch information. The estimated mixed-species TACs represent the values which could hypothetically be achieved if it was possible to adjust the individual fleet efforts according to the estimated fleet factors. For various practical reasons, including relative stability, it will not normally be possible to achieve this. Many of these practical reasons relate to management through TAC rather than effort control.

In relation to its present implementation, MTAC output now includes a diagnostic to indicate how overall fleet shares change between input and results, and this can be used to give an indication of deviations from relative stability. Further, by selecting inputs so that all fleets are required to change their effort to the same extent, it is possible to produce results where the national quota shares will not change between inputs and outputs, and hence approximate relative stability. However, this would mean that for instance a fleet which caught hardly any cod would be subject to the same effort limitations as a directed cod fleet. This illustrates the nature of the compromises which will always arise when attempting to account for mixed fishery effects. Such problems are an attribute of mixed fisheries themselves rather than the MTAC approach. Such compromises may also mean that for instance the resultant advice may not result in all stocks being returned to within safe biological limits.

In addition to these points, there are also technical reasons why it would be less than straightforward to implement relative stability constraints. It would require a more direct optimisation approach than is used at present, and previous experience with this is that there are problems with finding a unique solution with this approach. Further, any attempt to include e.g. relative stability or other constraints in MTAC, would add complexity through the need for the user to provide additional weightings.

On the basis of the above points, the SG concluded that it would not be appropriate to incorporate relative stability constraints within MTAC.

5.2 Long-term considerations for development of mixed fishery models.

The longer-term application for mixed-fishery approaches is their incorporation in medium- to long- term projections to give advice on harvesting and management strategies, particularly in relation to multi-annual harvest control rules. It would be desirable for such projections to incorporate a wide range of features including implementation error, biological interactions, a variety of possible management objectives and performance measures, different recruitment models, etc. However, from the point of view of technical interactions, the key point to include would be to model the response of fleets to management measures. The approach used at present uses fleet catch information from previous years and assumes that these will remain static in the future. As ACFM (2003) note, "*In many jurisdictions fishermen have demonstrated the ability to reduce by-catch of critical species, through season, area or gear modifications, or changes in their short-term fishing patterns. There is a danger that the allocation of fishing opportunities for different species based on past catch compositions will lock fisheries into their historical context, and provide no incentive for industry to find ways to fish without catching species that are restrictive on fleet activities. Such adaptive changes in fishing behaviour are difficult to predict but to the extent that they occur, they will limit the realism of mixed fishery*

forecasts." These concerns are even more relevant to attempts to incorporate mixed fishery considerations in multi-annual projections.

Some progress has been made in relation to modelling fleet responses to management measures (see Section 2.3) but the data requirements to perform such analyses and make such models operational are substantial and greatly in excess of what is currently available. While some progress in this area may be made in EC-funded projects such as TECTAC and EFIMAS, it is desirable that any models developed can be made operational. One implication is that suitable data would be available for use in the model. It is possible that in the future data of sufficient quality and detail may become available for some areas, but it would also be desirable to develop simpler, more robust approaches which would be usable in relatively data-poor situations. It is not at present clear what such approaches might involve.

6 CONCLUSIONS

Several approaches have been undertaken to define fleets and fisheries in the different areas being investigated. The approaches taken were driven by data availability, but also traditional savoir-faire in the research institutes. For the North Sea and the Northern shelf areas, fleets were defined based on gear definitions and fishing areas visited. Fisheries were defined by various combinations of gear, area, mesh size and catch compositions. For the southern shelf, fleets were referred to as fishing units, and were identified by grouping vessels using the same gear and having a similar activity, as identified from the catch profiles (e.g. *Nephrops* or gadoids fleets). Fisheries were then defined according to the main target species within each activity.

Catch-at-age by fleet were provided by some countries in each area. However, the SG was of the opinion that the current sampling by national institutes is generally more suited to derive age-structured information by stock than by fisheries.

The MTAC model has been further evaluated by the SG. The group considered that MTAC was an appropriate short-term fix. However, the group also recognised that models should be developed in the medium-term to accommodate several processes including biological interactions, fleet adaptation, recruitment dynamics, in the provision of mixed-species forecasts.

The shift towards the routine provision of data and advice on a fishery basis is proving to be a substantial task, with implications for national sampling schemes as well as how data are compiled. Notwithstanding the caveats above, the SG has made progress in providing fleets and fisheries definitions, and also in compiling data on a fishery basis for some areas and nations. Many of the limitations on making further progress on these issues relate to availability of data to national institutions, or to limitations of staff time available to work on data extractions and analysis, and are thus factors which are beyond the control of the present SG.

The group acknowledges that mixed-fisheries issues have taken an increasing weight in ICES advice, and that more focus should be dedicated to such issues. However, the group was uncertain of the future role of SGDFF, at least in the short-term. The group was of the opinion that the role of SGDFF should be restricted to providing technical support to assessment WGs. In that case, there would hardly be any need of convening SGDFF in 2005, since the technical support provided by SGDFF04 (definitions of fleets/fisheries/métiers and of data formats), should be applicable for several years in the future.

7 RECOMMENDATIONS

In its report on the mid-term revision of EU Regulation 1639-2001, the STECF's Sub-Group on Research Needs (SGRN) notes that:

> There is increasing recognition that a fishery-based approach should be used when collecting data on quantities caught, landed and discarded (Module E) and when sampling commercial landings and discards for length and age (Module H). In view of this, there is a clear need to be able to disseminate data to the lowest level of disaggregation.
>
> *SGRN accepts that there is a need for flexibility in data collection, to allow fleets to be sampled at the level of metiers (where possible). This shift in approach will increase the required levels of sampling for length (and age), which in turn will impact on costs. SGRN is not in a position to evaluate the effects of this shift and recognises the need for further clarification at a later stage. In the meantime, SGRN recommends that MS plan collection and aggregation of the data under Modules E and H by fleet segment or metier when they set up their sampling programmes.*

SGDFF strongly supports this view, and recommends that countries should not wait for the revision of EU Regulation 1639-2001 to start setting up data collection programs for (a) fishing effort, (b) quantities caught, landed and discarded, and (c) length and age composition of catches, landings and discards, by metier of fishery rather than by stock (as is currently required by the Regulation).

SGDFF recommends that Assessment WGs adopt the data-exchange format proposed by SGDFF (Section 4.1) for the submission and compilation of data in order to facilitate fleet/fishery-based assessments and analyses.

8 WORKING DOCUMENTS

[WD1] Rätz, Hans-Joachim. SMP, a programme for Short-term Multi species/multi fleets stock and catch Projections.

The programme calculates mixed fisheries catches constrained by minimum spawning stock biomass values at the start of the year after the TAC year and maximum fishing mortality during the TAC year for up to 6 jointly exploited species. Such constraints could be set to the precautionary reference points in fisheries management or any other values to be defined through mixed fisheries considerations. The programme is designed to determine weighted fishing mortality factors (effort factors) for up 80 fleets and 6 stocks, for which age structured analytical assessments are available (up to 20 age groups). Fleet weighting is based on the contribution of the fleets to the total fishing mortality of the species (F reference) and can be manipulated by species weighting. Resulting stock parameters, such as exploitation patterns, catch in numbers, catch in weight, stock in numbers, stock in weight, spawning stock in numbers and spawning stock in weight-at-age will be predicted for each species aggregated over all fleets. Partial exploitation patterns, catch in numbers and in weight-at-age disaggregated for each fleet will also be determined. These results will be aggregated for each species and given for the 3 projection years, the assessment year (intermediate prediction year), the TAC year (assessment year + 1) and the following year (assessment year +2). Given the necessary inputs (SSB and F constraints, stock parameters, fleets' specific F) the application of the programme is not dependent of scientific advice. The programme does not account for any assessment error or bias. Such drawbacks could be accounted for when specifying the constraining minimum spawning stock biomass or maximum fishing mortalities. The programme code is written in Visual Basic for Applications and uses an EXCEL workbook and its spread sheets as input and output forms.

[WD2] Ulrich, C., and Andersen, B. Dynamic of Danish fisheries, and flexibility of Danish fleets activity between 1989 and 2001.

The Danish fishermen can be characterised by the diversity of their fishing practices (in terms of fishing gears and target species), and by their flexibility in operating in several different practices throughout the year. We describe the fluctuations in time of this flexibility between 1989 and 2001. A number of fisheries are identified, describing the fishing trips. Fishing vessels are then gathered into fleets, on the criteria of their main fishery by year. We investigate to which extend the fleets modified their activity over time, and to which extend individual vessels shifted from one fleet to another. We show that the flexibility differ between areas and gear, but that some general trends can be observed. Generally, it appears difficult to consider the areas as independent management units, as the fleets mobility between all areas from the Baltic Sea to the North Sea is relatively high. These results are aimed to be further used in the modelling of fishermen's reaction to technical measures.

[WD3] Clarke, L. A Brief Report on Defining Fisheries using Scottish Demersal Reported Landings Data for the North Sea .

We define Scottish fisheries using cluster analysis of the landings composition of Scottish demersal reported landings data for the North Sea in 2000-2002. We use the percentage weight landed by species (or species group) i.e. the landings composition for each trip to define the clusters. The cluster analysis identifies a clean *Nephrops* fishery and several small clean fisheries targeting plaice, mackerel, squid or sandeels. These fisheries can be easily defined by gear and mesh-size. The remaining mixed demersal fishery is split into several smaller categories, landing large percentages of haddock or monkfish on average, for example. These fisheries are more difficult to define for management purposes, using simple combinations of gear, mesh-size and fishing area. However, their locations could be used to define areas in which to reduce fishing effort. Consultation with experts and the industry is now required.

[WD4] Castro, J, Rasero, M., and Punzon, A. A preliminary identification of fisheries for the Spanish trawl fleets in the European Southern Shelf..

Cluster analysis was used to classify the Spanish trawl fishery catching demersal resources in the ICES Subarea VII and Divisions VIIIabd. Classification of individual trips based on the species composition of landings resulted in the identification of six catch profiles, whose potential applications in assessment and management are discussed.

[WD5] Santurtun M, Prellezo R., Lucio P., Iriondo A. and I. Quincoces. A first Multivariate approach for the dynamics of the Basque trawl fleet in 2002.

From the multivariate analysis performed to the Basque trawl fleet operating in Div. VIIIa, b, d and Subareas VI and VII, and the previous knowledge of the fishery five main trawl fisheries have been obtained. These preliminary results have to be considered carefully as a more detailed studies would be desirable to be carried out to explain for possible seasonality of the fisheries. In the meantime, the main difference between the vessel of the sample is the share of ling, tusk, megrim and hake in the total catch of the vessels, the area where they are mainly fishing: Subarea VI, VII, or Div. VIIIa, b, d, and the different way the fleet operate: Otter bottom trawler ("Baka") and VHVO Pair trawlers.

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APPENDIX 1

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APPENDIX 2

COUNTRY CODES TO BE USED IN THE MANDATORY FILES.

COUNTRY	CODE
Belgium	BEL
Denmark	DEN
Estonia	EST
Finland	FIN
France	FRA
Germany	GER
Ireland	IRL
Latvia	LAT
Lithuania	LIT
Netherlands	NED
Norway	NOR
Poland	POL
Portugal	POR
Portugal (Azores)	POR
Russia	RUS
Spain	SPN
Sweden	SWE
United Kingdom (Jersey)	GBJ
United Kingdom (Guernsey)	GBG
United Kingdom (Alderny/Sark/Herm)	GBC
United Kingdom (England and Wales)	ENG
United Kingdom (Isle of Man)	IOM
United Kingdom (Northern Ireland)	NIR
United Kingdom (Scotland)	SCO
Other countries	OTH

APPENDIX 3

GEAR DEFINITIONS IN EU DATA REGULATION 1639/2001, WITH SGDFF GEAR CODES.

TYPES OF FISHING TECHNIQUES			**Gear code**
Mobile gears	Beam trawl	<221kW	SMALL_BEAM
		>=221kW	LARGE_BEAM
		Outside North Sea	BEAM
	Demersal trawl & demersal seine	Bottom trawl	OTTER
		Danish & Scottish seiners	DEM_SEINE
	Pelagic trawl & Seiners	Pelagic Trawl	PEL_TRAWL
		Pelagic seiner & purse seiner	PEL_SEINE
	Dredges		DREDGE
Passive gears	Longlines		LONGLINE
	Drift & fixed Nets		GILL
	Pots & traps		POTS

APPENDIX 4

MESH SIZE RANGES IN COUNCIL REGULATION 850/98.

Gear type	Mesh size range
Mobile gears	<16
	16-31
	32-54
	55-69
	70-79
	80-99
	100-119
	>=120
Passive gears	10-30
	50-70
	90-99
	100-119
	120-219
	>=220

APPENDIX 5

ICES DIVISION AND SUBAREA CODES TO BE USED IN THE MANDATORY FILES. THE WGS CONSIDERED ARE WGNSSK, WGNSDS, WGSSDS, WGNEPH, WGHMM. COMBINATIONS OF SUBAREAS WITHIN A DIVISION (E.G. 8ABD) ARE ALSO ALLOWED.

North Sea, Skagerrak, Eastern Channel
3an
4
6an
7d

Northern Shelf
2
3a
6
6a
6b
7
7a

Southern Shelf
7b
7c
7e
7f
7g
7h
7j
7k
8a
8b
8d

Iberian Peninsula
8c
9a

APPENDIX 6

SPECIES AND CODE LIST FOLLOWING THE COUNCIL REGULATION (EC) NO 2287/2003 OF 19 DECEMBER 2003, FIXING FOR 2004 THE FISHING OPPORTUNITIES AND ASSOCIATED CONDITIONS FOR CERTAIN FISH STOCKS AND GROUPS OF FISH STOCKS, APPLICABLE IN COMMUNITY WATERS AND, FOR COMMUNITY VESSELS, IN WATERS WHERE CATCH LIMITATIONS ARE REQUIRED, ANNEX I.

Common name	Alpha-3 code	Scientific name
Albacore	ALB	*Thunnus alalunga*
Alfonsinos	ALF	*Beryx spp.*
American plaice	PLA	*Hippoglossoides platessoides*
Anchovy	ANE	*Engraulis encrasicolus*
Anglerfish	ANF	*Lophiidae*
Antarctic icefish	ANI	*Champsocephalus gunnari*
Antarctic toothfish	TOP	*Dissostichus eleginoides*
Atlantic catfish	CAT	*Anarhichas lupus*
Atlantic halibut	HAL	*Hippoglossus hippoglossus*
Atlantic salmon	SAL	*Salmo salar*
Basking shark	BSK	*Cetorhinus maximus*
Bigeye tuna	BET	*Thunnus obesus*
Birdbeak dogfish	DCA	*Deania calcea*
Black scabbardfish	BSF	*Aphanopus carbo*
Blackfin icefish	SSI	*Chaenocephalus aceratus*
Blue ling	BLI	*Molva dypterigia*
Blue marlin	BUM	*Makaira nigricans*
Blue whiting	WHB	*Micromesistius poutassou*
Bluefin tuna	BFT	*Thunnus thynnus*
Capelin	CAP	*Mallotus villosus*
Cod	COD	*Gadus morhua*
Common sole	SOL	*Solea solea*
Common shrimp	CSH	*Crangon crangon*
Crab	PAI	*Paralomis spp.*
Dab	DAB	*Limanda limanda*
Flatfish	FLX	*Pleuronectiformes*
Flounder	FLX	*Platichthys flesus*
Forkbeards	FOX	*Phycis spp.*
Greater silver smelt	ARU	*Argentina silus*
Greenland halibut	GHL	*Reinhardtius hippoglossoides*
Grenadier	GRV	*Macrourus spp.*
Great lantern shark	ETR	*Etmopterus princeps*
Grey rockcod	NOS	*Lepidonotothen squamifrons*
Haddock	HAD	*Melanogrammus aeglefinus*
Hake	HKE	*Merluccius merluccius*
Herring	HER	*Clupea harengus*
Horse mackerel	JAX	*Trachurus spp.*
Humped rockcod	NOG	*Gobionotothen gibberifrons*
Kitefin shark	SCK	*Dalatias licha*
Krill	KRI	*Euphausia superba*
Lantern fish	LAC	*Lampanyctus achirus*
Leafscale gulper shark	GUQ	*Centrophorus squamosus*
Lemon sole	LEM	*Microstomus kitt*
Ling	LIN	*Molva molva*
Mackerel	MAC	*Scomber scombrus*
Marbled rockcod	NOR	*Notothenia rossii*
Megrims	LEZ	*Lepidorhombus spp.*
Northern prawn	PRA	*Pandalus borealis*
Norway lobster	NEP	*Nephrops norvegicus*
Norway pout	NOP	*Trisopterus esmarki*
Orange roughy	ORY	*Hoplostethus atlanticus*
‘Penaeus' shrimps	PEN	*Penaeus spp*

Plaice	PLE	*Pleuronectes platessa*
Polar cod	POC	*Boreogadus saida*
Pollack	POL	*Pollachius pollachius*
Porbeagle	POR	*Lamna nasus*
Portuguese dogfish	CYO	*Centroscymnus coelolepis*
Redfish	RED	*Sebastes spp.*
Red Seabream	SBR	*Pagellus bogaraveo*
Roughead grenadier	RHG	*Macrourus berglax*
Roundnose grenadier	RNG	*Coryphaenoides rupestris*
Saithe	POK	*Pollachius virens*
Sandeel	SAN	*Ammodytidae*
Seabass	BSS	*Dicentrarchus labrax*
Short fin squid	SQI	*Illex illecebrosus*
Skates and rays	SRX-RAJ	*Rajidae*
Smooth lantern shark	ETP	*Etmopterus pusillus*
Snow crab	PCR	*Chionoecetes spp.*
South Georgian icefish	SGI	*Pseudochaenichthys georgianus*
Spanish ling	SLI	*Molva macrophthalmus*
Sprat	SPR	*Sprattus sprattus*
Spurdog	DGS	*Squalus acanthias*
Swordfish	SWO	*Xiphias gladius*
Toothfish	TOP	*Dissostichus eleginoides*
Tope shark	GAG	*Galeorhinus galeus*
Turbot	TUR	*Psetta maxima*
Tusk	USK	*Brosme brosme*
Unicorn icefish	LIC	*Channichthys rhinoceratus*
Velvet belly	ETX	*Etmopterus spinax*
White marlin	WHM	*Tetrapturus alba*
Whiting	WHG	*Merlangius merlangus*
Witch flounder	WIT	*Glyptocephalus cynoglossus*
Yellowfin tuna	YFT	*Thunnus albacares*
Yellowtail flounder	YEL	*Limanda ferruginea*

APPENDIX 7

EUROPEAN FISHERIES DATA COLLECTION SYSTEM (EFDC)

System Purpose

The European Fisheries Data Collection System is an information system that will be operated and maintained by Directorate General of Fisheries. The aim of the system is to collect and store Aggregated data that are derived from the national programmes set up by the Member states of the European Union (EU) for the collection and management of fisheries data in accordance with the Commission Regulation (No. 1639/2001).

The system is expected to provide the Commission with information necessary to assess and evaluate the fish resources, fishing activity and economic activity in the European Community. It is expected that the system will aid the Commission by providing with consistent information in electronic format that will eventually improve the scientific analysis. To be more specific, the system must provide:

Storage (temporary) of data including:

- Fisheries data for capacity and effort;
- Fisheries data for catches and landings;
- Economic data for fisheries and processing industry;
- Data on recreational fisheries;
- Survey results;
- Biological data.

Aggregation and homogenisation of data;

Access to aggregated and homogenised data to staff in the Commission in order to curry out scientific analyses of data.

The system must be capable of:

- Receiving and processing data from different Member States at different levels of aggregation.
- Support queries at higher levels of aggregation using the correct aggregation rules.
- Produce a set of Aggregated tables.

System Scope:

The scope of the European Fisheries Data Collection System (EFDC) is defined by the need to provide the European Commission (EC) with biological and fisheries information in order to facilitate the assessment of fish stocks per regional fisheries organisation and evaluate the economic situation of the fisheries sector.

The European Commission has developed a process to standardise the exchange of biological and fisheries economic data within the European Community, under the Commission Regulation (No. 1639/2001).