

# ICES PGCCDBS REPORT 2010

ICES ADVISORY COMMITTEE

ICES CM 2010/ACOM:39

## Report of the Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS)

1–5 March 2010

Lisbon, Portugal



**ICES**

International Council for  
the Exploration of the Sea

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## Executive summary

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The Planning Group on Commercial Catches, Discards and Biological Sampling [PGCCDBS] (Co-Chairs: Christoph Stransky, Germany, and Kjell Nedreaas, Norway) met 1–5 March 2010 in Lisbon, Portugal. The Planning Group and workshops are proposed in response to the EC-ICES Memorandum of Understanding that requests ICES to provide support for the Data Collection Framework (DCF; EC Reg. 199/2008 and 665/2008, Decisions 2008/949/EC and 2010/93/EU). PGCCDBS is the ICES forum for planning and co-ordination of collection of data for stock assessment purposes; it coordinates and initiates the development of methods and adopts sampling standards and guidelines. Many activities in this group are closely linked to the activities of the DCF, and DG MARE of the European Commission is a member of PGCCDBS to ensure coordination with the DCF activities. Stock assessment requires data covering the total removal from the fish stocks and the PG serves as a forum for coordination with non-EU member countries where appropriate. Since 2007, Mediterranean scientists have organised a Mediterranean Planning Group for Methodological Development (PGMED) to deal with specific sampling issues of this area. Although organised in an autonomous group, it was agreed among all scientists that the contact and cooperation between the Mediterranean area the ICES area should be promoted and maintained. The link between the two planning groups is maintained through: (i) the organisation of parallel meetings; (ii) the organisation of joint plenary sessions for generic issues, and (iii) the organisation of joint workshops.

Last year's recommendations and intersession work were reviewed. Most of them were concluded with success and those not concluded gave rise to developments carried out during this year.

The intersession work was related to developing guidelines to improve the use of results from age calibration exercises in assessment working groups, to evaluate sex-separated maturity ogives when estimating SSB, and to develop statistical tools for comparison of maturity stages assignments of samples at workshops to assess the significance of agreement/disagreement among laboratories. This work is still in progress. PGCCDBS finds it very useful to link this work and development with the COST-FRESH network (COST Action on 'Fish Reproduction and Fisheries'). The WebGR (Web Services for Support of Growth and Reproduction Studies) and COST (Common Open Source Tool) projects have also been further developed intersessionally, and will be finished, presented and used during 2010. Some of the intersessional work was presented at a theme session (N) during the ICES Annual Science Conference 2009 dedicated to 'Quality and precision of basic data underlying fish stock assessment and implications for fishery management advice'.

The Group reviewed reports from relevant Expert Groups with respect to recommendations addressed to PGCCDBS. As feedback mechanism from data users (mainly assessment WGs and benchmark assessment WKs) to the PG, 'data contact persons' have been nominated with a set of tasks to report on data problems etc. PGCCDBS will act as an advisory group on the further development of InterCatch. InterCatch is a web-based system to ease the data handling for assessment purpose and as documentary system of fish stock assessment data. Further improvement of InterCatch needs to be addressed with urgency. Recent changes in data collection (e.g. through the revised EU DCF) were reviewed and the need for workshops was defined.

Workshops have become an important tool to deal with tasks required by the PG. At the moment, there are two types of workshops: methodological workshops that deal with general methods of applications to all areas/species/fisheries; and calibration workshops that include age reading and maturity staging and deal with promoting agreement among scientists classifying otoliths and gonads of specific species or groups of species. All workshops are carried out as official ICES workshops and the reports stored on the PGCCDBS documents repository (<http://www.ices.dk/reports/acfm/pgccdb/PGCCDBSdocepository.asp>). The results of the several workshops on methodology, maturity staging and age reading were presented and discussed. In general, there was a good acceptance of the work done so far although several issues were identified that require improvements.

The methodological workshops WKACCU, WKPRECISE and WKMERGE previously initiated by PGCCDBS have provided valuable general knowledge in how catch sampling programs can be designed and the reports are beneficial for countries aiming to improve the current situation. PGCCDBS further stresses the need to establish a methodological support system for catch sampling and suggests that a series of workshops be set up and the findings presented in a reference book, as this is missing at the present time. The main aim with the series of workshops would be to provide countries with enough support to design and implement scientifically sound and transparent sampling programs enabling quality assessment of estimates used for stock assessment.

Self-sampling programs are under development in many countries. The PG recommends to look at the outcomes from two ICES Wks using fishers to sample catches to get some valuable guidance, and encourages the countries to analyse the data collected from the self-sampling programmes and observer programmes to be able to validate the effectiveness and quality of the data collected.

Guidelines for organizing otolith exchanges, workshops on age calibration and on maturity staging were updated and will ensure that the key issues are addressed in a consistent manner. Based on the reviewed information, a set of small otolith exchanges (brill, black spot sea bream, red mullet and striped red mullet, North Sea sprat, Spanish mackerel, tusk, megrim, sea bass) and full otolith exchanges (European eel; European Atlantic sardine; anglerfish and black-bellied angler; Baltic, North Sea and Black Sea turbot; roundnose grenadier) are planned for 2010-2011. Furthermore, methodological workshops (practical implementation of statistical sound catch sampling programme, and the use of commercial fleets in tuning assessments), age reading workshops (Greenland halibut, salmon, sardine, eel, and age readers coordinator meeting) and maturity workshops (redfish and Greenland halibut, herring and sprat, gadoids and some flatfish species) were proposed for 2011-2012.

The report also contains a full and updated list of national age readers and coordinators.



## 1 Introduction

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### 1.1 Terms of Reference

2009/2/ACOM39 The **Planning Group on Commercial Catches, Discards and Biological Sampling** [PGCCDBS] (Co-Chairs: Christoph Stransky, Germany, and Kjell Nedreaas, Norway) will meet in Lisbon, Portugal, 1–5 March 2010, to:

- a) Review and follow up of last year's recommendations and intersession work;
- b) Review reports from PGCCDBS contact persons with Assessment Working Groups. Where appropriate propose changes to sampling strategies, protocols, and levels to be proposed for implementation within the EU Data Collection Regulation and national centres responsible for sampling commercial catches;
- c) Identify changes or proposals for changes in data collection, that may have a potential impact on stock assessment, and summarise these changes for consideration by the Assessment Working Groups;
- d) Report on the implementation of the Quality Assurance Framework (QAF) into stock assessments and advise on the further development of Inter-Catch;
- e) Review available methods and equipment to improve the data collection from fisheries. Report on the effectiveness of self sampling programmes versus traditional observer programmes;
- f) Agree a workplan for 2011 for further developing and finalising standards and best practices for sampling commercial fisheries.

### 1.2 Participants

First name	Last name	Country
Margaret	Bell	UK-Scotland
Ken	Coull	UK-Scotland
Jørgen	Dalskov	Denmark
Christian	Dintheer	France
Mónica	Felício	Portugal
Włodzimierz	Grygiel	Poland
Maria	Hansson	Sweden
Ernesto	Jardim	Portugal
Kélig	Mahé	France
David	Maxwell	UK-England
William	McCurdy	UK-Northern Ireland
Kelle	Moreau	Belgium
Cristina	Morgado	ICES Secretariat
Estanis	Mugerza	Spain
Kjell	Nedreaas*	Norway
Gráinne	Ní Chonchúir	Ireland
Maris	Plikshs	Latvia
Jukka	Pönni	Finland

First name	Last name	Country
Wolfgang Nikolaus	Probst	Germany
Antonio	Punzón	Spain
Tiit	Raid	European Commission (JRC)
Herwig	Ranner	European Commission
Dália	Reis	Portugal
Katja	Ringdahl	Sweden
Marie	Storr-Paulsen	Denmark
Christoph	Stransky*	Germany
Els	Torreele	Belgium
Edwin	van Helmond	The Netherlands
Sieto	Verver	The Netherlands
Francesca	Vitale	Sweden
Jon Helge	Vølstad	Norway
Lotte	Worsøe Clausen	Denmark
Lucia	Zarauz	Spain
Annemie	Zenner	Belgium

\*Co-chairs

### 1.3 Background

The Planning Group and workshops are proposed in response to the EC-ICES MoU that requests ICES to provide support for the Data Collection Framework (DCF; EC Reg. 199/2008, 665/2008; Decisions 2008/949/EC and 2010/93/EU).

PGCCDBS is the ICES forum for planning and co-ordination of collection of data for stock assessment purposes; it coordinates and initiates the development of methods and adopts sampling standards and guidelines. Many activities in this group are closely linked to the activities of the DCF, and DG MARE is a member of PGCCDBS to ensure coordination with the DCF activities. Stock assessment requires data covering the total removal from the fish stocks and the PG serves as a forum for coordination with non-EU member countries where appropriate.

The PG shall develop and approve standards for best sampling practices within its remit and for fisheries in the ICES area. The implementation of these practices is discussed regionally and implemented nationally.

The PG coordinates initiatives for workshops and other activities to address specific problems. The success of the workshops requires a substantial amount of preparatory work in the laboratories. This preparatory work is the responsibility of the national laboratories. ICES has been informed that this work is included in the DCF National Programmes.

There are four EU Regional Co-ordination Meetings (RCMs) relevant to the PG work: 1) North Sea and Eastern Arctic, 2) Baltic Sea, 3) North Atlantic, 4) Mediterranean. A fifth RCM, on Long-Distance Fisheries, was established at the same time of this PG meeting. These RCMs are fora where EU Member States discuss how best to implement their National Programmes.

#### 1.4 General introductory remarks and work plan

The PGCCDBS has increasingly become a more action-based group that could plan and execute tasks. With this in mind, the experts attending the group accepted to always go beyond recommending, by providing actions, identifying responsibilities and defining schedules to fulfil the tasks proposed.

PGCCDBS took on some tasks and defined intersession work to be carried out during 2010. The tasks, their coordinators and deadlines were agreed during the meeting and are included in a specific section about intersession work (section 7.4).

Once more, the stabilisation of the ToRs contributed to clarify the role of the PG in the ICES advisory system and largely contributed to an efficient meeting. The work of an expert group like PGCCDBS, with 34 participants from 15 countries, must be built along the years, and finding its role within ICES and having consistent ToRs is of extreme importance.

The meeting was organised in small subgroups with 4 to 7 scientists dealing with specific tasks. This allowed the group to be more efficient and promoted a wider contribution to our final results.

The use of online tools to deal with our tasks and support the meeting organisation was extended. The SharePoint site was used to store background information and presentations, revise sub-group results and report sections. These tools supported the development of our work and created conditions to continue our tasks intersessionally.

#### 1.5 Cooperation with PGMED

Since 2007, Mediterranean scientists have organised a Mediterranean Planning Group for Methodological Development (PGMED) to deal with specific sampling issues of this area. Although organised in an autonomous group, it was agreed among all scientists that the contact and cooperation between the Mediterranean area the ICES area should be promoted and maintained.

The link between the two planning groups is maintained through: (i) the organisation of parallel meetings; (ii) the organisation of joint plenary sessions for generic issues, and (iii) the organisation of joint workshops. The last report from PGMED is available under the PGCCDBS Sharepoint

<http://groupnet.ices.dk/PGCCDBS2010/PG%20Med/Forms/AllItems.aspx>.

#### 1.6 Workshops

Workshops have become an important tool to deal with tasks required by the PG. At the moment, there are two types of workshops:

- methodological workshops that deal with general methods of applications to all areas/species/fisheries;
- calibration workshops that include age reading and maturity staging and deal with promoting agreement among scientists classifying otoliths and gonads of specific species or groups of species.

All workshops are carried out as official ICES workshops and the reports stored on the PGCCDBS documents repository, in PDF format and available to the public (<http://www.ices.dk/reports/acfm/pgccdb/PGCCDBSdocepository.asp>), maintained by the ICES Secretariat.

The group continues to promote the idea that the work done in (a group of) certain workshops should be published under the ICES Cooperative Research Report series (CRR) when ready for synopsis. Such a publication should constitute a major contribution to the literature by reporting the state of the art of scientific knowledge regarding a species or a group of species. It is our view that this process will promote quality of this work and will constitute an important recognition of the scientists involved. During 2009, a CRR on hake age calibration was published (Piñeiro *et al.* 2009), and other examples will be promoted (e.g. WKACCU/WKPRECISE outcome).

### 1.7 ICES ASC 2009 Theme Session on Data Quality

The PGCCDBS in 2009 suggested several presentations or posters to the ICES Annual Science Conference in Berlin, Sep. 2009, Theme Session N: Quality and precision of basic data underlying fish stock assessment and implications for fishery management advice. The conveners were: Philippe Moguedet (European Commission), Ernesto Jardim (Portugal), and Kaija Metuzals (Canada). Almost all contributions from PGCCDBS members were accepted and presented:

- N:01: J. H. Vølstad, D. Skagen, S. Aanes, and M. Pennington: Evaluating the effects of uncertainty in age-length keys and tuning indices on analytical assessment and quota recommendations for fish stocks
- N:04: Joël Vigneau: COST - A generic tool for raising and estimating the properties of statistical estimates in fisheries data
- N:06: Kjell Nedreaas, Christoph Stransky, Ernesto Jardim, and Joël Vigneau: Quality assurance framework – the concept of quality assurance applied to fisheries data and its operationalisation under the ICES scope
- N:09: Ernesto Jardim, William James McCurdy *et al.*: WebGR – storing images of biological material and creating a framework to promote the implementation of sound statistical analysis in age calibration
- N:15: Georgs Kornilovs, Jon Helge Vølstad, Daniel Stepputtis, Dankert Skagen, and Tiit Raid: Do the regular age reading exercises improve the quality of assessments? The case of Baltic herring
- N:23: Margaret Bell: Minimum Sampling Programmes - How to deal with a plethora of different protocols [Poster]
- N:24: Lotte Worsøe Clausen and William James McCurdy: ICES calibration workshops – extracting the juice from bonny structures and gonads [Poster]
- N:27: Michael Pennington, Joël Vigneau, and Jon Helge Vølstad: A framework for improving accuracy in fisheries data used in stock assessments [Poster]

The theme of this session was very broad and this was reflected by the variety of talks that were presented, such as modelling, software development, quality control, monitoring (including electronic ones), surveys as well as incorporating effects of uncertainty.

A large number of presentations were focussed on modelling data to obtain precise estimates. It was interesting to note that most scientists are now following model-based approaches, including a strong emphasis on Bayesian modelling, but at the same time moving away from design-based approaches, which were mentioned for simple comparison. Bayesian modelling was addressed specifically during a small discussion period in the session. There seems to be a wide acceptance of this infer-

ence method, while simultaneously the group showed a genuine concern about the shortfalls arisen by the complexity and the consequent difficulty in understanding the concepts that support Bayesian modelling.

It was clear from the different presentations that monitoring is a multidisciplinary approach that must use distinct sources of information and can take advantage of the latest technological developments. Two presentations showing the usage of onboard electronic monitoring (e.g. video cameras plus sensors on winches) to obtain information about real time fishing activities, with lower costs in comparison to observer programmes, were outstanding examples.

It was also shown that sampling errors propagate through the information flow generating imprecise and possibly biased estimates of stock status. The link between the information collected by sampling procedures and the usage of that information was not evident. A talk was given proposing a framework to assure that the quality of the data used for stock assessments is optimum. This suggests that a different procedure is necessary in order to assure that the analyst dealing with the data obtains all the necessary information to make the best decision about the way the data are integrated (e. g. quality control procedures using standards and best practices).

The effects of fish distribution, ranging from patchily distributed species in Alaska to monkfish in the Northern European shelf, on abundance index estimates from trawl surveys were also discussed. Statistical methods to tackle this variability in fish distribution and consequent effects in the abundance indices were proposed.

## **1.8 Project proposal**

The project proposal on the 'Age Determination and Maturity Staging of species not previously subjected to biological sampling for analytical assessments', drafted at and after the PGCCDBS 2009 (ICES 2009, section 1.8), was further developed at this year's meeting and is presented in section 4.4.2.

## **1.9 Organisation of the report**

This report is organised by Terms of Reference (ToR), starting with Section 2 for ToR a) to Section 7 for ToR f). A set of annexes was added including the list of participants, agenda, ToR for 2011, the WK proposals and recommendations, as well as other information that is too spacious for the main part of the report.

## 2 Review and follow up of last year's recommendations and intersession work (ToR a)

The group reviewed last year's PGCCDBS recommendations:

Recommendation	For follow up by	Timeframe	Status at PGCCDBS 2010
PGCCDBS are strongly of the opinion that the improvement of InterCatch needs to be addressed with urgency.	ICES Secretariat	As soon as possible	Partly done, see section 5.2.
PGCCDBS recommends all countries to record data on seal predation on fish, and instances of seals interaction of fishing gears.	National laboratories	From now on	Addressed at PGCCDBS 2009 and RCM Baltic.
PGCCDBS recommends that the scorecard developed by the WKACCU to detect bias in key parameters of importance in stock assessments should be tested at benchmark workshops.	Benchmark WKS	next benchmark WK meetings	Scorecard has been tested at WKROUND 2010 (NEA saithe, southern hake) and WKFLAT 2010 (sole in IIIa and plaice in VIIId); use of scorecard should be part of ToRs for Benchmark WKS (for the preparation of input data to Benchmark assessments)
PGCCDBS recommends that in the future, appropriate data should be collected and the cluster size recorded from which a sample was taken. In general, it is best to collect a few fish for aging from as many clusters as possible. When presenting the results, the effective sample size should be reported since it is much more informative than the total number of fish sampled.	National laboratories	From now on	EU-COM DG-MARE DCF unit to forward to Member States; For non-EU countries, national delegates should ensure that national labs take this recom. into account Liaison Meeting to take into account PGCCDBS recommendations
PGCCDBS recommends that countries consider the effect of intra cluster correlation when completing their length based concurrent sampling programmes, and attempt to attain length samples from as large a numbers of "clusters" as possible.	National laboratories	From now on	EU-COM DG-MARE DCF unit to forward to Member States; For non-EU countries, national delegates should ensure that national labs take this recom. into account Liaison Meeting to take into account PGCCDBS recommendations
PGCCDBS recommends that AWG's complete and include in the report the Table – "Stock Data Problems Related to Data Collection" (Annex 4) as part of their generic ToR b).	Assessment Working Groups (AWGs)	Next AWG meetings	Partly implemented (most AWGs used template); AWG chairs reminded at WGCHAIRS meeting Jan. 2010
PGCCDBS recommends that Member States evaluate potential changes to the continuity of their	National laboratories	From now on	EU Member States are being asked to describe changes in data collection

<b>Recommendation</b>	<b>For follow up by</b>	<b>Timeframe</b>	<b>Status at PGCCDBS 2010</b>
stock assessment fishery data sets caused by the new DCF sampling schemes from 2009 onwards.			by the guidelines for DCF Technical Reports
PGCCDBS recommends that STECF reviews the requirement for recording of each effort variable according to the current and potential future regional requirements of the end users of the data.	STECF	As soon as possible	See Table 4.2.1. in PGCCDBS 2009 report; STECF-SGRN in Dec. 2009 recommended that the collection of these variables should be mandatory for the fisheries metiers that are included in the ranking system according to Commission Decision 2008/949/EC.
PGCCDBS recommends that those involved in future age calibration exchanges and workshops should adhere to the guidelines for both exchanges and workshops as outlined by the PG in its 2008 report.	Chairs of age reading WKS and co-ordinators of otolith exchanges.	From now on.	ICES Secretariat has sent out guidelines to age reading WK chairs in 2009; recommendation repeated this year
PGCCDBS recommends the wide use of the outcome of the WebGR and COST projects, once available (see sections 2.1.6 and 2.1.7, 4.7.1 and 4.7.3).	National laboratories	Once project results are available for implementation.	COST project has finished, WKCOST will be held in April 2010; WebGR has developed webpage, project will finish end of March 2010
PGCCDBS recommends that an analysis on the effectiveness of self sampling programmes versus traditional observer programmes be conducted.	Fisheries Observer Conference 2009, ICES Symposium 2010	PGCCDBS 2010/2011	Dealt with under ToR e), see section 6.3.
PGCCDBS recommends to evaluate (develop guidelines to improve) the use of results from age calibration exercises in assessment working groups.	PGCCDBS intersession work, co-ordinated by Lotte Worsøe Clausen (Denmark) and Loes Bolle (The Netherlands).	PGCCDBS 2010	In progress, see section 4.2.3.
PGCCDBS recommends that Benchmark WKS should evaluate sex separated maturity ogives for each stock, where ogives are available, when estimating SSB. This task may be developed in connection with the FRESH Action (see section 6.2).	PGCCDBS intersession work, co-ordinated by Fran-Saborido Rey (Spain).	PGCCDBS 2010	In progress within the FRESH consortium (see section 4.3.4).
PGCCDBS recommends developing statistical tools for comparison of maturity stages assignments of samples at workshops to assess the significance of agreement/disagreement among laboratories.	PGCCDBS intersession work, co-ordinated by Fran-Saborido Rey (Spain), David Maxwell (UK) and Ernesto Jardim (Portugal).	PGCCDBS 2010	Options on how to develop these tools following the completion of the WebGR project were explored but an approach and source of funding were not found (see section 4.3.6). The issue remains open.

<b>Recommendation</b>	<b>For follow up by</b>	<b>Timeframe</b>	<b>Status at PGCCDBS 2010</b>
PGCCDBS recommends that for new species where no mature data exist, there is no need for workshops and laboratories should use standard protocols developed by WKMAT, until more specific and agreed protocols exist for the concerned species/stocks.	National laboratories	Until specific protocols have been developed.	Still valid.
PGCCDBS recommends that workshops on species following different reproductive strategies should be initiated, such as viviparity and hermaphroditism in fishes, crustaceans and cephalopods.	PGCCDBS	PGCCDBS 2010	WKMSC took place 2009; WKMSSEL, WKMSCEPH and WKMSREGH will take place in 2010; PGCCDBS requests that the FRESH action reports information on the other issues as a way forward, rather than holding specific workshops (section 4.3.5).
PGCCDBS recommends an angler and black-bellied angler otolith exchange		2011	see section 7.2.2.11.
PGCCDBS recommends a blue whiting otolith exchange	Hans Høie (Norway)	2010	In progress, see section 4.2.2.6. Co-ordination changed to Åge Høines & Elna Sælen Meland (both IMR), replacing Hans Høie.
PGCCDBS recommends a brill otolith exchange	Annemie Zenner (Belgium)	2010	Will start in April 2010.
PGCCDBS recommends a North Sea cod otolith exchange	Hans Høie (Norway)	2010	In progress, see section 4.2.2.5. Co-ordination changed to Hildegunn Mjanger (both IMR), replacing Hans Høie
PGCCDBS recommends a North Sea sole otolith exchange	Mark Etherton (UK)	2010	Will be started in April 2010
PGCCDBS recommends a Baltic turbot otolith exchange	Lotte Worsøe Clausen (Denmark)	2010	North Sea and Black Sea turbot will be included, see section 7.2.2.12. Co-ordination changed to Annemie Zenner (Belgium)
PGCCDBS recommends a roundnose grenadier otolith exchange	Kélig Mahé (France)	2009/2010	Will be conducted in 2011, see section 7.2.2.13
PGCCDBS recommends a dab otolith exchange	Christoph Stransky (Germany)	2009	In progress, see section 4.2.2.4. Co-ordinator changed to Ulrich Damm (Germany). WKARDAB will be held in Nov. 2010
Spanish mackerel is only fished by Spain and Portugal and a small exchange should be arranged by those countries alone.	Spain, Portugal		Will be conducted in 2012, co-ordinated by Portugal, see section 7.2.2.5
PGCCDBS recommends investigating the need on holding	PGCCDBS	PGCCDBS 2010	In progress, see section 7.3.1.



<b>Recommendation</b>	<b>For follow up by</b>	<b>Timeframe</b>	<b>Status at PGCCDBS 2010</b>
maturity staging workshops in 2011-12 regarding: Blue Whiting, Megrin, Deep-sea species, Salmon			
PGCCDBS recommends a workshop on methods for merging fleet metiers for fishery based sampling [WKMERGE]	ICES Secretariat	until August 2009	WKMERGE took place 19-22 Jan 2010, see section 5.1.2.
PGCCDBS recommends a Workshop on the Design of Regional Age Sampling Schemes [WKDRASS]	ICES Secretariat	until August 2009	WKDRASS will be postponed to 2011 or 2012, see section 5.1.3.
PGCCDBS recommends a Joint ICES-STEFC Workshop on the implementation of the Common Open Source Tool (COST) [WKCOST]	ICES Secretariat	until August 2009	WKCOST will take place 13-16 April 2010
PGCCDBS recommends a Workshop on ecosystem indicators of discarding [WKEID]	ICES Secretariat	until August 2009	WKEID will take place 28 Sep-1 Oct 2010
PGCCDBS recommends a Workshop on Age Reading of Greenland Halibut [WKARGH]	ICES Secretariat	until August 2009	WKARGH will take place 14-17 Feb 2011
PGCCDBS recommends a Workshop on Age Reading of Greenland Cod [WKARGC]	ICES Secretariat	until August 2009	WKARGC took place 1-4 Sep 2009
PGCCDBS recommends a Workshop on Age Reading of dab [WKARDAB]	ICES Secretariat	until August 2009	WKARDAB will take place 16-19 Nov 2010
PGCCDBS recommends a Workshop on Age Reading of North Sea (IV) and Skagerrak-Kattegat (IIIa) plaice [WKARP]	ICES Secretariat	until August 2009	WKARP will take place 2-5 Nov 2010
PGCCDBS recommends a Workshop on Age Reading of Mackerel [WKAMAC]	ICES Secretariat	until August 2009	WKAMAC will take place 1-4 Nov 2010
PGCCDBS recommends a Workshop on Sexual Maturity Staging of Redfish and Greenland Halibut [WKMSREGH]	ICES Secretariat	until August 2009	WKMSREGH will take place 25-28 May 2010
PGCCDBS recommends a Workshop on Sexual Maturity Staging of Herring and Sprat [WKMSHS]	ICES Secretariat	until August 2009	WKMSHS is included in the ICES Resolutions for 2011
PGCCDBS recommends a Workshop on Sexual Maturity Staging of Elasmobranches [WKMSEL]	ICES Secretariat	until August 2009	WKMSEL will take place 11-15 Oct 2010
PGCCDBS recommends a Workshop on Sexual Maturity Staging of Cephalopods [WKMSCEPH]	ICES Secretariat	until August 2009	WKMSCEPH will take place 8-11 Nov 2010

### 3 Review reports from PGCCDBS contact persons with Assessment Working Groups. Where appropriate propose changes to sampling strategies, protocols, and levels to be proposed for implementation within the EU Data Collection Regulation and national centres responsible for sampling commercial catches (ToR b)

#### 3.1 Review reports from PGCCDBS contact persons with Assessment Working Groups and Benchmark Assessments

The Group reviewed Assessment Working Group and Workshop reports with respect to requests addressed to PGCCDBS. The ICES Secretariat will forward matters directly to RCMs where appropriate.

Table 3.1 Requests from ICES Assessment Working Groups, Benchmark Assessments and Workshops, and PGCCDBS comments.

#### Issues related to catch data collection and methodological improvements:

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
AFWG	<i>S. mentella</i> in Sub-areas I and II	Reportings from the pelagic fishery should be done by country. Lack of biological sampling of the pelagic fishery	NEAFC should require this from those countries who will participate in the fishery. PGCCDBS to propose this for implementation in the EU-DCF and national sampling programs	While EU-DCF covers sampling requirements, sampling at national level is determined by ranking system. However, countries participating in these fisheries must ensure that sampling at regional level meets DCF requirements. To be considered at RCM NS&EA.
AFWG	<i>Sebastes marinus</i> , <i>Sebastes mentella</i> , <i>Sebastes viviparus</i>	Species identification. Species subject to confusion	Proper identification keys and photos; Training courses	Norway will coordinate work with other countries to produce a catalogue with photos and keys for the NorthEast Atlantic.
HAWG	All	Sampling coverage	HAWG encourages the development of guidance on the sampling of landings of flagged vessels landing into different states under the DCF.	PGCCDBS feels that no further guidance is required and this matter has been addressed at RCM level. See comments from RCM NS&EA section 3.2.3 (Regional agreements on collection of data)
HAWG	All stocks	HAWG recommends		See comments from

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
		that all metiers with substantial catch should be sampled (including bycatches in the small meshed fishery). (see Section 2.2.2).		RCM NS&EA and RCM NA.
HAWG	North Sea herring	Guidance on the sampling of landings of flagged vessels landing into different states under the DCF.	PGCCDBS and North Sea RCM	PGCCDBS feels that no further guidance is required and this matter has been addressed at RCM level. See comments from RCM NS&EA section 3.2.3 (Regional agreements on collection of data)
SGBYC	Protected species	Protected species should be considered within the Data Collection Framework	Protected species should be considered within the Data Collection Framework to provide an unbiased and wide ranging overview of some of the environmental impacts that may be caused by fisheries on the marine environment.	PGCCDBS or RCMs are not in a position to request Member States to collect data out of the scope of DCF. PGCCDBS informs SGBYC that basic sampling information is available through the DCF Technical Reports. Additionally, MS have an obligation to report on mammals and this is made available to DG Environment. PGCCDBS recommends that RCM's provide an overview of data collection and availability.
SGBYC		Better coordination on bycatch issues with other ICES groups	Better coordination on bycatch issues with other ICES groups including WGSE, WGEF, WGMME, PGCCDBS to ensure that data collected under the DCF are made available to all groups.	PGCCDBS agrees that better coordination between other ICES Groups is desirable. In order for this to be effective, discussion needs to take place at WGCHAIRS regarding requirements and data availability.
WGDEEP	All	Lack of data from countries who are ICES members and	The working group is unclear as to what the process is to obtain	Should have been addressed by ACOM delegates. PGCCDS

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
		may have deep water fisheries (e.g. Poland, Lithuania, etc.) but are not represented at WGDEEP	data from countries who are ICES members and may have deep water fisheries (eg. Poland, Lithuania, etc.) but are not represented at WGDEEP	recommends that ICES Secretariat provides a list of stocks to WGDEEP and relevant RCM's so that RCM's can provide an overview of data available.
WGDEEP	Roundnose Grenadier	Information on catch and discards is collected by Spanish observers on fishery at Hatton Bank. It would be useful if this information was made available to the working group.	PGCCDBS to request data.	Spain has confirmed that data is available for presentation to AWG.
WGHMM	Ang-78	United Kingdom, Spain and Ireland: Discards provided to WGHMM but not used because of bad quality of the data. (Doubts about the adequacy of raising methodology used).	Application of recommendations of WK Discards (2003) and future WK on discards (2009)	Countries should refer to outcomes of WKDRP (2007) and workshops on discard sampling methodology and raising procedures (Denmark 2003).
WGHMM	Generic	Discards	The WGHMM received several data sets of discards data regarding hake, monkfish, megrim, sole and <i>Nephrops</i> . Most of these data are not used in the assessments due to the short time series. However, the group would like to have more information about the discard data provided in order to better assess their quality. WGHMM requests that discards data be accompanied with information about the number of trips, number of hauls, raising factor and coefficient of variation. WGHMM acknowledges that most data sets provide some information about precision but none provided all the information required.	PGCCDBS notes that the following comment from RCM NA addresses this issue: Countries are recommended to provide information on number of trips, number of hauls, raising factors and coefficient of variation (See ICES WKPRECISE recommendations). Additionally, the WG would like to have information on outlier analyses, if any were conducted and how they were treated. RCM NA also encourages the use of COST tools data investigation and raising.

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
			<p>Additionally the WG would like to have information about outlier analyses, if any. Due to the large variability found in some of the data sets, it is very important to have information about how outliers were treated in order to take decisions about the inclusion of discards data in the assessment.</p>	
WGHMM	Mgw-8c9a	<p>The following data, which would be useful for the assessment, are missing from Portugal: all data relating to discards, length distributions of landings, ALKs</p>	<p>Request the appropriate data from Portugal, with indicators of quality</p>	<p>RCM NA should address this.</p>
WKAGME	Megrim and anglerfish	<p>Migration and growth uncertainty</p>	<p>WKAGME recommends that further tagging studies should be carried out to assess the extent of migration between stock areas and individual growth rates.</p>	<p>PGCCDBS has recommended an exchange on anglerfish age estimation to be held in 2011. PGCCDBS recommends that WKAGME, in conjunction with relative experts, formulate a proposal for a small-scale study to assess the extent of migration for megrim and anglerfish.</p>
WKNEPH-2009	<i>Nephrops</i>	<p>Biological data</p>	<p>Instigate an internationally coordinated project to obtain basic biological data from the various FUs. Data to include growth, natural mortality, burrow occupancy and size of animal in relation to burrow size.</p>	<p>See comments from RCMs. This matter should be addressed by SGNEPS.</p>
WKROUND-2009	Eastern Baltic cod	<p>Seal and fishing interaction</p>	<p>Since the beginning of the '90, grey-seal stocks have increased and thus predation on cod, herring and Baltic salmon has increased.</p>	<p>Addressed at PGCCDBS (2009) and RCM Baltic.</p>

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
			Grey-seals-fishery interaction (gillnetting, trapnets) should be investigated and the effects of predation evaluated	
WKROUND-2009		Multispecies Interactions	International coordinated stomach sampling from the North Sea has not been conducted since 1991. Since then the North Sea environment and ecosystem has changed considerably. Predator assemblages are now less dominated by gadoids and the predator-prey overlap for all species might have changed. For the Baltic multispecies interactions, the stomach content database contains mainly information for the period 1977–1993. Stomach sampling continued from 1994 to 2004, but at a much lower intensity than in the 1977–1993 period. A new international coordinated stomach sampling program is recommended both in the North Sea and the Baltic Sea to track changes in the food web, to be used for estimation of predation mortalities and to facilitate an ecosystem approach to management.	PGCCDBS recommends that WGSAM, in conjunction with IBTSWG and WGBIFS formulate a common proposal to address this issue.
WKROUND-2009		Voluntary Data Provision from Industry	Nationally reported landings are used to estimate total catch and usually include raising factors to account for misreporting and discarding. The successful partnerships established with	This should be included as a recommendation to MIRAC. In addressing this issue, consideration should be given to the outcomes of WKUFS and WKSC.

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
			industry have lead to improved estimates of misreporting and discarding, and there are various self-sampling protocols in existence to encourage this data collection. These voluntary schemes work well and need to be better integrated into the overall national data collection programmes necessary for stock assessment. The WK recommends that ICES further collaborates with industry to provide a stock-by-stock list of data requirements that can be incorporated into national data collection programmes.	
WKDEEP	Deep-water sharks	Discarding is poorly documented. At present this is aspect particular important due to recent TAC restrictions	Development or intensification of collaborative projects with the industry including self sampling and collections of samples for lab analysis. REMARK: The actual fishing reductions is hampering the possibility to follow the evolution of populations	PGCCDBS support these initiatives which should be handled by RAC's. This should be included as a recommendation to MIRAC. In addressing this issue, consideration should be given to the outcomes of WKUFS and WKSC.
WKDEEP	Deep-water sharks	Improvement of species identification	Taxonomic problems on the identification of species include in the Centrophoridae family particularly those occurring at NE Atlantic (e.g. <i>C. granulosus</i> , <i>C. lusitanicus</i> ). Recommendation: There is a need for a project to revise the using for example genetic approach.	PGCCDBS recommends that WGEF draw up proposal for small scale study which could include: a) improvement of logbook recordings by species ID keys & revision of legal requirements; b) establishment of species ID methods by genetics etc.
WKDEEP	Deep-water sharks	Maturity staging of species	<i>C. squamosus</i> and <i>C. coelolepis</i> both exhibit lecithotrophic	PGCCDBS recommends that ICES secretariat

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
			viviparity, however more understanding on their reproductive strategy needs to be addressed. A standard maturity scale need to be adopted and calibration of the criteria between labs need to be addressed. Recommendation: Workshop for standardization of criteria used to assign maturity stages between labs as well as on sampling protocols to guarantee adequate levels of precision	contact the Chair of WKMSEL, Oct. 2010) to ensure that these aspects are included in the Terms of Reference.
WKDEEP	Deep-water sharks	Stock structure	For both species <i>C. squamosus</i> and <i>C. coelolepis</i> it is assumed a unique stock for the whole NE Atlantic, although for the second species the structure into local populations might be admitted. In the future, genetic studies are encouraged possibly under dedicated scientific projects.	PGCCDBS recommends that WGEF draw up proposal for small scale study which should be considered in conjunction with proposed WK on age reading.
WKDEEP	Roundnose grenadier	Misidentified species	Only observers with an experience in the identification of species of grenadier should be sent aboard fishing vessels catching species of grenadier	PGCCDBS regard this as a QA measure for each country.
WKDEEP	Roundnose grenadier	The quality of length measurement is unknown	Some exercises should be made to evaluate between observers (or for the same person) the quality of pre-anal fin length measurement.	PGCCDBS recommends that WGDEEP prepare illustrated definitions on measurement procedures and distribute through RCM's.
HAWG	All stocks	Spatial data and information on sampling coverage and precision needs to be provided and if possible used in the assessment.	PGCCDBS should formulate data requirements	Documentation of the sampling strategies and documentation of the raising has to be established in bilateral agreements



AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
				between countries sampling shared metiers/stocks.
WKFLAT-2009		Data analysis	<p>The workshop identified lpue analysis and standardization as an area for improvement in pre-model data analysis. For some stocks, lpue is calculated simply as annual catch over annual effort (by fleet). While additional factors are taken into account in some lpue analyses (e.g. corrections for horsepower in Belgian VIId sole lpue), a more systematic and statistical approach to deriving lpue (such as use of GLM and related models) would likely improve such model inputs as indices of abundance. The methods by which data are aggregated up to international catch-at-age and other key model inputs also bear closer scrutiny. In particular, an improved statistical basis for error propagation should be adopted. WKFLAT recommends that statistical methods such as use of general linear models and related methods be used to standardize lpue time-series used in assessments. (For a general overview of such methods, see special issue of Fisheries Research 2004 Volume 70).</p>	The PGCCBDS recommend that lpue / cpue should be standardized by a statistical sound method such as GLM. Catch-at-age data can only be analyzed for bias and precision if the countries have a sound and transparent probability- based sampling strategy.
WKROUND-2009	All stocks	Spatial data and information on sampling coverage and precision needs	The results of COST and the new regional co-ordinated Database should help here. All	If COST is the basis for analysis, then the national countries have to ensure that

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
		to be provided and if possible used in the assessment.	countries should make an effort to populate these with the necessary retrospective data.	estimators in COST are appropriate for the actual sampling program in place. For COST to handle the range of sampling, it needs a further development.
WKROUND-2009	Celtic Sea Cod	Catch underestimated	Reported landings data and "landings equivalents" since 2003 are thought to be underestimated. It may be possible to get some estimates of what true landings were from diaries or other sources. This is a major source of uncertainty in the assessment. PGCCDBS may be able to recommend ways of estimating uncertainty and bias in the catch data based on the results of WKACCU and WKPERCISE.	B-ADAPT and SAM has a multiplier. Unreported landing can be a major problem in many stock assessments and the problem should be acknowledged. Alternative methods such as landings/export of the species from the nation can be look into. However as this area is a very important and there are many different solutions, PGCCDBS will recommend a future workshop to address this issue.
WKROUND-2009	Eastern Baltic cod	Unreported landings	Unreported landing is decreasing recently but still problematic for the quality of the assessment. Together with age readings inconsistencies, unreported landings are the major source of uncertainty in the assessment. PGCCDBS may be able to recommend an approach to estimate uncertainty and bias in the catch based on results of WKACCU and WKPRECISE.	PGCCDBS acknowledges that unreported landing can be a major problem in many stock assessments. Alternative methods such as comparing the national landing and export figures of Baltic cod could be compared to obtain an estimate of misreporting. Because of the general importance of estimating levels of misreporting PGCCDBS recommends a future work-shop to address this issue.
WKROUND-2009	Celtic Sea Cod	Discarding & high-grading is poorly documented.	There needs to be an evaluation of sampling levels by fleet required to get precise enough discard estimates for	Self-sampling without quality control can give biased results. However, in combination with

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
			<p>stock assessment. Most countries supply discard data to the WG but sampling levels are low and variable for the main fleets catching cod. Discard rates are also highly variable and changing in response to recruitment and management. There may be scope to develop co-operative projects with industry on self sampling, reference fleets etc.</p>	<p>video, observers program etc. It can improve the data coverage.</p>
WKROUND-2009	Western Baltic Cod	Recreational fisheries	<p>Recreational fisheries are not considered in the assessment although there are indications that recreational fisheries have a high contribution on total removals. A WK on recreational fisheries will be held this year. The outcome of this WK should provide recommendation on recreational fisheries sampling.</p>	<p>The WKSMRF in 2009 and the PGRFS in 2010 have guidelines for setting up a survey program. Denmark has in 2010 started a national survey program for cod.</p>
WKROUND-2009		Commercial Tuning Fleets	<p>Currently standardized research survey cruises are the method of choice for tuning stock assessment models and are used in the North Sea. In the Baltic and Kattegat cod stock assessments a combination of commercial fleets and research surveys are used for tuning. However, research surveys have better spatial coverage and attempt to ensure that catchability is constant from year to year. Commercial fleets tend to have higher catches of larger fish, but</p>	<p>See below</p>

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
			<p>suffer from poor spatial coverage, difficult to estimate technology-creep improvements in catchability, difficulties in standardizing gear types and cross-correlation issues. To improve transparency with the industry and to guide working groups, the WK recommended that a group be struck to provide reference criteria on the use of commercial fleets in tuning assessments.</p>	
WKROUND-2009		Use of Commercial cpue and VMS	<p>A future workshop should be set up to develop guidelines on the types of data and information that need to be supplied, and the relevant factors that need to be taken into account, in order to maximise the utility of commercial cpue and VMS data as inputs to assessment models, or as ancillary information to evaluate the credibility of assessment results. Substantial input from fishing industry representatives, including active participation in such a working group, is required for such a workshop to be successful.</p>	<p>VMS data could give a significant contribution in improving the quality of the CPUE estimates. The PG realized that even the Council Regulation 199/2008 article 15 prescribes that the use of the data also covers e.g. logbook data as well as VMS data not all fisheries research institute have access to these data and therefore not able to carry out analysis such as CPUE estimates. In table xx an overview of the countries/institutes access the two data types is shown. The PGCCDBS suggest that STECF – SGRN take this issue into account. Furthermore, PGCCDBS recommends that a workshop should be established in the autumn of 2011. A DCF Study project: Lot 2: Development of tools for logbook</p>

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
				and VMS data analysis (Call for Tenders – MARE 2008/10) is at present running. This project should be finalized ultimo 2010. The outcome from this project could probably provide useful information for the suggested workshop. (see section 5.3 and Annex 15 for details)
<b>Age reading-related issues:</b>				
AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
AFWG / NWWG	Greenland halibut V, VI, XII, and XIV	Age reading methods	Method described and agreed on. Appropriate joint international reference set.	PGCCDBS refers to WKARGH to be held in Vigo, Spain, 14-17 Feb 2011. PG assumes a reference collection will result from the workshop.
HAWG	Celtic sea herring	Recruitment index	It has long been recognized by HAWG that a recruit index is required for Celtic Sea herring. To achieve this HAWG makes a three-fold recommendation: 1) Update the NI GFS survey data for 0- and 1- ring herring. In order to segregate these by season of spawning otolith techniques should be used. This could provide an index of recruitment for Irish Sea herring and of the abundance of Celtic Sea emigrants in the Irish Sea. 2) The 1-quarter trawl survey, using GOV trawl, conducted in 2009, should continue in subsequent years. 3)	Survey-related request should be dealt with by the respective survey planning groups. PGCCDBS notes that this request goes to WGIPS and IBTSWG as well.

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
			The time allocated to VIIj in the q-4 Celtic Sea acoustic survey has rarely encountered substantial herring abundance. Sacrificing this VIIj acoustic ship time would not jeopardize the existing acoustic index. However the ship time saved could be re-allocated to the q-1 trawl survey mentioned in point 2 above.	
NWWG	Cod offshore Greenland; XIVb	Age reading	Has been forwarded to PGCCDBS, workshop in 2010	WKARGC was held in Sep. 2009, see section 4.2.1.5.
WGANSA	Sardine	Age reading has not been standardized between the VIIIc-IXa stock and outside areas (VII and VIIIa,b)	A workshop in 2010 on sardine age reading is recommended, to standardize age reading methodology and criteria between the different areas.	A workshop is planned for 2011, see section 7.2.3 and Annex 15.
WGANSA	Anchovy in IXa	Age composition	The WGANSA recommends that age composition of anchovy in Division IXa by age readings of otoliths in the Spring Portuguese acoustic surveys is done, and that the support by ICES for such an effort is communicated to the Portuguese institute (IPIMAR).	A methodological workshop is planned for 2012, see section 7.2.3 and Annex 15.
WGCSE	Anglerfish (ang-ivvi)	Age validation and consistency	Anglerfish are currently aged by counting annual rings in either the otoliths or the illicia (lure). There have been suggestions that the methods are not accurate. An exchange should be carried out to ensure that these methods provide consistent	An exchange has been proposed for 2011, see section 7.2.2.11.

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
			ages so that an international catch at age dataset can be collated for use in stock assessments. If possible the validation of both ageing techniques should also take place with reference for example to growth models.	
WGDEEP	Tusk	Tusk length-at-age data availability.	Tusk assessment would be improved by greater availability of length-at-age data. Previously WGDEEP has pointed out that material to run age based assessment has been collected in Va, but has not been worked up due to staff time limitations. Assistance in reviewing this material would be helpful. PGCCDBS and relevant RCMs to consider resources and experience available to assist.	PGCCDBS endorses the recommendation of RCM NS&EA to initiate an exchange between countries interested in age reading of tusk. An otolith exchange has been proposed, see section 7.2.2.6.
WGHMM	Mgw-78	France: No ALK and consequently age composition of landing and weight at age is provided to the WGHMM routinely.	Strong request for providing these data to Member State.	PGCCDBS suggests a collaboration with experienced institute in the age reading of megrim in order to provide requested age information to the working group.
WGHMM	Mgw-8c9a	The following data, which are relevant for the assessment, are missing from Spain: length or age distributions of discards	Request the appropriate data from Spain, with indicators of quality	PGCCDBS supports the request of WGHMM to provide all the necessary data for the working group.
WKACM	<i>M. barbatus</i>	Age reading	New exchange for a new set of <i>M. barbatus</i> otoliths from the Mediterranean should be examined in order to clarify the ageing in this species.	An exchange for <i>Mullus</i> species is proposed for 2011 to address <i>Mullus</i> -related requests, see section 7.2.2.3.

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
WKACM	<i>M. surmuletus</i>	Age reading	New exchange with new sets of <i>M. surmuletus</i> otoliths from Mediterranean, the Biscay Gulf and the English Channel should be organised in order to detect differences between areas.	
WKACM	<i>Mullus</i> sp.	Age reading	The precision and the agreement of age determination in both <i>Mullus</i> species but particularly in <i>M. barbatus</i> need be improved.	
WKACM	<i>Mullus</i> sp.	Age reading	After establishing an agreement for the reading guidelines, a protocol needs to be developed which will be improved by the time.	
WKACM	<i>Mullus</i> sp.	Age reading	More validation studies (e.g. daily increment studies, tagging, length based analysis, marginal increment analysis etc.) are necessary for both species.	
WKACM	<i>Mullus</i> sp.	Age reading	A new Workshop is necessary to be organised in 2011 to take into account the results of the new exchanges.	
WKAGME	Megrim and anglerfish	Age reading and precision	WKAGME recommends that measures be taken to achieve international consensus among age readings for anglerfish and megrim, particularly in stock unit areas such as the northern shelf. This might best be achieved through a collaborative project whose aims should take into account recommendations of	



AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
			previous workshops.	
WKREDS	Redfish	Age determination	Further work on age determination and validation is needed.	PGCCDBS supports the call for further research on redfish age determination and welcomes the recommendations of WKADR 2008.
WKROUND-2009	Eastern Baltic cod	Age reading inconsistencies	Although several age reading workshop were carried out in the past, there is no agreement on a standard age reading criterion between Baltic countries. A project on alternative methodologies is going on, but it seems that there is no obvious solution for this because of lack of validation for age/otolith. Historic length composition data should be available. A workshop devoted to compile length composition data is recommended.	This request is forwarded to WGBFAS. Additionally PGCCDBS recommends to refer to the EU project DECODE (FISH/2006/15 Lot 9) and recent published literature on the matter.
WKSHORT-2009	North sea sprat	Age reading	WKSHORT is unclear as to whether the age reading of sprat otoliths can be achieved with sufficient accuracy and precision for generation of age structured data. Given that there has not been an age reading comparison for this stock since 2004, the Working Group therefore recommends the formation of a workshop with the aims of reviewing past work, investigating new techniques for age reading and answering this	The PGCCDBS recommends setting up a full otolith exchange in 2011 following the PGCCDBS guidelines, see section 7.2.2.4.

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
			important and unresolved question.	
<b>Maturity-related issues:</b>				
AWG/WK	Stock	Data problem	How to be addressed/ by whom	PGCCDBS Comments
WGWIDE	Norwegian spring spawning herring	Maturity at age	Workshop on maturity at age for Norwegian spring spawning herring.	A Workshop on estimation of maturity ogive in Norwegian spring spawning herring (WKHERMAT) will take place during 1-3 March 2010
WKMSC	Crustaceans	Adopt a new 5-stage maturity scale.	scientists involved in research carried out within the framework of the EU DCF	We recommend that a sixth stage, 'abnormal' is included as this can be used as an ecosystem indicator.
WKMSC	Crustaceans	Collect more information and develop methods to distinguish developing from recovering specimens.	scientists involved in research carried out within the framework of the EU DCF	Agree
WKMSC	Crustaceans	Collect always information on occurrence of berried females in <i>N. norvegicus</i> and of spermatophora in <i>A. antennatus</i> and <i>A. foliacea</i> females.	scientists involved in research carried out within the framework of the EU DCF	Agree
WKMSC	Crustaceans	Distinguish males of deep water pink shrimp, giant red shrimp and violet shrimp in juveniles and adult on the basis of petasma status.	scientists involved in research carried out within the framework of the EU DCF	This sounds sensible but we have limited knowledge on the topic.
WKMSC	<i>Nephrops</i>	Separate males of Norway lobsters in juvenile and adult on the basis of morphometric relationships between the appendix masculina and carapace length	scientists involved in research carried out within the framework of the EU DCF	This sounds sensible but we have limited knowledge on the topic.

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
		if available.		
WKMSC	Crustaceans	Recommended 6 tasks for a new WK.		We consider the tasks listed are mainly pre-workshop work. A firm proposal for a new WK was not made, so we recommend that the need for, and details of, a new WK should be considered in PGMED & PGCCDBS 2011
WKMSSPDF	Sole, plaice, dab, flounder	Recommended a new common 6 stage maturity scale		Agree
WKMSSPDF	Sole, plaice, dab, flounder	As it is difficult to identify the proper maturity stage when fish is not clearly developing, data collection for maturity ogives is recommended during the pre-spawning season. This implies that sampling for macroscopic maturity staging for sole, plaice, dab and flounder should be done during late fourth quarter until the end of the first quarter.	Research institutes	Agree
WKMSSPDF	Sole, plaice, dab, flounder	For assessment purposes, only data from one month before the spawning season (to be identified based on the collected data) until the start of the spawning season should be used for the estimation of maturity ogives for sole, plaice, dab and flounder.  Any macroscopic staging outside of this period can be misinterpreted and should not be used	WGNSSK and other assessment groups using maturity data of sole, plaice, dab and flounder.	Agree

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
		for maturity ogives.		
WKMSSPDF	Sole, plaice, dab, flounder	Collecting maturity information outside the defined period might be interesting for scientific purposes other than stock assessment. For these purposes, it is recommended that histological staging is done.	Research institutes	Agree
WKMSSPDF	Sole, plaice, dab, flounder	It is recommended that institutes carry out in-house workshops on the reproductive biology of the fish and maturity staging.	Research institutes	Agree. Record the outcome of these internal workshops on the WKACCU quality scorecard.
WKMSSPDF	Sole, plaice, dab, flounder	It is recommended that the process of trial-discussion-retrial is based on fresh samples. This means that at least two staging sessions on fresh material have to be done during future workshops.	Maturity workshop organisers/ PGCCDBS to add in the guidelines for maturity workshops	Partly agree. Fresh material is definitely important for discussions about stage description but histology ought to be prioritized for stage validation.
WKMSSPDF	Sole, plaice, dab, flounder	It is recommended to use images as a tool for calibration prior to a workshop or to identify the need for future workshops.	Maturity workshop organisers/ PGCCDBS to add in the guidelines for maturity workshops	Agree, guidelines updated.
WKMSSPDF	Sole, plaice, dab, flounder	Based on the experiences of WKMSSPDF, it is recommended to set the maximum fish to stage in one session to 120. This applies for fresh samples as well as pictures.	Maturity workshop organisers	This is a useful guideline for a session. The total numbers to stage should also take into account the species and any sample size requirements for statistical comparisons.
WKMSSPDF	Sole, plaice, dab, flounder	If time allows during a survey, it is recommended to put the content of a gonad under a microscope in case of disagreement or doubt on the maturity stage of a fish.	Research institutes	Agree, where practical. PGCCDBS recommends survey planning groups (WGBIFS, IBTSWG, WGBEAM) review this recommendation and include it in sampling manuals if appropriate

AWG	Stock	Data problem	How to be addressed	PGCCDBS Comments
WKMSSPDF	Sole, plaice, dab, flounder	Recommended Workshop on sexual maturity staging of sole, plaice, dab and flounder in 2012.		Agree with the need for a follow-up workshop based on the percentage agreement reported and the developments made. See Annex 15 for proposal.

### 3.2 Assessment Working Group Contact Person

PGCCDBS (2009) put in place measures identified to improve the effectiveness of the role of the contact person providing feedback to and from assessment groups. For the role to operate effectively, it has proved to be beneficial for the contact person to be closely linked to the relevant assessment group and if possible be involved in the co-ordination and planning work through PGCCDBS or the RCM's. In several cases AWG's and PGCCDBS were in a position to nominate a contact person. Where this has not been done the contact person must be identified, no later than the first day of the AWG meeting by considering the following criteria.

The contact person should be;

- An attendee of the relevant assessment group;
- A participant of PGCCDBS or close contact with an attendee of that group;
- A participant of relevant RCM or close contact with attendee of that group.

In order to assist in the identification of a suitable contact person, PGCCDBS have produced an updated table (Contact person link, Annex 6) identifying the current members attending PGCCDBS and their involvement in RCM's as well as the AWG they may participate in. Participants of the most recent RCM's are listed in the relevant RCM reports. In order for the contact person to function effectively, PGCCDBS envisage that the role should include the following tasks;

- Contact all stock coordinators (and assessors) that the AWG represents in order to identify issues relevant to PGCCDBS;
- Ensure that all issues relevant to PGCCDBS and RCM's are entered in the table - "Stock Data Problems Related to Data Collection" (Annex 5) and that this is included in the report of the AWG;
- In completing the form, the contact person should, where possible, indicate the course of action that they feel is required in order to address the issues identified;
- Provide feedback from PGCCDBS and RCM's to AWG or Benchmark WK;
- Should work in cooperation with ICES secretariat.

The ICES Secretariat should compile the relevant comments from AWG's and forward these to RCM's, PGCCDBS and all ACOM members and EU Commission. This will allow the RCM to consider the issues directed to them and respond accordingly and informs all countries (including non-EU countries) of data issues. This process serves to advise countries of the issues and is not to be regarded as a specific request, only for information. It will also ensure that in planning for harmonisation and coor-

dination of National Programmes for the coming year, the requirements of AWG's are addressed at the earliest opportunity. The RCM's should then advise PGCCDBS of their actions in addressing relevant issues and indicate where further action is required from PGCCDBS.

**Table 3.2. PGCCDBS Data Contact Persons – 2010**

Expert Group	Name	E-mail
AFWG	Åge Fotland	aage.fotland@imr.no
HAWG	Lotte Worsøe Clausen	law@aqua.dtu.dk
NWWG	Heino Fock	heino.fock@vti.bund.de
WGBAST	Tapani Pakarinen	tapani.pakarinen@rktl.fi
WGNAS	No contact person was identified at WGNAS meeting, 22-31 March 2010; ICES Secretariat will provide link	
WGBFAS	Henrik Degel	hd@aqua.dtu.dk
WGHMM	Ernesto Jardim	ernesto@ipimar.pt
WGCSE	Joël Vigneau	joel.vigneau@ifremer.fr
WGNSSK	Alexander Kempf	alexander.kempf@vti.bund.de
NIPAG	Carsten Hvingel	carsten.hvingel@imr.no
WGWIDE	Jens Ulleweit	jens.ulleweit@vti.bund.de
WGANSA	Alexandra Silva (sardine) Andres Uriarte (anchovy Div. VIIIab) Fernando Ramos (anchovy Div. IXa)	asilva@ipimar.pt auriarte@azti.es fernando.ramos@cd.ieo.es
WGDEEP	Neil Campbell	campbelln@marlab.ac.uk
WGEEL	Allan Walker	alan.walker@cefes.co.uk
WGMIXFISH	Alexander Kempf	alexander.kempf@vti.bund.de
WGNEW	Kelle Moreau	kelle.moreau@ilvo.vlaanderen.be
SGBYC	Bram Couperus	bram.couperus@wur.nl
WKFLAT	Joël Vigneau	joel.vigneau@ifremer.fr
WKROUND	Ernesto Jardim	ernesto@ipimar.pt
WKDEEP	Tom Blasdale	tom.blasdale@jncc.gov.uk

## **4 Identify changes or proposals for changes in data collection, that may have a potential impact on stock assessment, and summarise these changes for consideration by the Assessment Working Groups (ToR c)**

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### **4.1 Changes in the EU Data Collection Framework and ICES policy**

The requirement of the Data Collection Framework changed in 2009, so no further changes have occurred. PGCCDBS's comments from last year remain valid and Member States should document changes to national sampling programmes resulting from the new DCF and evaluate their effects on the data series used in stock assessments.

The basis for ICES advice on fish stocks will change from the Precautionary Approach (PA) to Maximum Sustainable Yield (MSY), with 2010 being a transitional year. PGCCDBS does not expect this change to alter data collection requirements in the short-term but over time it may be a further driver to improve knowledge for data-poor stocks.

### **4.2 Age reading-related issues**

#### **4.2.1 Summaries of Age Reading Workshops held in 2009**

##### **4.2.1.1 Workshop on Age Estimation of European hake (*Merluccius merluccius*) [WKAEH]**

The workshop was held in Vigo, Spain, 9-13 Nov 2009. It was preceded by an exchange of digital images of otolith sections from 104 tagged fish recovered during all seasons and for which size at recapture ranged between 25 cm and 67 cm, between laboratories involved in the assessment of the hake stocks, for which the aims were:

- 1) To evaluate the age estimation errors (accuracy and precision) based on a reference collection (otoliths marked with oxytetracycline).
- 2) To subsequently evaluate the relevance of the ageing method traditionally used to provide ALKs for stock assessment purposes.
- 3) To inter-calibrate readers, specifying the interpretation differences (annuli positions).
- 4) To progress in the implementation of quality control and quality assurance (QC/QA) in the labs.

Six calibration exercises were undertaken for and during the workshop where a group of 15 readers participated. Interpretation of tagged material resulted in a general shift towards younger ages (from 0-10 to 1-5 years) for the same otolith/fish collection. This demonstrates the need to develop approaches allowing the integration of a "validated" growth model or age reading errors into the stock assessment model. A preliminary set of guidelines have been established to help the interpretation of otoliths but it will require further refinement using younger and older marked fish to study the structural growth pattern of the otolith. The workshop achieved quite a lot in terms of demonstrating that hake is a much faster growing species than was previously believed and recognised the necessity of working together towards a solution to improve the accuracy and precision of ageing for the assessment. The calibration exercises and general discussions proved positive, by bringing stock assessors, otolith readers and research scientists together, in order to identify the issues and associated consequences of age estimation of hake and to propose some clues to settle this matter.

### Recommendations

- 1) It is recommended to replace the previous criteria for hake estimation with the current evolving guidelines for hake age estimation developed at this workshop. Further research is needed to develop these guidelines to increase the accuracy and precision of ALKs.
- 2) More validated data is required to increase the understanding of the hake otolith growth pattern. This could be achieved by tagging experiments in different areas, including the Mediterranean Sea, and experiments in controlled conditions. Research on the effects of environmental factors on otolith formation should be supported.
- 3) It is recommended that assessment readers re-read a common collection of circa 250 otoliths from previous years, using the new age estimation guidelines. This data could be used to investigate possibilities of providing a transition matrix from the old to the new ALKs. Involved participants will include MI, IPIMAR, IEO, IFREMER, AZTI, COISPA, HCMR
- 4) There should be an annual intercalibration exchange (circa 100 otoliths) in order to check future stability of agreement between age readers. For the next exchange, otoliths from previous workshops should be included in the sample set. These exchanges should be conducted using the new WebGR program which will be available in Jan 2010.
- 5) Another workshop should be performed in three years to continue promoting standardization of methodologies and practices for age estimation of hake based on the current work done. It is recommended readers continue working and discuss by correspondence.
- 6) Continue work on the analysis of tagging, 'daily' ring counting and age readings to: (i) estimate a growth model or, (ii) develop an error transition matrix between ages identified with previous protocol and ages identified with tagged otoliths or daily ring counts. Both approaches would allow the integration of a growth model or age reading errors into the stock assessment model.
- 7) The work undertaken during this WK could be published as a monographic article or in a publication in the ICES CRR series.

#### 4.2.1.2 Workshop on Age Reading of Red mullet (*Mullus barbatus*) and Striped mullet (*Mullus surmuletus*) [WKACM]

The PGCCDBS meeting in 2009 identified Red mullet (*Mullus barbatus*) and Striped mullet (*Mullus surmuletus*) as two species requiring an ageing workshop to evaluate and improve the age interpretation based on whole otoliths and burnt whole otoliths. 6 European Countries (Greece, Cyprus, France, Italy, Spain & UK) and 11 Institutions (including 29 persons) participated at the exchange and the workshop. The workshop was held in Boulogne sur Mer, France, 30 March - 3 April 2009. Two sets of otoliths were chosen, one (60 otoliths) from the CNR-IAMC collection for *M. barbatus* of the Sicily Channel and another (63 otoliths) from the IFREMER collection for *M. surmuletus* of the Eastern English Channel. These two otolith collections included a large range of lengths and age groups, from various time periods and represented two different geographical areas (Mediterranean-North Atlantic). The results of *M. surmuletus* otolith (whole otolith: agreement: 64.3%, CV: 60.7; burnt whole otolith: 71.6, CV: 25.7) and *M. barbatus* (Agreement: 51.6%, CV: 68.5) exchange exercise indicated that ageing of both species could not be considered as easy.



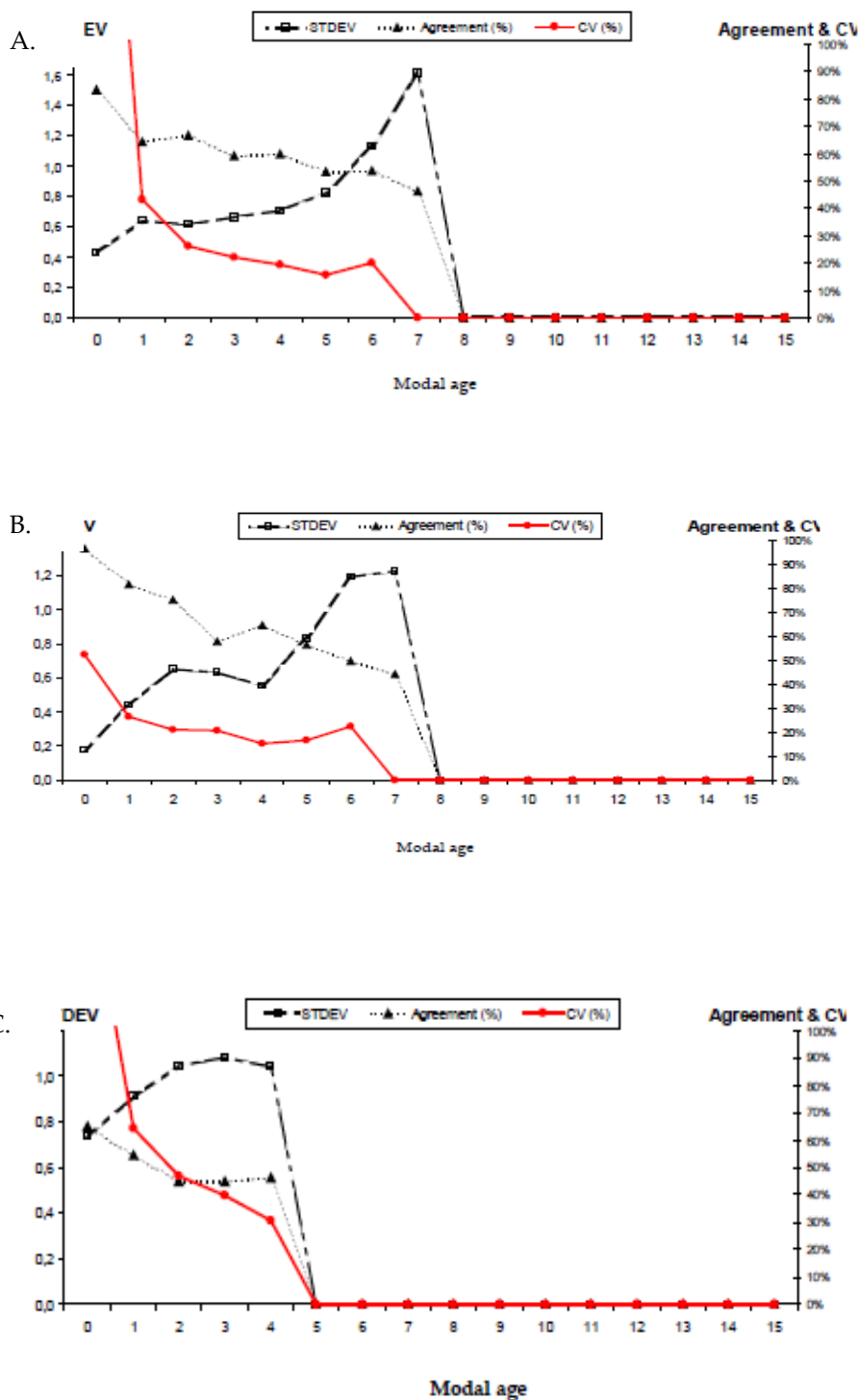


Figure 4.2.1.2 The coefficient of variation (CV%), the percent agreement and the standard deviation (STDEV), from all readers combined, plotted against the MODAL age of the *M. surmuletus* (whole otolith : A ; burnt whole otolith : B) and *M. barbatus* (whole otolith : C) otoliths age readings.

The agreement was in all cases low and the CV was high, particularly for the Mediterranean set of *M. barbatus* otoliths. Mediterranean age readers gave generally better results for the Mediterranean set of *M. barbatus* otoliths (fact that could be related with their experience on the Mediterranean growth pattern) compared with their

north European colleagues. The opposite occurred with the north European set of *M. surmuletus* otoliths.

The sources of bias were:

- Disagreement in the identification of the first annual ring; one group of the readers considered the first ring as the ring of settlement, whereas the majority considered it as the first annual ring.
- Confusion concerning the protocol of reading during the exchange; some of the readers considered as date of birth the 1st of January, whereas others considered as date of birth the 1st of June.
- Confusion concerning the axis of the otolith used for the measurements.
- the poor quality of the images for *Mullus barbatus*

After discussions, a common protocol for interpretation of age has been compiled:

- a blind reading of the otoliths without any information related with the otoliths (e.g. length) except on the date of capture of the specimens.
- consider the 1st of January as date of birth for both species
- hyaline ring at the edge of the otolith during the first semester of the year is considered as annulus.
- hyaline ring at the edge of the otolith during the second semester of the year is not considered as annulus.
- Measurements should be done on the axis derived between the sulcus and the nucleus

The final recommendations of WKACM are:

- 1) Review the results of the new exchanges and compare with those of the previous workshop
- 2) Clarify the interpretation of annual rings and use various validation methods (daily increment...)
- 3) Improve the protocol of the guidelines
- 4) Create a reference collection of well defined otoliths

#### **4.2.1.3 Workshop on Age Reading of European (*Anguilla anguilla*) and American Eel (*Anguilla rostrata*) [WKAREA]**

The Workshop commenced with a review of general eel biology and otolith structure, confirming the main terms and definitions in a glossary. The Workshop also reviewed the report of the 1987 EIFAC workshop on eel age determination and used this as a point from which to move forward.

The two main otolith preparation protocols for the Atlantic species of eel, *Anguilla anguilla* and *A. rostrata*, currently in use are, with slight variations between institutes, the burning and cracking (or better now the cutting and burning), and the grinding and polishing (and in most cases staining) protocols. Clearing whole otoliths "in toto" has limited use for small eels of young age. The validation methods were reviewed along with information for otoliths prepared by each technique and also images were compared between the two main techniques so as to identify common structures (e.g. zero band). The Workshop recommended a preparation with a transverse section of the otolith for slow growth, or old eels, with burning and cracking being the most

efficient in that case. Detailed protocols were discussed for each otolith preparation technique and these have been included in the manual.

The estimation of growth is based on the count of winter annuli, excluding the oceanic and glass eel phase. A number of studies were reviewed that used otolith marking, otolith time series, and eels of known age in order to confirm the presence of a zero band for the start of the continental growth phase and to identify and discount the inclusion of false annuli growth checks, often due to stress associated with quarantine/marketing and tagging of stocked glass eel, periods in aquaculture, and in the wild due to natural stresses and growth variability. The identification of the zero band, may be confirmed by the use of the measurement of the *nucleus* size, or the average measurement of the radius from the centre of the *nucleus* to the zero band (170 $\mu\text{m}$ ) which is quite consistent for both eel species, irrespective of the otolith preparation technique used.

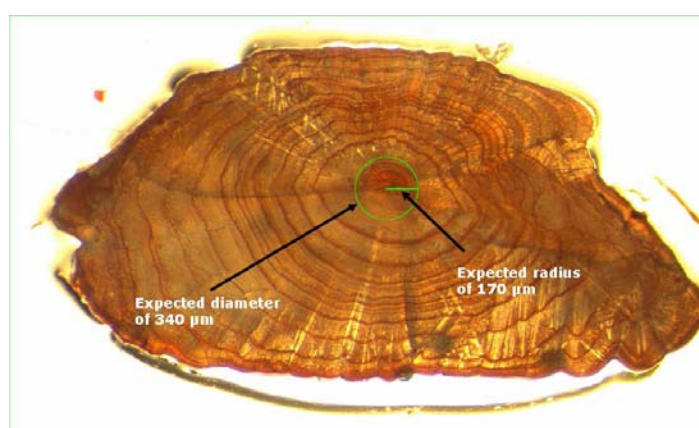


Figure 4.2.1.3. Image of an *A. anguilla* sagittal plane otolith with an inserted circle of diameter 340 $\mu\text{m}$  indicating the location of the zero band (visible just inside the green circle) and a radius of 170  $\mu\text{m}$ .

The date of reference for age is set as the 1st of January, meaning that a cautious approach is recommended for eels sampled in winter and spring before the period for which the winter annuli is not obvious on the otolith margin. The Workshop recommended that the age estimation is obtained using both the otolith annuli count and additional data such as location and date of capture, eel life stage (i.e. yellow or silver), length, sex, and previous history if known (e.g. stocked from wild, stocked from aquaculture) as this supports a more accurate interpretation of the growth pattern and helps to discriminate winter annuli from false checks. "Blind reader" tests may be appropriate in some circumstances but for routine age determination, possession of the full information reduces unnecessary misinterpretation and variability.

A preliminary inter-calibration exercise was carried out during the workshop using 21 Swedish otoliths of eels of known age where the 25 readers were of varying experience and had varying levels of knowledge on the supporting eel data and information. This indicated considerable variation and the results were only used to support the workshop discussions. An experienced reader inter-calibration procedure should be undertaken in the near future based on the age criteria described in the manual and the reading of at least a hundred otolith pictures for each species, including both eels of known and unknown age. This could be done using image exchange and culminate in a workshop for discussion of the outcomes, follow-up training and update of the manual.

#### 4.2.1.4 Workshop on the Age Reading of Anchovy (*Engraulis encrasicolus*) [WKARA]

WKARA was held in Mazara del Vallo, Sicily, Italy, 9-13 November 2009. During the meeting, each participant presented the activities carried out in each lab regarding the otolith sampling, storing and reading methods. The presented working documents mainly deal with the annual growth patterns even if some lab (IEO Santander, ISMAR Ancona, IAMC, Mazara) showed studies on micro-increment daily growth as validation tool for first annual ring. In the report section the validation techniques have been also discussed giving some advice in order to encourage these studies. As future work it was also strongly recommended (by the working group) to carry out a specific working group on micro-increments analysis and methodology.

The second step was to present methods and results from the otolith exchange programme carried out from May to October 2009. 14 readers with different levels of experience of anchovy otolith reading participated in the otolith exchange, from different research institutions from France, Spain, Portugal, Italy and Slovenia and from the different areas concerned. Unfortunately, not all readers of the exchange of otoliths attended this Workshop and other new readers with little experience participated in the workshop. Although all participants read the otoliths in the workshop, only the results of the exchange readers (8 readers participated in both) were taken into account, and the results new participants were excluded from the analysis. 323 otoliths and images were analysed for age assignment, distributed in 7 sets from different anchovy distribution (Atlantic and Mediterranean areas).

For all areas, the average percentage of agreement and CV seemed not to be satisfactory, taking into account the few ages read: most of the anchovy otoliths were not well classified by most of the readers during the 2009 exchange, excluding the results of the readers of the Bay of Biscay (BB readers) in the Bay of Biscay Set (Set A) that were satisfactory. Possibly the success of the Bay of Biscay readers on the set A, compared with the other sets, is because since 1990 exchanges and workshops in Bay of Biscay have been conducted, and there are sufficient criteria for the interpretation of the anchovy otoliths.

The results and the otoliths of the 2009 Anchovy Otolith Exchange were discussed to improve the agreement in the ageing technique and a second reading was made during the meeting. One of the first shared observation based on the otolith exchange programme and by the otolith images from each area, was on the differences in morphology (annual increment patterns) among areas. The readability and the interpretation difficulties changed when we move from oceanic to Mediterranean waters or from the north to the south. These differences among areas could be due to differences in the habitat conditions.

The growth annual pattern was analysed and specific guidelines were provided for the interpretation of growth structures in otoliths.

Sets were selected from two areas for the second reading during the workshop, one where the structure of the otoliths was easier to interpret (set A, Bay of Biscay) and other where the structure of the otoliths was more difficult (set D, Alboran Sea). Comparing the results of the first and the second reading age it is clear a significant improvement for the Biscay of Biscay (set A) in all cases, while there was a light improvement for the Alboran Sea (set D). Based on the exchange programme and on other images from the participating labs, a reference collection of otolith was established, discussed and presented.

During the meeting one question arose which participants tried to examine: What are the consequences of the assumed birth date (1st of January or 1st of June) on the age assignment? And which alternatives could be followed? Tables and examples were produced to explain the meaning of the birth date a-priori assignment and which are the recommendation to avoid misinterpretation and mistakes in the final age assignments. In both cases (1st of January or 1st of June) the age of fish is underestimated or overestimated in relation to the catch date, but sampling fish all the year around would compensate these inconsistencies.

#### **Final Recommendations of WKARA:**

- In order to support the identification of the 1st annual ring, the otolith radius of the first hyaline ring must be measured and used as a gauge for exclude the first check in ageing older individuals;
- Validation of first annulus has to be done and could be based on the micro-increment daily rings;
- In order to identify when the hyaline/opaque rings are laid down, the otolith edge seasonal evolution should be followed across the year for different age classes and areas;
- A workshop joining readers from the different areas should periodically (3 years) take place;
- This group agreed that any decision concerning the use of the birth date criterion in anchovy age assignment and its consequences in the stock assessment must be preceded by a more detailed analysis of juvenile fish otoliths and a broader discussion in other Working Groups;
- A strong needs rise up from discussions and results of WKARA on planning a standardization meeting on the micro-increment analysis of the European anchovy otolith among Mediterranean and Atlantic partners.

#### **4.2.1.5 Workshop on Age Reading of Greenland Cod (*Gadus morhua*) [WKARGC]**

The Workshop on Age Reading of Greenland Cod (WKARGC) was held in Reykjavík, Iceland, 1-4 Sep 2009. Three nations took part (Iceland, Germany, Greenland) with 11 participants. This was the first workshop after a long period of cessation of internationally co-ordinated Greenland cod ageing work. Thus, the main objective was to improve age reading for the cod stock off Greenland and in particular to improve age reading for the East Greenland stock component. The East Greenland shelf is a complex ecosystem with many environmental influences, and knowledge from the 1980's shows that otolith structures from there are difficult to read.

During three different reading rounds and respective lab work, overall reading expertise could be improved though the levels of agreements between reader obtained in workshops in the 1980's could not be achieved. The formation of a 'bottom ring' (see picture below) appears to be critical when identifying the first annulus to read.

It appeared during the workshop that different techniques were applied to prepare and read otoliths, so that the intercalibration test was likely biased due to different levels of experience with any one of methods.

Recommendations from the workshop were:

- To implement an extensive exchange and training program with the aim to foster reading capabilities of new age readers and to improve the overall performance. This program started in autumn 2009.
- To apply a classification and grading system to account for otolith quality and readability. This will start in 2010 for the German laboratory, the Icelandic lab has already established such a system.
- To prepare a manual comprising images of annotated and validated otoliths to foster intersession work prior to a follow-up workshop.
- To work on validation tools for age reading in terms of cohort analysis. This will be reported to the ICES NWWG in 2010.

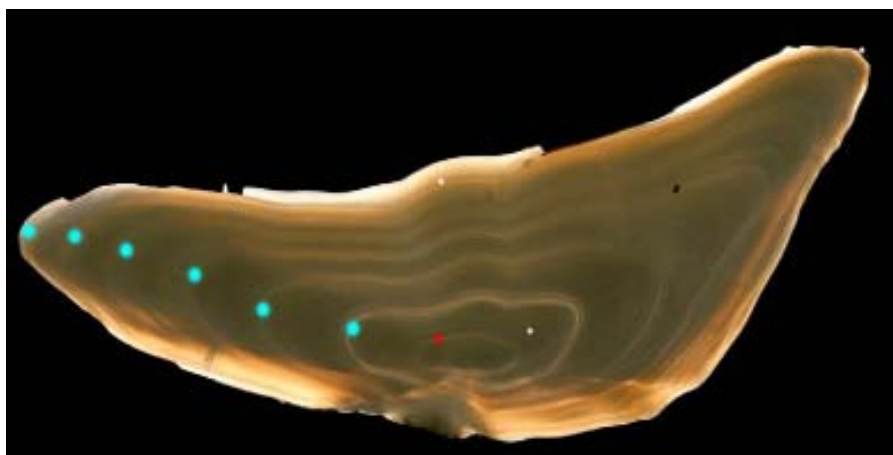


Fig. 4.2.1.5. Thin-section of a Greenland cod otolith showing annulus reading marks (blue points) and the position of the 'bottom ring' (growth structure related to settling of 0-group cod from the pelagics to demersal nursery areas).

## 4.2.2 Summaries of Otolith Exchanges carried out in 2009

### 4.2.2.1 Mackerel (*Scomber scombrus*)

A mackerel otolith exchange organised by Marine Scotland-Science (formerly FRS, Scotland) took place during 2008 and 2009. 23 readers from 13 institutes took part in the exchange. Of the 23 readers, 15 were experts (their age estimations are used for assessment purposes) and 8 were non-experts (readers whose age estimations are not used for assessment).

The countries participating in the exchange were Denmark, Spain, France, Faroe, Portugal, Germany, Iceland, Ireland, Netherlands, Norway, UK-England and UK - Scotland.

There were 195 otoliths used in this exchange from ICES sub areas IV, VI, VII, VIII and IX.

The outcomes were assessed separately for the expert group and the non-expert group. The percentage agreement reached by the experts (when considered against the modal age) was between 75% and 45%. CVs ranged from 11 to 23. There was a range of up to 8 years difference between age estimations of a single otolith.

The agreement between readers tended to decline with the age of the fish, reaching 40% and less at ages older than 10 years. The individual bias of readers was highly

variable which also lead to a high variability of bias between institutes. Individual biases lead to consistent under- or overestimation of age. More than 90% of individual reader deviations from modal age were  $\pm 1$  year.

The percentage agreement reached by the non-expert group was lower. Non-expert readers consistently underestimated age when compared to the results of experienced readers.

A workshop on further calibration of age reading between institutes with extended material has been arranged for November 2010.

#### 4.2.2.2 Haddock (*Melanogrammus aeglefinus*)

A Haddock otolith exchange was organised by Marine Scotland-Science (formerly FRS, Scotland) and AFBI, Northern Ireland. Otoliths from ICES sub areas IV, VI and IIa were circulated to 12 institutes.

- All age data has been returned and is entered in the analysis spread-sheets.
- No attempt has been made at this point to separate the ages provided by experts (those providing ages for assessment) from novice or inter-mediate readers
- Provisional outcomes:
  - Division IIa, North east Arctic:
    - Overall agreement is 83.6%, with a CV of 7.8%. (6 readers only)
    - North sea area IV / West of Scotland area VI:
      - Sectioned otoliths – Overall agreement is 84.2%, with a CV of 18%.
      - Broken otoliths - Overall agreement is 85%, with a CV of 7.5%

It is expected that the overall agreement will improve with the removal of novice and intermediate readers' age estimations.

The results of the haddock otolith exchange are not finalised yet. Preliminary results indicate a high agreement of 83 % for haddock otoliths from Division IIa (North East Atlantic). For the North Sea haddock otoliths, reader agreement for breaking and sectioning of otoliths was equally high (85 %). The effect of reader experience has not been evaluated yet. Due to the high agreement between the individual age readers, a workshop may not be necessary in the near future.

#### 4.2.2.3 Plaice (*Pleuronectes platessa*)

All but 2 readers (GER, N-IRL) have aged the exchange sets. The preliminary results showed substantial differences between readers (overall CV >20%). Highest precision appears to be achieved for the North Sea sectioned otoliths. The preparation method does not seem to affect the estimated age composition for the exchange set (in which age  $\leq 10$  years). PGCCDBS 2008 identified the need for a plaice exchange in 2009-2010 to be followed by a workshop in 2010 (WKARP, to be held in IJmuiden, The Netherlands, 2-5 Nov 2010).

#### 4.2.2.4 Dab (*Limanda limanda*)

Preliminary results of the exchange of dab otoliths are available from nine age readers from five countries. In 40% of the otoliths, there was absolute agreement between readers. The experience of age readers did not affect the age attribution, but the comparison among readers suggested a strong individual bias. A workshop to standard-

ize the preparation methods and reading protocol on age reading of dab otoliths will be held in Hamburg, Germany, 16-19 Nov 2010.

#### 4.2.2.5 North Sea cod (*Gadus morhua*)

The exchange is still ongoing and the finalization of the exchange is expected for May 2010. Between GER, NL, BEL and UK-E the agreement in reading sectioned otoliths will be compared. R, N, UK-E, UK-S, DK and SW will compare the agreement for broken otoliths. Depending on the outcomes of the exchange, it will be decided whether only readings from experienced readers with knowledge of regional peculiarities will be included to calculate modal age.

#### 4.2.2.6 Blue whiting (*Micromesistius poutassou*)

The exchange of blue whiting otoliths is still ongoing. The fragile nature of the blue whiting otoliths is a problem already encountered during this stage of the exchange. Instead of sending otoliths the exchange of digital images is recommended. The exchange is scheduled until February 2011 and final results will not be expected until spring 2011.

#### 4.2.2.7 Summary of outcomes from otolith exchanges

The outcomes of the otolith exchanges carried out in 2009 can be summarised as follows:

Table 4.2.2.7 Summary of outcomes from otolith exchanges. n.a. = not available.

Species	Status of results	Overall agreement	CV	Individual bias observed?	Experience bias observed?	Range of deviation
Mackerel	Final	65 %	15 %	Yes	Yes	-9 to +4 years
Dab	Preliminary, Final expected in 2010	83 %	n.a.	Yes	No	8
Haddock	Preliminary, Final expected in 2010	85 %	8 %	Yes	n.a.	
North Sea cod	Expected 2010	n.a.	n.a.	n.a.	n.a.	n.a.
Blue whiting	Expected 2011	n.a.	n.a.	n.a.	n.a.	n.a.
Plaice	Preliminary, Final expected in 2010	80 %	> 20 %	Yes	n.a.	n.a.



#### **4.2.2.8 Changes made to the PGCCDBS Guidelines for Otolith Exchanges (Annex 11) during the 2010 PGCCDBS meeting**

The recommended frequency of exchanges and workshops has been updated to accommodate both the need for QA and the workload of the age readers.

The use of the **Age Reader Forum** (see section 4.2.4) in tandem with the **WebGR** tool (see section 4.4.3) has been recommended. These sites and their recommended uses are defined and described.

Images are not required for small scale exchanges, but could be considered as an option to ease the exchange speed. All participating countries must agree in advance if only images (no calcified structures) are being offered as this is not the method used by most MS to estimate age.

For large exchanges, samples of both calcified structures and images should be included.

Technical specifications for the acquisition and storage of images are described.

We recommend trying out other analysis tools than the “Age Comparison Tool” by Guus Eltink for difficult species.

#### **4.2.3 Inclusion of outputs from workshops in the assessment work**

Very important and productive workshops dealing with disagreements, precision, etc. in relation to age estimation are funded and held under the auspices of the PGCCDBS. The end results are published in extensive and very thorough ICES reports. The main objectives are to decrease bias and improve the precision of age determinations between age readers from different labs. The generic ToRs do cover all things necessary to get a common interpretation of the age structures of the otoliths of a given species and the dissemination of results gives a solid background for stock-assessors to judge the quality of the age distributions used in the assessment.

The question is whether the right audience is reached by these reports. Moving beyond precision is becoming increasingly more common in age calibration workshops and the aimed is to report the outputs as quantitative evaluations of the performance of the age readers. Getting outputs better ‘fit’ for input to assessment models would greatly improve the application of the results. In order to achieve this, the outputs must be tailored to fit stock-assessment model inputs.

The products of age determinations are proportions at age i.e. parameters of a fish population, not individual fish. It would appear reasonable to include a possibility to estimate the variance around the ‘point-estimate’ to get a realistic impression of the age distributions of the stock assessed.

Including a variance estimate on the age distribution can be done following several paths. One way could be bootstrapping around the age segregated data in the ‘traditional’ stock-assessment models (XSA, ICA). Sampling errors in estimated numbers at age in the catches, can be accounted for in age based assessment models by resampling the age data in accordance with the survey design. Typically, primary sampling units are vessels or trips. Each bootstrap replicate would then create a file with numbers at age for a resample of trips. The estimated numbers at age can then be run through the assessment model for each bootstrap replicate. Ageing errors can be included on top of the bootstrap replicates by assigning age for a given age reading in accordance with a probability table.

Alternatively, new approaches like a State-space Assessment Model (SAM) could be applied to a given stock. The model is quite flexible, and is an extension to statistical models allowing unobserved random variables; e.g. allowing noise in the catch-at-age observations (Gudmundsson 1987, 1994; Fryer 2001; Nielsen 2010). Figure 4.2.3 panel D illustrates how SAM can reconstruct stock dynamics including confidence limits based on e.g. variance in the age estimations of a given stock.

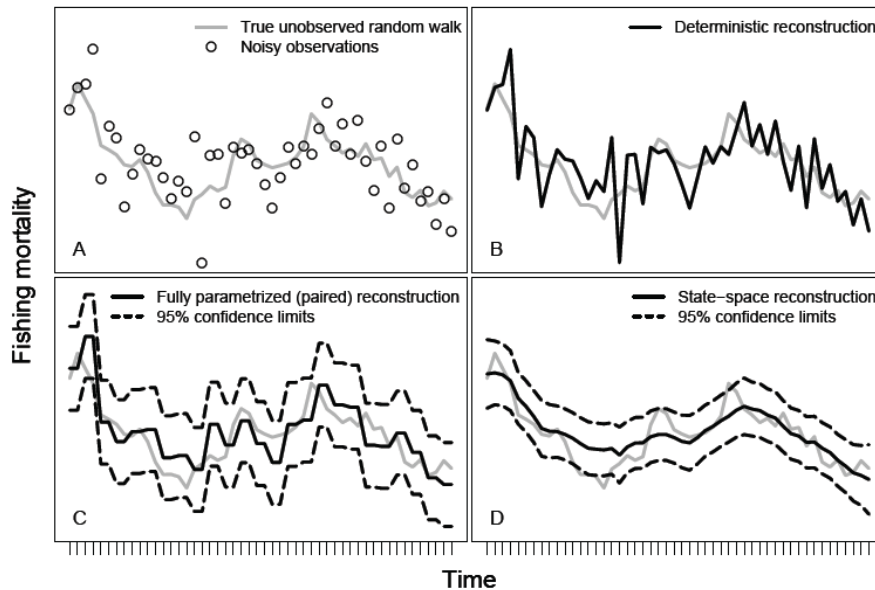


Figure 4.2.3 Three different approaches to assessment; the State-space reconstruction in panel D allows for inclusion of variance around estimates (Nielsen 2010).

The PGCCDBS advocates for testing the opportunity to apply the improvements of both accuracy and precision in age estimations achieved during exchanges and workshops into stock-assessments. Thus as an intersessional work, the Western Baltic Cod population will be used as a case study. This stock is currently assessed using a SAM model, but has previously been assessed using a standard XSA approach (Shepherd 1999) and will be a good case study as both models has been tested on the stock. In collaboration with experts in statistics, the outcome of the most recent WK on age estimation of Western Baltic Cod (ICES 2006) will reviewed and the output will be tailored into a shape fit for applying in both bootstrapping of the XSA and the SAM. The outcome of this intersessional work will be presented in the PGCCDBS meeting 2011.

Additionally, the PGCCDBS recommends the following actions to create and improve the application of results from exchanges and/or workshops in stock-assessment:

- Collaboration between the stock-assessment statisticians and the chairs of the calibration workshops is needed; look to the approach of the WKAEH;
- Develop the 'Guus Eltink spreadsheet' further and into a non-excel based shape; the outcomes of calibration exercises should feed directly into assessment models, e.g. by producing a matrix stating the variance or CV around the estimation of a given age; quantifying this into a variance parameter for the age distribution of the stock;

- Simulations of precision levels necessary for safe preservation of stocks and evaluate the acceptable 'width' of confidence bands by species based on simulations with various degrees of disagreement by age.

#### 4.2.4 Age Readers Forum (ARF) – Sharepoint

Currently the basis of the ARF is available at the following link:

<http://groupnet.ices.dk/AgeForum/default.aspx>

PGCCDBS established the ARF in response to feedback received from those engaged in age reading across Europe. The objective was to establish a "One Stop Shop" for all those involved in age reading. It was thought that the forum would provide an important resource for training of new age readers, as well as providing opportunities for sharing and discussing existing age reading manuals, establishing standard operating procedures, and standardising preparation and interpretation methods. The forum was initially established as a Google Group, but was subsequently migrated to a more secure Sharepoint site. At the moment, the forum includes the following information:

- The contact details and a mailing list of age reading coordinators as well as those engaged in age reading of fish species in the various European laboratories.
- A calendar of upcoming workshops and also the PGCCDBS meeting details.
- A link to the PGCCDBS documents repository.
- The EFAN Reports
- PGCCDBS guidelines for otolith exchanges and workshops.

The Sharepoint has been established for a year now but has not been used by age readers. Cristina Morgado from the ICES secretariat undertook a questionnaire to try to understand the issues regarding the forum and received 15 responses. The feedback from these replies indicated that 50% of those questioned did not know of the existence of the forum and had therefore never visited the site. However most respondents indicated that they believed the forum is a positive development and would like to see it utilised.

#### Actions for 2010

- There is a need to highlight the existence of the forum and to encourage participation on the site. PGCCDBS recommends that each member of the PG speak to their age reader coordinators and encourage them to raise awareness of the age readers forum amongst their age readers.
- The PG discussed establishing a "SharePoint team" who would take responsibility for updating the content of the site. PGCCDBS recommends that one person be appointed to monitor the forum and update information. Gráinne Ní Chonchúir from Ireland has volunteered to do this in 2010. This role should be rotated annually, amongst the various laboratories, ensuring the various laboratories become familiar with the forum.
- A suggestion was made to include a link to the WebGR software on the site to help enhance the utility of both. Images can be exchanged and discussed in WebGR and the age reading criteria, manuals and sops can be discussed and exchanged on the forum.

- It was also suggested to include a literature section, with titles for relevant books on age reading topics, as well as references to historic exchange and methodological reports which would also be of interest.
- Ensure all members of the SharePoint are aware that they can be alerted to updates on the site by activating the e mail notification system.
- Details of the location and ownership of Reference collections of both annotated agreed age images and calcified structures should be housed on the forum.
- The forum should be monitor for FAQ's and should respond to demand for different kinds of information.

### 4.3 Maturity-related issues

#### 4.3.1 Maturity Staging Workshops carried out in 2009

##### 4.3.1.1 Workshop on crustaceans (*Aristeus antennatus*, *Aristaeomorpha foliacea*, *Parapenaeus longirostris*, *Nephrops norvegicus*) maturity stages [WKMSC]

The gonad development pattern and maturity stage recognition are important biological items to be studied in fishery sciences. The WKMSC 2009, held in Messina, Italy from 19-23 October 2009, was aimed to study maturity aspects of the four crustacean species of main commercial values for the Eastern Atlantic and Mediterranean fisheries: *Aristeus antennatus*, *Aristaeomorpha foliacea*, *Parapenaeus longirostris* and *Nephrops norvegicus*. In particular the objectives were reviewing the existing maturity scales, defining objective criteria to classify the maturity stages both on micro and macro scale, reaching an agreement on common scales to be used in the future, and figuring out conversion rules between the old and new scales.

Before the Workshop, the researchers involved, belonging to 15 European laboratories, gathered information by species and describe the sexual development and the maturity pattern accepted and used at the present. Researchers provided working documents containing a synoptic presentation of available information for its own laboratory by operative unit or geographical area. Since the laboratories involved in the WKMSC 2009 operate in areas where different bodies are engaged in producing management advices, the Scientific Advisory Committee for GFCM for the Mediterranean, and ICES for the western European coasts, results were given by geographical sub-area (GSA) or area-division, respectively.

More than 24 Working Documents were presented at the Workshop and the presentations are available on the ICES *Share point* web page:

<http://groupnet.ices.dk/WKMSC2009/default.aspx>

During the meeting the participants reviewed the already employed scales. On the basis of the knowledge and experiences gained, histological and macroscopic descriptions of maturity stage were illustrated and discussed. Finally new 5 stage maturity scales for females of each species were proposed. Due to the difficulties to detail maturity condition of gonads in males at macroscopic level, no maturity scales for males were agreed. A reference image collection of females gonads by stage, both at micro and macro level, was built up and included in the report thanks to the contribution of all the participants.

The most important change to the previously adopted scales was related to developing and recovering stages. According to the experience and knowledge of the involved teams, it is impossible to distinguish at present the developing and recovering specimens from only a macroscopic point of view. Although not concerning the

ovary maturity stages, it is recommended to record always information on the occurrence of both berried females in *N. norvegicus* and spermatophora in *A. antennatus* and *A. foliaceus* females.

The agreed new scales were proposed to be adopted by all Institutes which are involved in European DCF. The need of a common and standardized system for identification and macroscopic classification of maturity stages in the assessment of the fishery resources by the laboratories collecting maturity data, had to be considered as an important priority to optimize DCF. A conversion table from both the historical and presently used scales to the new proposed common scales was also provided.

All WKMSC 2009 participants felt that all the aims of the workshop were attained and suggested future activity/meetings in order to improve standardization among scientists who work in this field.

#### **4.3.1.2 Workshop on Sexual Maturity Staging of sole, plaice, dab and flounder [WKMSPDF]**

##### **Introduction of common maturity scale**

When assigning maturity stages to fish, it is important to have an understanding of the biology of the fish and its reproductive cycle in the sampling area. This helps to distinguish the transitions between the different stages.

WKMSPDF 2010 proposed to adopt the 6 point scale as proposed by the gadoid workshop WKMSCWHS 2007 (ICES, 2008). From wide ranging discussions it has become evident that outside the spawning period it is not reliably possible to distinguish between what is described as a resting stage 5 and a re-maturing stage 2 (histological pictures have given credence to this). To this end it is recommended for flatfish, stage 5 should only be used during the proposed sampling period (see 'Optimal sampling time') and only to describe a skipped spawning fish.

It is recommended that institutes carry out in-house workshops on the reproductive biology of the fish and maturity staging, also as a follow-up of WKMSPDF2010 to introduce the new common scale. An important aspect of the introduction of the new common scale is to take care that all institutes will be able to transpose their own scale into the common scale. This will give the flexibility for the institutes sometimes to keep their own scale but to internationalise their data in an easy way.

##### **Classification criteria for maturity stages**

For all species, classification criteria were defined in subgroups and presented in a similar way. Plaice and dab were discussed in the same subgroup since only a few experts on dab were present at the workshop. As far as possible, the subgroups worked on a reference picture collection per species per sex.

##### **Comparison of stagings**

The stagings were done by 19 readers, in three rounds (picture-fresh-picture). The first staging (from pictures) had low agreement (<60%) for all species. The fresh staging had a clearly higher agreement (>75%) for all species. In the third staging (from pictures) progress was made in percentage agreement compared to the first staging, but there was still a lower agreement on the stages than the staging from fresh material. This is not surprising since touching is one of the ways to identify maturity stages in fish.

### **Comparison of macroscopic staging with histology**

The comparison between the macroscopic staging and histological slides shows that there is an early development stage in gonads seen in the histological samples which cannot easily be indentified macroscopically. The general percentage of agreement between histological slides and macroscopic scales is very low. This might be caused by the number of samples outside the recommended sampling period.

### **Optimal sampling time**

As it is difficult to identify the proper maturity stage when fish is not clearly developing, data collection for maturity ogives is recommended during the pre-spawning season. This implies that sampling for maturity staging for sole, plaice, dab and flounder should be done during late fourth quarter until the end of the first quarter.

For assessment purposes, only data from one month before the spawning season (to be identified based on the collected data) until the start of the spawning season should be used for the estimation of maturity ogives for sole, plaice, dab and flounder. Any macroscopic staging outside of this period can be misinterpreted and should not be used for maturity ogives.

However, collecting maturity information outside the defined period might be interesting for scientific purposes other than stock assessment. For these purposes, it is recommended that histological staging is done.

### **Future workshops**

Judging from WKMSSPDF a workshop on maturity staging for other commercial flatfish species (turbot, brill, lemon sole, witch flounder) might be useful. However, the lemon sole staging during WKMSSPDF shows that having the expertise in staging one species of flatfish can be adequate to stage other species of flatfish.

To define whether a workshop is necessary, it is recommended to do a calibration exercise prior to organising a workshop based on pictures, for example using the WebGR tool (see section 4.4.3).

Before setting up the next meeting, the number of pictures to stage during the workshop should be considered in order to meet the need for time to discuss individual cases as well as maintaining statistical accuracy. Based on the experiences of WKMSSPDF it is recommended that roughly 30 fish per species would be an adequate number to judge at each round during the workshop. This applies for fresh samples as well as pictures. It is recommended that the process of trial-discussion-retrial is based on fresh samples. This means that at least two staging sessions on fresh material have to be done during future workshops. As a consequence, for all species named in a workshop fresh material has to be available in the neighbourhood of the hosting institute.

A workshop on maturity staging should take place when the diversity in maturity stages is high and maturity stages are distinguishable.

WKMSSPDF 2010 developed a set of criteria for pictures to be made for a maturity staging workshop.

### 4.3.2 Changes made to the PGCCDBS Guidelines for Maturity Workshops during the 2010 PGCCDBS meeting

The guidelines for maturity workshops were further updated (see Annex 12) by including the WKMSSPDF guidelines on staging and on taking, using and storing photographs.

### 4.3.3 WKFLAT assessment of data collection

A preliminary assessment of the data quality for sole in IIIa and plaice in VIIId was provided to PGCCDBS from the Benchmark Workshop on Flatfish Species [WKFLAT], 25 Feb - 4 Mar 2010.

The outcomes of WKMSSPDF are expected to improve the maturity ogive used in the assessments, although other issues need to be tackled before modifying the maturity ogives currently used. The issues are, amongst others, the representativeness of the samples against the population, the choice between empirical or model estimates, and the appropriate means to collect maturity information in the absence of a scientific survey at the spawning time. PGCCDBS comments that histological validated methods should be used outside of the spawning period if a suitable survey is not available.

Where WKFLAT develops these preliminary comments into formal recommendations, PGCCDBS will address them as appropriate.

### 4.3.4 Sex-separated maturity ogives

Sex-combined ogives are currently used in Stock assessment although sex-separated maturity ogives are available for the majority of the stocks. It has been requested to members of the COST-FRESH network (COST Action on 'Fish Reproduction and Fisheries'; cf. ICES 2009, section 6.2) to evaluate the impact on SSB when using female ogives only or sex separated ogives. Work is in progress in a number of stocks and reporting will be during the FRESH Working group in March 2010.

A very preliminary Working Document on the southern hake southern stock has been delivered to the Benchmark meeting (WKROUND 2010). The investigation of the use of female only ogives in the southern hake assessment evidenced that the major changes observed in female size at maturity during the period 1980-2008 are not reflected in the combined ogives currently in use (Fig. 4.3.4).

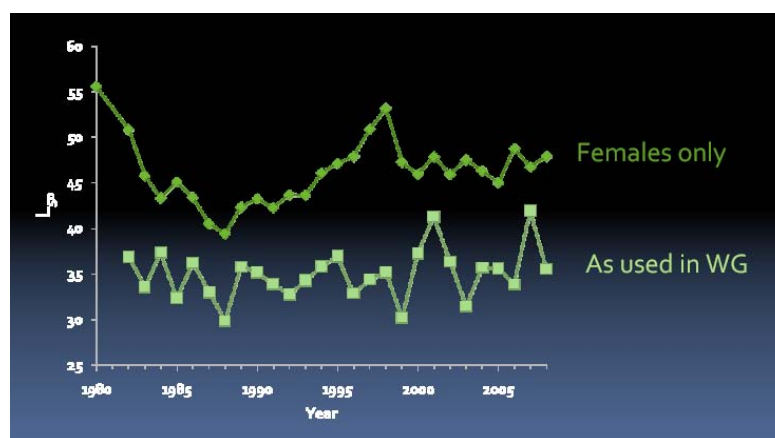


Fig. 4.3.4 The effect of using female-only maturity data in stock assessment.

Furthermore, a study is in progress to evaluate the impact of new ogives in SSB, to estimate indexes of Egg production and Stock Reproductive Potential as well as their implication in length-based assessments. This study is part of FRESH and will be presented at International Symposium on the Biology, Harvesting, Management and Conservation of Hakes (USA, May 11-12, 2010). These developments will also be reported to PGCCDBS.

FRESH also informed that similar work has been partly conducted in a number of ICES stocks and will be completed within FRESH for Baltic cod, North Sea plaice, North-East Arctic cod and Northern hake. A first draft of this work will be available for the next FRESH meeting (Autumn 2010) and FRESH will report on this matter to PGCCDBS in 2011.

#### **4.3.5 Viviparous and hermaphrodite species**

In 2009, PGCCDBS recommended that workshops should be initiated on species following different reproductive strategies, such as viviparity and hermaphroditism in fishes, crustaceans and cephalopods. PGCCDBS have reviewed this recommendation intersessionally and at the meeting. WKMSREGH will cover redfish, which is the main viviparous species in ICES waters. While the issue of hermaphrodite species is mainly relevant to tropical waters, with some interest for Mediterranean and southern European waters, for example black spot sea bream (*Pagellus bogaraveo*), therefore PGCCDBS proposes that the issue should be handled within the FRESH network. PGCCDBS requests that FRESH reports information on this type of species as a way forward, rather than holding specific workshops.

#### **4.3.6 Proposal for a training course on how to analyse between-reader calibration studies**

PGCCDBS has previously recognised that statistical tools need to be developed to test the bias and precision in maturity staging and that established tools for age reading comparisons need to be updated. The issue is of high importance as techniques to assess agreement between two readers are fundamental to a wide range of fisheries stock assessment inputs namely: ageing, maturity staging and egg identification. Work on this topic should take into account the WebGR system (see section 4.4.3) developed for storing images and associated measurement.

A large body of research on agreement statistics and methodology is available from the field of medical statistics. To transfer this knowledge into the fisheries arena PGCCDBS proposes a training course on how to analyse between-reader calibration studies. It was thought that this course could be delivered through the ICES training programme, but this route now seems unlikely to succeed.

As an alternative approach, the proposal was sent to the FRESH network. Their response is given in section 4.3.6.1.

A third approach, with a higher chance of going ahead, is to hold an ICES workshop.

Terms of reference could consider:

- reviewing measures of rater/reader agreement, in particular their strengths and weaknesses in the context of fisheries calibration;
- reviewing existing software for analysing calibration workshop data;
- defining data summaries and analysis outputs that are required by calibration workshop participants and for stock assessment input;



- creating a draft specification for software to analyse calibration workshop data or demonstrating how to use existing software for the purpose.

However, a full proposal was not agreed during the meeting and the issue remains open.

#### **4.3.6.1 Techniques to assess maturity and improve agreement between investigators**

Statistical analyses and tools to evaluate staging error in maturity determination, improvement of methodology as well as regular quality control would be valuable in the monitoring of maturity for fish stocks.

Maturity data are collected routinely for estimation of the spawning stock biomass in fish stock assessments. Maturity data are sampled by national laboratories and reported to ICES based on routine survey and harbour sampling. For this purpose, macroscopic determination of maturity stages according to predefined scales for females and males is common practice. Maturity scales used in the field generally list different characteristics that can be used to grade maturity. This method is subjected to individual interpretation and potential bias. Difficulties often relate to particular stages e.g. the difficulty to distinguish late immature, early development and resting specimens.

Techniques to determine maturity accurately and correctly are available and include histology, image analyses and light microscopy. These methods are well established and can be routinely performed, which makes these methods useful as ground truthing. Verification using these methods is recommended as basis for tests of staging accuracy and potential the bias for improvement of maturity staging.

Maturity determination thus differs from age reading, where the true age is often unknown and intercalibration studies are used to improve agreement among readers. In the case, of maturity staging training of investigators can be done by combining: sampling, staging and photographing, with ground truthing by histology, light microscopy or image analysis. Training can be done using fresh material, light microscopy or image analysis, followed up by evaluation of precision and accuracy of investigator staging comparing with information about the correct maturity stage obtained through histological analysis.

Histology is often used for validation of macroscopic maturity scales, and in recent years also light microscopy and image analysis. Illustrated manuals and training of investigators are useful means to reduce bias of data collected in the field or in the lab using macroscopic staging. Quality assurance of data using sub-sampling and verification would be a constructive improvement, considering national training programs as follow-up on ICES Workshops on improvement of maturity determination.

#### **Recommendations:**

- Well-established techniques to determine maturity accurately and correctly including e.g. histology, image analyses and light microscopy, which can be routinely performed at reasonable costs, should be applied for validation of macroscopic maturity determination. Without this ground truthing verification, comparison of maturity data is hypothetical.
- Statistical tests and analysis of staging precision, accuracy and potential bias for improvement of maturity staging should be based on verification of stage determination and consider staging error dependency on season and prevalence of specific stages.

- Analysis of the optimal sampling strategy and intensity and consideration of the need for development of regular quality control using stage verification.
- Development of follow-up national training programs to fully exploit the outcome of ICES Workshop on improvement of maturity determination.
- A collective meeting for workshop chairs to discuss experience and enhance consistency in the developed methods.

**Suggestions for workshop:**

- a) Validate macroscopic maturity stages using with histological analysis, image analysis and other accurate methods.
- b) Evaluate investigator's stage determination and accuracy precision using field determination of fresh samples, photographs and light microscopy to verification maturity stages and determine of staging error. This can be used both to evaluate the need for a workshop and improvement of determination and a starting point for training by comparing original staging and photos with the verified stage.
- c) Training and tests using fresh samples – including image analysis and light microscopy of fresh tissue during workshops e.g. and follow up determinations with histology to ascertain and analyse staging error and bias in relation to the verified stage.
- d) Enhance the macroscopic maturity scales and methods, develop illustrated manuals and other tools to assist in the maturity determination of the species.
- e) Develop a training program that can be applied for further training of scientists and technicians active in sampling and maturity staging nationally.
- f) Ascertain that the timing of sampling is optimal for maturity determination for assessment purposes. In particular that development of gonadal maturation for the following spawning season has started and the immature and developing stages can be separated as well as potential skip of spawning.

#### **4.4 Age-reading- and maturity-related issues**

##### **4.4.1 NESPMAN Project**

In 2004, a Memorandum of Understanding (MoU) was signed between the European community (EC) and the International Council for the Exploration of the Sea (ICES). This MoU provided in its Annex I a list of species in the ICES fishing area for which recurring advice is requested by the Commission. In addition to the standard species for which advice has been requested within former agreements for many years (the main commercial species such as cod, plaice and herring), a list of species was added under a paragraph "New species".

In the following year, 2005, an ICES Working Group on the Assessment of New Species (WGNEW) was established to provide information on these new species. Two WGNEW meetings have since been held, in 2005 and 2007 (ICES 2006, and ICES 2007). The terms of reference for these meetings were to compile information on the biology and the fisheries on these species, to consider possibilities for fish stock assessments, to evaluate the status of the stocks as appropriate on the basis of existing

information and develop a strategy that will further enable appropriate future assessments of these species.

The ICES working group considered the list of species and decided to add some species because they were considered to be of increasing commercial importance. The complete list of species that WGNEW is working on is as follows:

- sea bass (*Dicentrarchus labrax*)
- striped red mullet (*Mullus surmuletus*)
- red gurnard (*Aspitrigla cuculus*)
- tub gurnard (*Trigla lucerna*)
- grey gurnard (*Eutrigla gurnardus*)
- John Dory (*Zeus faber*)
- dab (*Limanda limanda*)
- flounder (*Platichthys flesus*)
- witch flounder (*Glyptocephalus cynoglossus*)
- lemon sole (*Microstomus kitt*)
- turbot (*Psetta maxima*)
- brill (*Scophthalmus rhombus*)

During the two meetings of WGNEW, a lot of information on these species has been assembled. The members of WGNEW, however, were aware that much more data have been collected for several species but have not been analysed, or otoliths have been collected, but the ages have never been estimated. Fisheries research institutes usually give priority to working on the major commercial species and not to the newcomers as listed above. In its report (ICES 2007), WGNEW has identified the species/area combinations where more information was expected to be available from data that had not yet been analysed. In addition some small scale sampling will be done to collect information in those cases where no sampling has been done previously and data on length compositions of catches/landings, or on growth parameters for some of the species are completely lacking.

The work is realised with Contract MARE/2008/10, "Improving the knowledge of the biology and the fisheries of the new species for management" (NESPMAN). The project was undertaken during a 12 month period from 22 April 2009. Nine fisheries research institutes from within the European Community participated in the NESPMAN project. All results will be presented during the final NESPMAN workshop scheduled from 29<sup>th</sup> of March – 2<sup>nd</sup> April 2010.

For these species, only 4 species were the subject of an exchange and workshop :

- **Turbot:** The otolith exchange was organized in 2004. Two otolith sets were included: a North Sea turbot set (N=110), and a Baltic turbot set (N=96). The Workshop on Age Reading of Turbot (WKART) was organised from 24 to 28 June 2008. The overall agreement rate of the North Sea sample was 82.8%. The range of agreement with the modal age was 70.5–91.1%. The overall agreement rate of the Baltic sample was 71.6%. A further exchange is planned, see section 7.2.2.12.
- **Striped red mullet:** The otolith exchange was organized in 2007. One otolith set was included from the Eastern English Channel (N=63). The Workshop on Age Reading of Red mullet (*Mullus barbatus*) and Striped mullet

(*Mullus surmuletus*) [WKACM] was organised in 2009. A comparison between whole otolith (agreement: 64.3%, CV: 60.7) and burnt whole otolith (agreement: 71.6, CV: 25.7) was realised. Consequently, the burnt technique is used for striped red mullet.

- **Brill:** An exchange is organised in 2010, see section 7.2.2.1.
- **Dab:** An exchange is organised in 2010, see section 4.2.2.4. A workshop (WKARDAB) will be held in Nov. 2010.

#### 4.4.2 Project proposal

During the PGCCDBS meeting in 2009, a proposal for a call-for-tender was put forward which was supported by the PG. The construction of the call-for-tender was decided to be postponed to 2010 after the PGCCDBS meeting in 2009 as a small-scale project (*MARE 2008/10: Lot 4: Improving the knowledge of the biology and the fisheries of the new species for management [NESPMAN]*) was already running dealing with basic data collection and for a part of the parameters necessary for assessment. NESPMAN now is in its conclusive phase; the results will be discussed in WGNEW (October 2010) and potentially applied in various stock-assessments in 2011. However, for those species investigated, age and maturity have not been the main focus, so those parameters still need to be addressed.

The PG acknowledges the need for a genuine procedure on how to handle 'virgin' populations in terms of biological sampling for analytical assessments. Thus it was decided by the group to modify the draft call-for-tender discussed during the PGCCDBS meeting in 2009 and put it forward to the DCF Liaison Meeting, asking for inclusion of the proposal in the EC Work Programme 2011 or 2012.

#### **Title: Age Determination and Maturity Staging of species not previously subjected to biological sampling for analytical assessments**

Duration: 18 months

Objective: The new DCF generates the need for biological information on species not previously subjected to biological sampling, in order to establish parameters for application in analytical assessments. The development of a methodological protocol on how to handle a new species, laying out a general procedure to achieve sound parameters for analytical assessment is highly warranted to enable the community to be proactive when alerted of a new stock appearing in the fishery.

When handling a new stock, a 'toolbox' needs to be consulted, encompassing baselines on ageing procedures, growth parameters, sex-ratio, age at maturity, spawning time, and potential stock identification structures.

Based on existing validation techniques and further development of applied methodology, ageing and maturity staging techniques must be developed and these should be stated in agreed manuals through a network of excellence. The manuals will then form the general protocol (the 'toolbox') that subsequently will be used in selected case-study stocks to test the applicability of the protocol and achieve sound parameters for analytical assessment for the particular stocks.

Potential case-study stocks are listed below:

- Ballan wrasse (*Labrus bergylta*)
- Blue Ling (*Molva dypterygia*)
- Boar fish (*Capros aper*)

- Common Whitefish (*Coregonus lavaretus*)
- Conger eel (*Conger conger*)
- Forkbeards (*Phycis* spp.)
- Lesser spotted dogfish (*Scyliorhinus canicula*)
- Ling (*Molva molva*)
- Longnose spurdog (*Squalus blainvillei*)
- Mediterranean horse mackerel (*Trachurus mediterraneus*)
- Pollack (*Pollachius pollachius*)
- Pouting (*Trisopterus luscus*)
- Rays & Skates (Rajidae)
- Spiny dogfish (*Squalus acanthias*)
- Thicklip grey mullet (*Chelon labrosus*)
- Tusk (*Brosme brosme*)
- Wolf-fish (*Anarhichas* spp.)

Along with the following 6 species, which are included in the NESPMAN project, so the case studies can build on the information generated in that project.

- John Dory (*Zeus faber*)
- Grey gurnard (*Eutrigla gurnardus*)
- Red gurnard (*Aspitrigla cuculus*)
- Tub gurnard (*Chelidonichthys lucerna*)
- Lemon sole (*Microstomus kitt*)
- Witch flounder (*Glyptocephalus cynoglossus*)

#### 4.4.3 Web Services for support of Growth and Reproduction Studies (WebGR)

WebGR (<http://webgr.berlios.de>) is a European project that aims to develop Open Source software for supporting studies of fish growth and reproduction. In particular it promotes the usage of online services to organize calibration workshops. Calibration workshops have been carried out for a long time between scientists "reading" otoliths to identify individual age, so that all scientists "tune" their interpretation of the ageing protocols. It has recently being extended to also cover identification of maturity stages with gonads. In general it can be applied to all situations where distinct scientists have to discuss the interpretation of a protocol to identify status of biological material. The WebGR website consists of a repository of images, a set of web forms to run a calibration exercise online, a reporting module with the most common statistical analysis and import/export modules to manage images and results. The software has a creative commons license (Open Source) to promote transparency, technology transfer and peer-review; and will allow the scientific community to get involved in further developments, like linkage to statistical analysis engines, or any other specific features. The usage of WebGR to carry out calibration workshops will promote the application of sound statistical analysis to design the experiment and compute workshop results. The results are extracted in a standard format that can be easily sent to scientists doing assessments.

The consortium is constituted by: Laboratório Nacional de Recursos Biológicos – IPIMAR (Portugal) Consortium leader, The Agri-Food & Biosciences Institute (UK),

AZTI Tecnalia Foundation (Spain), Federal Agency for Agriculture and Food (Germany), Johann Heinrich von Thünen Institute (Germany), Hellenic Centre for Marine Research (Greece), Instituto Español de Oceanografía (Spain), Institut français de recherche pour l'exploitation de la mer (France), Institute for Marine Resources & Ecosystem Studies (The Netherlands), Institute of Marine Research (Norway), Swedish Board of Fisheries (Sweden), Italian Society for Marine Biology (Italy). (For more information please visit <http://webgr.berlios.de>.)

## 5 Report on the implementation of the Quality Assurance Framework (QAF) into stock assessments and advise on the further development of InterCatch (ToR d)

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The outcomes of the methodological workshops WKACCU, WKPRECISE and WKMERGE previously initiated by PGCCDBS were reported to the 2010 meeting. These workshops were dealing with sampling design in relation to the métier based approach (see following sections). The métier based approach in the EU Data Collection Framework as well as the aim to move towards regional task sharing have highlighted the need for a more proper, robust and transparent sampling design for countries involved in catch sampling. The workshops have provided valuable general knowledge in how such catch sampling programs can be designed and the reports are beneficial for countries aiming to improve the current situation.

A summary from WKACCU can be read in last year's PGCCDBS report.

### 5.1 Workshop on Methods to Evaluate and Estimate the Precision of Fisheries Data used for Assessment [WKPRECISE]

The workshop was held in Copenhagen during 8-11 September 2009 and focused on methods to evaluate the accuracy of fisheries statistics on national level used for assessment. Quantities landed, discards, fishing effort, CPUE and biological data collected from the fisheries. The WKPRECISE workshop focused on sources of variability and on the procedures to estimate the precision of national level fishery statistics (quantities landed, discards, fishing effort, CPUE) and biological data collected from the fisheries. While precision of fisheries statistics can be improved by increasing the sample sizes in data collection programs, this will generally not reduce bias. It was recognized by WKPRECISE that measures of precision estimates based on fisheries data used for assessments only are meaningful for catch sampling programs that obtain representative data. Several national sampling programs were presented and reviewed during WKPRECISE. Discussions focused on survey design requirements and best practises in data collection programs that facilitate the quantification of precision of estimates based on national level fishery statistics (quantities landed, discards, fishing effort, CPUE). Procedures to assess the precision on a national level of biological data collected from the fisheries were examined. The WKPRECISE documented the complexity of typical fisheries sampling programs, including stratification and further grouping into métiers. Estimators of precision for key parameters must take into account clustering effects that are caused by multi-stage sampling.

**The PG Recommends on the basis of this workshop** that catch sampling programs should be based on statistically robust survey designs with clear definitions (and documentation) of;

- the sampling frame (how the ships and harbours are selected for sampling compared to the fishing effort, e.g., list of access points, ports, markets, or vessels, for sampling catches from trips, etc.) ,
- the primary sampling units (PSUs; e.g., ports/days, vessels/trips),
- the stratification schemes employed,
- and the methods used for selecting samples in each stratum.

The statistical estimation of precision requires that representative catch sampling be conducted using probability-based methods (to the extent possible within logistical

constraints). Ad-hoc sampling rules out the estimation of precision and should be avoided. The PG also recommends that the precision of estimates of key parameters is given in terms of standard errors or relative standard errors (often referred to as the coefficient of variation for a parameter estimate). In addition, the number of primary sampling units observed along with estimates of the effective sample size for the associated estimate should be given. This is because the variances of key estimates are typically driven by the number of PSUs sampled, and so the effective sample size is usually much smaller than the total number of individuals sampled. If age-length keys (ALKs) are used to estimate age-distributions, then it must be noted that the precision of such estimates cannot be evaluated unless the age-length data are coupled to the primary sampling units from which the age and length data were collected. The accuracy of estimates of age-distributions based on static ALKs that do not take into account the survey design of the catch sampling programs (or ALKs derived from ad-hoc sampling) cannot be assessed.

## **5.2 Workshop on Methods for merging metiers for fishery based sampling [WKMERGE]**

The WKMERGE was held in Copenhagen 19-22 January 2010 and was the last workshop in a row of three (WKACCU, WKPRECISE, and WKMERGE). An important role of WKMERGE was to provide theoretical training on the design of robust sampling schemes for at-sea and on-shore sampling of fishing vessels to provide data on metier based biological variables. The workshop covered the main aspects of sampling design including defining objectives; identifying the population to be sampled and suitable frames for accessing primary sampling units; stratification schemes; sample selection schemes including equal and unequal probability methods, and associated estimation procedures. The use and data-needs of model-based estimators were discussed, including the pros and cons of “quota” sampling for model based and design based estimators. Examples of applying vessel list frames for at-sea sampling and area (access point) frames for on-shore sampling were covered in detail, and methods of combining data from both types of frames are included in the WKMERGE report. A primary focus of WKMERGE was the design of sampling schemes that avoid problems of under-sampled and non-sampled strata or domains requiring imputation of missing data. When imputation is required, it should be done at the analysis stage using expert knowledge of the fisheries. Automated procedures for filling missing entries in databases with data “borrowed” from neighbouring samples or strata should be avoided. A major problem is non-accessibility of vessels for sampling at sea or on shore, as the vessels not available for sampling may have a different catch composition and size frequencies than the accessible vessels. Characteristics of the non-accessible vessels should be recorded to allow retrieval of any auxiliary variables shown to be correlated with discarding or size compositions in the sampled vessels (e.g. gear, mesh, area, trip duration etc.).

### **The PG Recommends on the basis of this workshop:**

- Primary data held in databases should be real observations and not imputations done manually or with automated routines. Imputation must be carried out external to the data base using transparent and robust methods. If modelling is to be used for imputation (e.g. to fill in gaps for non-accessible vessels), the data collection scheme should ensure that the necessary auxiliary data are collected for those vessels. Strata should be defined so that there is controlled sample selection probability. Take



necessary steps to achieve representative sampling of fishing trips or vessels within strata using random or systematic (with random element) schemes. Avoid targeted non-random sampling (quota sampling) to reach sample sizes for highly resolved domains (e.g. Level 6 metiers, see Commission Decision 2010/93/EU) present within the primary sampling strata. Sampling schemes should provide the ability to provide data

- Formation of a Study Group or EU contract would be appropriate to consider methods and tools for optimisation of sampling schemes between MS to achieve international precision targets and consistent collection of data to allow analysis by domains covering international strata within regions (e.g. metiers) – (conditional on having the data collected on an appropriate basis for input to optimisation schemes).
- Further development of data basis and COST tools should aim to cater for different possible sampling designs and associated procedures described in WKMERGE

### 5.3 PGCCDBS recommendation on Quality Assurance Framework (QAF)

It is recognized that probability-based sampling of fisheries is difficult to achieve, primarily due to logistical constraints. Also, it may be difficult to achieve precise estimates of key parameters even for large sampling efforts because of cluster effects at different sampling stages. This means that the “devil is in the details” and methodological aspects, assumptions etc. would benefit from a transparent international discussion. This is particularly true for countries aiming towards regional data collection programs to achieve international precision targets within e.g., the EU DCF. To meet this need WKMERGE recommended establishment of a Study Group or an EU-contract to develop statistically robust sampling schemes that are also practical. The PGCCDBS realizes that several working groups are established to coordinate international trawls surveys but that no equivalent system exists to support and improve catch sampling programs. As most stock –assessment models used at present in ICES (such as standard VPA and the XSA) work with the assumption that the Catch-At-Age data are unbiased, and know exactly, it seems very important to actually be able to assess if this assumption is reasonable by measuring the accuracy of the estimated catch-at-age based on data from sampling programs. Some of the recommendations passed on to the PG from different assessment working groups are further related to assessment of the quality of different estimates such as catch-at-age data. To be able to give validation on the data quality it is crucial that the sampling program is set up in a transparent, statistical sound way. Such assessments need proper sampling designs and estimation processes that are well documented.

This further stresses the need to establish a methodological support system for catch sampling.

The PGCCDBS suggests that a series of workshops be set up. The workshops should be based on case studies allowing for a more thorough discussion on the details of design and implementation of catch sampling schemes. The case studies should from a methodological point of view be of general interest and should be well prepared prior to the workshop. Special attention should be given to design and implementation of regional sampling schemes. When regional schemes comprise non-overlapping national sampling schemes, raising may be done for each national scheme before combining estimates to regional scales. In cases where national schemes collect data from overlapping geographic areas, the raising needs to be ad-

justed to ensure unbiased estimates at regional scales. The main aim with the series of workshops would be to provide countries with enough support to design and implement scientifically sound and transparent sampling programs enabling quality assessment of estimates used for stock assessment.

The PGCCDBS further consider it beneficial to collate the findings from the series of workshop into a reference book as this at present time is missing. This book should contain documentations and estimators for the basic statistics and how it is should be implemented in the assessment. A book would further enable to attract experts to the workshops witch is crucial for a good outcome. A book will however require funding and the means for this need to be investigated.

The chairs will write a letter to EFARO (The European Fisheries and Aquaculture Research Organisation; an association composed of the Directors of the main European Research Institutes involved in Fisheries and Aquaculture research; [www.efaro.eu](http://www.efaro.eu)) applying for financial support to invite experts to these workshops and the subsequent book writing.

The first workshop should analyze the design and implementation of three different types of sampling schemes common in European fisheries. The workshop should come up with suggestions for a robust design taking the logistic problems into account serving as guidelines for countries to set up a program.

The analysis should be based on one case study per type of the most used sampling program. The sampling programmes covered by the first workshop should be 1) based on an area frame (small scale fisheries), 2) based on access points (port/market sampling) and 3) based on vessels/trips (sea sampling). The latter case study could include two sub-cases: (3a) where sampling of vessels and trips are taken from the entire fleet, versus (3b) where the sampling of trips are nested within a fixed number of vessels (e.g., the Norwegian reference fleet). The PGCCDBS suggest this workshop to be scheduled for early 2011.

A sequential second workshop should facilitate the design and implementation of regional sampling schemes. ToRs for this workshop should be discussed at the PGCCDBS 2011. This second workshop may then replace the planned WKDRASS (Workshop on the Design of Regional Age Sampling Schemes), which was scheduled for 2010, as the PG found it appropriate to first go for general methodology (based on WKMERGE and WKPRECISE) and then go regional.

#### **5.4 Recommendation on Quality Assurance in InterCatch**

The PGCCDBS was asked to propose further development of the InterCatch, especially in relation to the quality assurance work and the outcome of the WKACCU, WKPRECISE and WKMERGE. The last few years several initiatives (methodological workshops, precision requirements in the DCF) have been taken to increase the quality as well as the assess ability of the quality of data collected within catch sampling schemes. It is thereby important to firmly acknowledge the need of quality indicators in databases holding input data for stock assessment.

Regional disaggregated databases have further been discussed (and in one region used) for a number of years. The view on the need for such databases is different between regions. Some countries believe it is a prerequisite for effective and transparent data management at the regional level while other consider effective and transparent regional data management a technical issue that can be solved at a country level. The framework for common databases for regions have not yet been put in place.

In summary the PGCCDBS acknowledge the need of quality indicators for data bases (InterCatch) holding data for stock assessment. However, at present, several different processes relating to data quality and data management have been initiated or are ongoing making it premature for PGCCDBS to suggest further development in terms quality assurance for InterCatch.

However, at the 2009 meeting PGCCDBS strongly expressed the opinion that improvements of InterCatch needed to be addressed with urgency, and suggested a prioritized list of the tasks left to be done. The status of this work can be summarized as follows:

Two very big issues have been implemented in 2009:

- Internal conversion of programming code
- Revision possibilities of previous years' catch data
- The interface have been restructured and made more user-friendly

Status of the stocks in InterCatch by the end of 2009:

- Data for 38 stocks have been imported and worked up but not to final export
- So far 26 stocks have used InterCatch all the way through

The ICES Secretariat's priorities in 2010 are:

- Include tuning fleets, WEST, Maturity
- Discards 1st part calculation (based only on rates of CATON, no discard age-length keys)
- Extract data to the 'yellow data table' from InterCatch
- Age-length conversions

PGCCDBS would like to maintain the recommendations from last year and hope that the Secretariat can allocate sufficient resources to complete the above worklist for 2010 before the PGCCDBS 2011 meeting.

## **6 Review available methods and equipment to improve the data collection from fisheries. Report on the effectiveness of self sampling programmes versus traditional observer programmes (ToR e)**

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### **6.1 Review new developments in data collection methods and equipment**

The PGCCDBS has for its 2010 meeting been asked to review available methods and equipment to improve the data collection from fisheries.

The primary collected data are catch and effort statistic and biological data. The catch and effort information are collected from the logbooks and/or sales slips. Prior to 2010 the logbooks used by the fishers were simple paper version that was filled in, handed over to the national fishery authorities where the information was manually recorded into a national logbook data base. Since January 2010 all EU vessels with a length over all of more than 24 m have to use an electronic logbook where the recorded information should electronically be transmitted to the authorities at minimum once a day. For countries outside EU, the introduction of electronic logbooks may differ. In Norway, for vessels above 21 m from 1 October 2010, and for vessels above 15 m from 1 January 2011. In Iceland, a new logbook regulation stipulates that electronic logbooks will be mandatory from 15 June 2010 for all vessels larger than 10 GRT. In Russia and the Faroe Islands the system is still under testing.

In some countries, sales slip information is transmitted to the authorities electronically and while in other countries sales slips registration is manually recorded. Without any doubt the use of e-logs can only improve the quality of the logbook data.

Biological information (length, weight, age, sex and maturity) are primarily collected by the fisheries research institutes. Different methods and electronically facilities are used in the different countries. In order to get a status of methodologies and electronically facilities used for collecting information on length and weight in the different countries an overview was produced (Table 6.4). Probably for traditionally reasons, most countries are still collecting biological information (length and weight) by using a plain measuring board and register the length by using pen and paper. One person is doing the length and weight measurement and the other person is recording the length and weight on paper using en pen. However, different initiatives for developing semi automatic or automatic methods for registering length and weight have been made and implemented in some countries. So far, no optimal new techniques have been introduced in a wider extent. An overview of the automatic methods in use is shown in the overview (Table 6.4).

There is an urgent need for developing systems which would ease and make the sampling procedure more efficient to achieve high quality information and reduce the cost for sampling. While all countries have the same need for finding new efficient systems all fisheries research institutes would benefit from a coordinated initiative for developing a common solution in order to reduce the development and production costs. Furthermore, a more automate method would reduce the sampling costs, minimize manual data entry into data bases, improve the data quality assurance and time spent for data cross-checking. Therefore, the PG would like to encourage any initiative to develop electronic facilities for conducting e.g. length and weight measurements.

The requirements for electronic measuring system are different depending on the sampling site. A system to be used onboard a larger research vessel can be placed permanently and the requirement for flexibility is limited. Dock site monitoring or harbour/market sampling needs a system that can be transported in a van and be placed e.g. in a fish auction. Equipment to be used onboard a commercial fishing vessels needs to be portable and easy to carry, robust and suitable for harsh environment and could be used by a single observer onboard. Even though, a more automatic sampling method will reduce the time spent on sampling, collection of biological information on age, sex and maturity still need staff time.

A number of examples of useful electronic equipment to gain better estimates were presented to the PG. These examples are described below.

### 6.1.1 CatchMeter

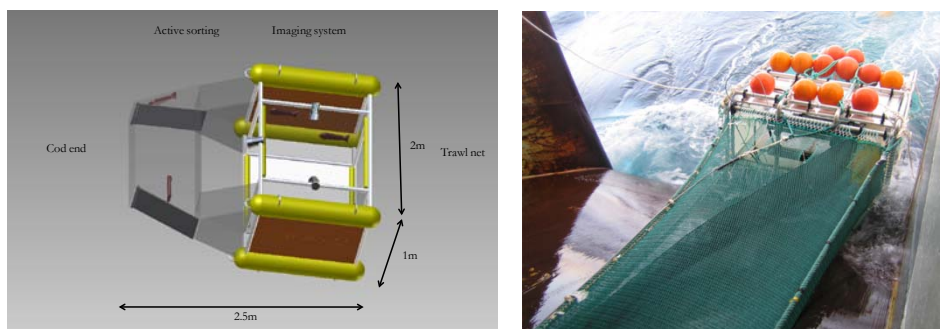
A joint Norwegian scientific research – industry project is currently developing an electronic system that automatically identifies and sorts fish within a trawl without hurting the fish. The system, which was briefly presented at the PG, makes it possible to select fish that should be caught, and to release fish which are not wanted. The system species identifies and measures the length of the fish by taking high quality colour photos (8fps) and video. An ethernet through a standard net sound cable to the bridge of the vessel secures full system control and live video to the bridge. Concerning the within trawl version, the PG first of all find such an equipment useful for more precise scrutinizing of fish during acoustic surveys and the understanding and correction for fish behaviour during such surveys.

The system was first developed to be used at fishing plants on land or on board vessels for identifying, measuring and sorting fish on a conveyor belt. The PG finds these versions more relevant for scientific sampling of commercial catches.

For biological sampling the system may result in:


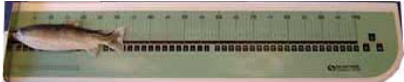

- More fish being sampled
- More representative subsamples
- More efficient sampling – effective sampling of complete catch
- More representative and better data
- Freeing up time so observer can perform other tasks
- Helping identifying difficult species
- New measurement parameters available, e.g. morphology useful for identifying population structure

In order to make such equipment operational for the different catch sampling purposes, it seems necessary to establish a project group who should define the possible applications and specify the needs for functionality and precision in order to get the right technical solutions and costs. Both the developers and the PG encourage the different countries and labs to support any technical solution to the completion of this useful sampling device for more tailored purposes.



### 6.1.2 Scantrol FishMeter

FishMeter is an electronic measuring board for recording fish sampling data. The board includes an array of magnetic sensors that are activated by a magnet attached to the operator's index finger. The magnetic marker is used for entering length on the magnetic length scale that has a resolution of 5 mm. There are also magnetic keys for entering numbers, species and other functions. The boards include an additional length scale with resolution of 1 mm that can be used in combination with the number keys when 1 mm resolution is required. The systems are waterproof according to IP67 and fish blood or dirt can easily be flushed off the base of the boards. The boards are connected to a PC with a USB interface.

Fish-Meter Models		Range	Weight
FM50 USB		0-50 cm	5,7 kg
FM100 USB		0-100 cm	10,5 kg
FM120 USB		0-120 cm	12,5 kg

A new version of the FishMeter has been developed. The new wireless FishMeter is designed to operate in tough conditions where space is limited and power is not available. No cables are needed. The wireless FishMeter transmits data directly to your mobile or PDA, and gives you voice feedback in the earpiece at the same time. This gives full focus on fish sampling, and data is stored into Windows Excel on the PDA. It uses bluetooth technology which connects with mobile, PDA or a PC, and sampling results is given trough voiceover feedback into the earpiece. Powered by rechargeable batteries, no cables will be in your way. The wireless FishMeter is ideal for marine researcher, fishery observers and fishery inspector with limited work-space. Many of the users experience that they have limited work space, and this makes fish sampling challenging. That is why the wireless measuring board is perfect for use on commercial vessel, at fish markets and for field work. The complete mobility makes the sampling easy and convenient.



For further information see [www.scantrol.no](http://www.scantrol.no)

### 6.1.3 Fishmetrics

The Fishmetrics solution for fish size sampling to be applied in landing ports and fishing vessels is developed by Gui Menezes (University of the Azores). It is a Portuguese development project using image recognition of fish boxes and their content. This system was developed in 2006 and 2007 initially as a research project in the IMAR/University of the Azores in collaboration with a Portuguese engineering company specialized in vision technologies. In the end of the project a spin-off company was created (the Fishmetrics, Lda.) with the aim to provide size sampling services using the developed solution, which proves among others to have relevant statistical advantages when compared with the traditional size sampling methodologies.

Initially the objective was to develop a prototype of a system using modern visual technologies to get representative size samples of fish species (or other species), and to solve many of the statistical problems faced by the traditional sampling programs (e.g. choice of a representative sample, stratified sampling, fish manipulation, short times between landing and fish sale, etc), and in the end improve the quality of the data for stock assessment and management. Initially the system use digital still images, but at present the system is based on image frames from video cameras. The first phase of the project includes the development of the Fishmetrics software and the finding of the best hardware combination. All this was tested and improved during several months in the Horta (Azores) fish auction house.

The system design reduces the sampling costs, and is very flexible, able to be used in many different situations (e.g. auction houses, fishing vessels). It is composed by two cameras, the Fishmetrics software, a computer, a UPS, and ideally linked to the internet.

The principle of the system is simple:

- Digital images of fish boxes are acquired and saved.
- The Fishmetrics software controls the image acquisition and also allows the measures to be made in the acquired images. Measures taken have a precision of about 1 mm.
- Measures are made a posteriori in a computer by a sampler on all the fish (whenever possible) or in any other visible part of the fish (e.g. eyes, pectoral fins, head-length, etc, etc). Any of several visible fish structures, may be converted to the measure of interest (e.g. fork or total length) from biometric equations which are included in the software.
- Images of all the fish boxes landed may be acquired and saved in an image archive for posterior analysis. This means that all the universe of landed boxes by day, is saved and choices of species, number of boxes to be processed, number of fish to measure (n), may be done a posteriori with time in

a computer terminal and according with the precision levels desired, and /or any statistical design options.

- Measures are linked to each image and raw data of the measures obtained can be easily exported in several formats, and make available to further analysis much more rapidly.
- Other auxiliary information can be added to each images other information can be included (boat name, box weight, etc).

The Fishmetrics system was recently improved, turning it a work alone system. In particular it is able to work autonomously in any remote area or port if linked to the internet. It can detect autonomously the fish boxes and is able to organize them in a database by port, species, date, etc.

Automatic identification of the species from the image is also possible. In the future it is expected that some measurements (e.g. orbital diameter) can be obtained automatic by the development of image processing algorithms.

For more detailed information contact: Gui Menezes [gui@uac.pt]

#### **6.1.4 Electronic Data Capture (EDC) system**

Cefas has been using an Electronic Data Capture (EDC) system to record its research vessel fisheries data for the last 15 years. The system has now being re-developed to expand the systems capability to include on-board catch and discard sampling and a variety of field sampling activities.

Hardware – key features:

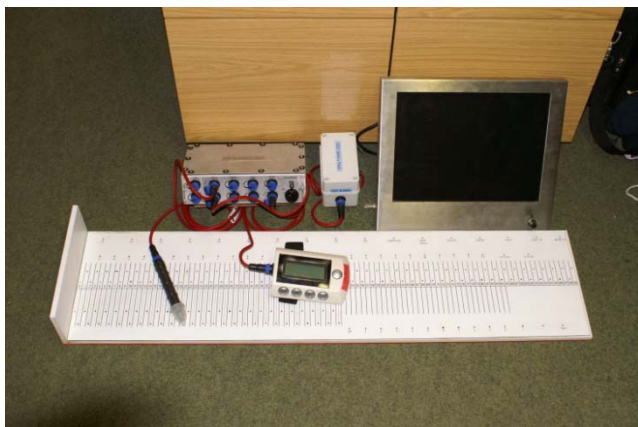
- Portable, can be carried in a backpack, utility belt or with carry handle.
- Ruggedised – intended rating to IP 67.
- Power input – from 6 to 50 v DC, internal 10 min backup battery.
- Hot swappable power sources, allowing multiple battery units to be carried.
- Interface with digital scales, callipers and GPS.
- Arm (!) or unit mounted LCD display for portable use.
- VGA Flat screen connection for permanent installations.
- USB port for keyboards, data backup and transfer via memory sticks.
- Capture unit internal components are off-the-shelf industry standard.

Software – key features:

- Management of sampling targets.
- Multiple profiles allow one unit to be used in a multitude of sampling situations without configuration changes.
- Autonomous units with data interchange and updates via network connection or USB.
- Multiple language options.
- Live help for species identification and maturity stage evaluation.
- Data checking and validation on collection.
- Sample summary data presented in the field, allowing operator to sample to prescribed levels of precision.



- Structured or free data collection gives flexibility of use or controlled data capture.
- Sample distribution data can be size or weight based.



For more detailed information contact: Richard Ayers [richard.ayers@cefas.co.uk](mailto:richard.ayers@cefas.co.uk)

### 6.1.5 Voice Recognition System

IFREMER in France is currently working on a voice recognition system.

To optimize the time of data acquisition on the field, IFREMER develops a module on its software "Allegro", allowing the storage of data by dictation of the information and voice recognition, without manual data entry, and interfacing with the existing software.

The idea is to use a unique instrument for the data acquisition: species, length, weight, sex, maturity and so on.

One of the advantages is that the observer keeps his hands free for manipulation. The observer can use simple instrument for length or for weight measures.

IFREMER is currently performing the first tests on the field (March 2010). It is the plan to develop a full version for 2011.

Hardware:

- Rugged tablet computer
- Wireless headset with blue tooth connection (ideally IP67)

Software

- Allegro: IFREMER's data acquisition software
- Package allowing the link between the headset and Allegro



For further information contact: Vincent Badts. E-mail : [Vincent.Badts@ifremer.fr](mailto:Vincent.Badts@ifremer.fr)

## 6.2 International initiatives for disseminating the improvement of fisheries data collection

Several international and worldwide initiatives for promoting and improving the collection and the use of fisheries data have been initiated in 2009 and 2010. A number of workshops or conferences has or will be held where the topics are fisheries data collection.

In 2009, the 6<sup>th</sup> **International Fisheries Observers and Monitoring Conference (IFOMC)** was held in Portland, Maine, USA.

The aim of the conference is to develop, promote and enhance effective fishery monitoring programs to ensure sustainable resource management throughout the world's oceans. Furthermore, to improve fishery monitoring programs worldwide through sharing of practices and development of new methods of data collection and analysis. To provide a forum for dialog between those responsible for monitoring fisheries and those who rely upon the data they collect.

The goals for the 2009 IFOMC conference were to:

- Improve the quality of fishery monitoring data through sharing of best practices for collection and analysis of information.
- Improve the use of fishery monitoring data to support sustainable resource management.
- Promote the international exchange of ideas and best practices from fishery monitoring programs throughout the world.
- Improve accessibility to fishery monitoring data.
- Support the development of new innovative data collection methods.
- Improve the training and safety of at-sea fisheries observers.
- Advance the development of the observer profession.

The proceedings from the IFOMC 2009 can be found at:

[www.fisheriesobserverconference.com](http://www.fisheriesobserverconference.com)

A workshop on **Fully Documented Fishery** was held in Copenhagen, Denmark in March 2010. The purpose of the workshop was to encourage further work on the development of catch quota management systems in Europe the fisheries and the use of electronic monitoring technology.

The aim of the workshop was to:

- Establish a common understanding of fully documented fisheries and define the information needs required to support them.
- Examine the operational requirements of electronic monitoring program and its applicability for various fishery needs such as stock assessment, biological sampling (i.e., in a reference fleet context), research and compliance monitoring.
- Examine approaches for cost effective control and "intelligent control" based on compilation of electronic data in relation to fisheries behaviour in order to establish advanced risk based control methods.
- Define other relevant consequences and perspectives of a management system based on full catch documentation.

The outcome of the workshop can be found at: [www.aqua.dtu.dk](http://www.aqua.dtu.dk)

A conference **Fishery Dependent Information (FDI) 2010** will be held in Galway, Ireland in August 2010.

The FDI 2010 is an international conference for managers, scientists and the fishing sector on the collection and interpretation of traditional and non-traditional information in the context of the ecosystem approach. The conference will focus on fishery dependent information requirements to support science, management and policy development, and on the collection and use of fishery dependent data, including conventional and novel data collection methods, analysis and interpretation.

Specific areas of interest of the conference are:

- Development and evaluation of policy and regulatory measures.
- Data requirements to support environmental, economic and social understanding of fisheries dynamics and management.
- Collection of socio-economic data and fishers' knowledge data and integration into the analytical and management process.
- Use of fishery dependent data to quantify technology creep and selection of appropriate metrics to define fishing effort.
- Evaluation of fishery dependent data in relation to the ecosystem approach to fisheries (EAF) including impacts of fishing for target and bycatch species on fishing communities and habitats, and as indicators for stock condition and distribution.
- Innovative data collection strategies such as self sampling and reference fleets, including assessment of precision and bias, and integration of data.
- Observer programs; use of observer data in analytical assessments; cost-benefit optimization; recognition of bias (e.g. accounting for spatial and temporal inconsistencies); sampling design.
- Electronic monitoring (EM) systems such as video and VMS; use of these types of data to support fisheries management and understanding of fisheries dynamics; integration of EM data with other types of information.
- Other novel approaches to data collection and application of these approaches to support and develop management objectives.
- Ancillary (e.g. environmental) data collection during fishing operations and utilization in support of the EAF.
- Data quality (uncertainty and bias) impacts on stock assessment and recognition in interpretation and provision of advice.
- Quality control.
- Integration of multiple sources of information and information systems design, e.g., for estimating discards and IUU-fishing.
- Management and acceptable use of information

Conference proceedings will be available at: [www.marine.ie/fisherydependentdata](http://www.marine.ie/fisherydependentdata)

A symposium **Improved Fisheries and Science Partnership as Policy Driver** will be held in Ostend, Belgium on 9<sup>th</sup> and 10<sup>th</sup> November 2010.

The symposium intends to bring together members of the European fisheries, scientific and policy communities to discuss, plan and develop a fisheries/science research partnership that can serve as a driver to improve the present knowledge base and the advisory process to policy.

Stakeholders will be invited from:

- European, national and regional research institutions dealing with scientific research and scientific advice to policy.
- Producer organizations, fishermen and their federations/associations
- ACFA
- European institutions
- Regional Advisory Committees
- European, national and regional governments
- European associations e.g. ICES, EFARO, EAFE, EAPO ...

The merits of the symposium are to generate information and tools for generic and specific approaches applicable at, respectively the large scale European geographical and the regional levels and to find answers and decisions on:

- the kind of interactive research which is needed and how it can be done,
- the adjustment and adaptation of the process to the needs of the involved stakeholders,
- the data collection and common ownership of the data and the results,
- the mutual acceptance of the results and findings,
- the cooperation between scientists and professionals on the design of the participation and advisory process,
- the long term engagement of scientists, professionals and policy makers,
- the financing of actions required by the Green Paper,
- an on-going co-education of scientists and professionals,

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As it appears of the above information, several initiatives for improving fisheries data sampling methods and equipment at present are going on, and the PG found it more appropriate to postpone this review to the 2011 PG meeting. It has been agreed that the outcome of the workshops, conferences or symposia should be reviewed as an intersessional work and reported to the 2011 PG meeting.

### **6.3 Report on the effectiveness of self-sampling programs versus traditional observer programmes**

Two workshops dealing with self sampling have been held and have contributed with very useful and valuable information.

The first workshop on using fishers to sample catches was held in 2007 [WKUFS] (ICES CM 2007) to:

- Review existing systems for using fishers for sampling,
- Suggest on procedures for designing self-sampling systems
- Suggest on methods for analyzing data, appropriate estimators and sources of variability.

In 2008 there was a follow-up workshop on fishers sampling of catches [WKSC] (ICES CM 2008) to:

- update the review of existing self sampling programs,
- develop standards for designing industry sampling programmes,

- determine sampling scheme for estimating, among other quantities discards and unreported landings,
- examine general survey design such as the use of fixed stations design, the use of fishing vessels, or fishery independent surveys

The PG recommends that all countries before starting new self sampling programmes to look at the outcomes from these two Wks to get some valuable guidance.

Since 2009, when the new EU DCF regulations were introduced some new self- sampling programmes has been started for example in Belgium, The Netherlands, Portugal, Denmark and Sweden. These self sampling programmes are described in Annex 14. Also, Latvia is considering self sampling programmes for collecting information and biological information in the long distance fisheries taken place in the African waters.

The PG was asked to give some guidance on how to proceed after implementing a self sampling programme and report on effectiveness of self sampling programs versus observer sampling. A way forward would be to start analyzing the data collected so far within the different countries and validate the sampling programmes. Some initiatives regarding data validation have been taken and are described below.

### **6.3.1 Data validation – Case study from the Netherlands**

There are many sources of bias which may affect the representativeness of the data. As a guide to whether any of the samples may have been biased during observation (e.g. some crew members may have been picking consistently only a fraction of species and small or large individuals from one haul), a procedure was developed which compares size-based indicators (mean length of key discard species: plaice, dab, grey gurnard and whiting) from a validation sample (haul level) with a reference group.

To minimize variability, the reference group refers to hauls that were made in the same area, season and mesh size as the validation sample. Two mixed effects models were developed to compare the mean length of key discard species in the validation sample with the reference group. The first model takes a haul effect into account, whereas the second model takes both a haul and quantity (number of fish measured) effect into account. Thereby, it can “shrink” the mean back to the overall population mean by weighting how many fish have been measured in any haul.

If two samples from the same trip, flag up in both models and indicate significant differences in the mean length of at least two species (out of four tested) between the validation sample and its reference group, a more detailed audit will be done on these samples to decide on whether these samples are valid.

### **6.3.2 Data validation – Case study from Ireland**

In order to ensure that the data being collected from the fishers self sampling (FSS) scheme are concurrent with existing national programmes, FSS data will be cross checked with discard observer data collected from vessels from the same metier with similar spatial and temporal attributes.

Data will be screened as they become available and techniques such as triangulation plots (Figure x) will be used to cross check self-sampling results against data collected by at sea observers. This will provide necessary checks to identify potential problems with the self-sampling being undertaken by individual vessels and allow for prompt remedial action to be taken.

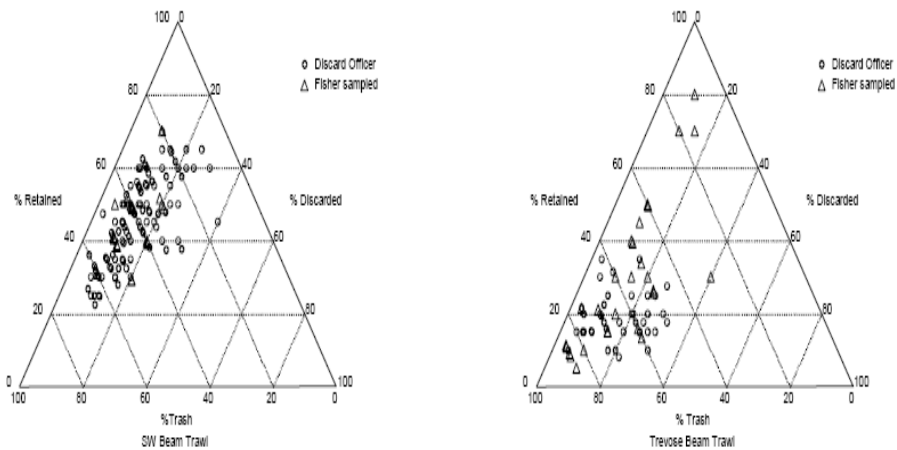


Figure 6.3.2 Triangulation plots from an earlier discard self-sampling scheme conducted in the Celtic Sea.

Once more data becomes available, detailed statistical analysis will be conducted at intervals to cross-check the data obtained using the two data collection methods. The three constituent components by weight (catch, commercial discard and 'unmarketable' elements) and length distributions obtained from each collection method will periodically be compared for significance where collection method will be considered as an explanatory variable.

### 6.3.3 Data validation, program evaluation and further use of self sampling data – Case study from Norway

The Norwegian Reference fleet program which started in 2000 comprises at present (2010) 17 high seas- (21-70 meters) and 21 coastal (9-20 meters) fishing vessels under contract. The program is self-financed by catch quotas and has a total budget (value of quota) of more than 4 mill €, including running costs of about 1.5 mill €. The vessels represent fisheries with a first-hand value of 1300 mill €. As the program has developed it has been important to evaluate and analyse the program and the collected data for representativeness, quality assurance and quality control (QA/QC), training and registration of discards. A short summary of this is shown below:

- **Representativeness**
  - The Reference fleet covers and represent the Norwegian fleet as follows: 0.1-4% based on vessel size; up to 0-15% based on gear métiers
  - The fleet's catches (in tons) represent: Pelagic species 1-4%; Demersal species 5-8%. In addition, by-catches of non-commercial species are recorded.
  - Collects information from about 100 of 257 species inhabiting Norwegian waters
  - The Reference fleet's fishing behavior in time and area is to be checked and compared with the whole national fleet by using VMS data
  - Catch-per-unit-effort (CPUE) of the fleet is being compared with other national vessels belonging to the same métier
- **Quality assurance and quality control is done by**

- Institute personnel visit on board
- Sampling protocols
- Technicians as helpmates for 2-4 vessels each including responsibility of QAQC
- Regular testing of received data
- Cross checking - comparison of sampling conducted with and without observers and inspectors
- Checking that sampling is conducted independent of catch size
- **Training**
  - Annual meetings with vessel owners and crews at the institute including small workshops for species and sex identification, maturity staging, sampling protocols etc.
  - During visit on board
  - Online communication by e-mail
  - Exchanging electronic photos by e-mail in almost real time
- **Registration of discards**
  - A special code used on each catch to indicate whether discards have been recorded/sampled or not
  - The crew is encouraged and paid to register all catch, including discards
  - The pelagic fleet that pumps the catch directly into closed tanks are difficult to sample at sea – this is hence done inside the port site when landing the catch
  - Discards may be estimated by comparing sampling at sea with sales notes and sampling at landing sites
- **Alternative or supplement to observers and port sampling?**
  - Cheaper? Dependent on purpose and goals.
  - A reference fleet builds trust and provides ownership to the results, and payment as incentive leads to increased data quality
  - Frequent visits on board increase trust which makes it more similar to observer programs
  - A reference fleet may provide better temporal and spatial data coverage, which may lead to reduced raising factors and hence greater precision
  - A reference fleet may contain too few vessels to cover all the métiers – satisfactory precision for stock assessment purpose and increased effective sample size are dependent on sampling many vessels
  - A reference fleet may be a valuable supplementary sampling platform at sea
  - A long-term contract with fishermen makes joint multipurpose research and development easier

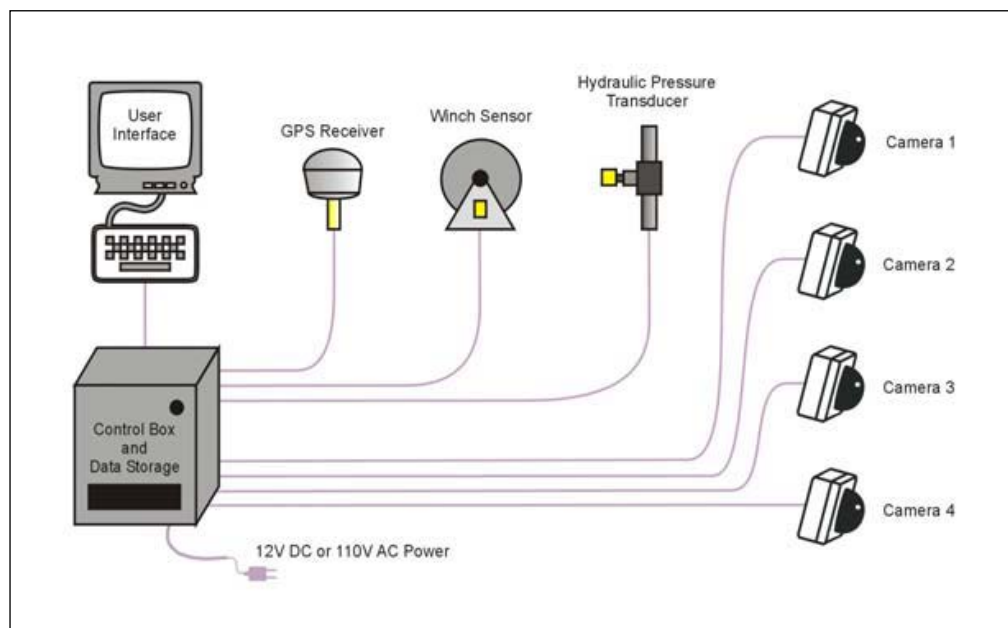
#### 6.3.4 Fully documented fishery – Case study from Denmark

The outcome of a project carried out in Denmark on Fully Documented Fishery was presented to the PG. The main aim of the project was to test whether it was possible to fully document the fishery by the use electronic monitoring means. Furthermore,

to examine whether fully documented fishery could ease a change of the present management system based landings quotas to a system using catch quotas. This means that the fishers would be accountable for their total catches, including eventual discards and not only the part of the catch that is landed. The total catch accounting system (catch quota scheme) could be implemented gradually on a voluntary basis and fishers should have an incentive by way of increased quota that compensates for the requirement that both retained and discarded catches are decremented against their held quota.

A requirement for entering into the new catch quota scheme is that the fishers operating under the scheme must have comprehensive, complete and reliable documentation of all their catches including discards. In order to demonstrate whether a “Full Documentation by Electronic Observation” can deliver the required level of assured documentation, a one year pilot project was conducted by the National Institute for Aquatic Resources, Technical University of Denmark (DTU Aqua).

The electronic monitoring (EM) system used in the pilot project consisted of up to four closed circuit television cameras, a GPS receiver, a hydraulic pressure sensor, a gear rotation sensor and a system control box (see figure 6.3.4). The EM Systems were installed on seven volunteer commercial fishing vessels where the cameras provided view of the aft deck, closer views of the fish handling areas and discard chute areas for catch identification.



**Figure 6.3.4 Schematic diagram of the electronic monitoring system, which can record video data from up to four cameras per vessel.**

The EM system has been collecting sensor data and images throughout the period September 2008 to July 2009. According to the vessel logbooks the vessels were at sea for 16,955 hours, carried out 561 fishing trips, and conducted 1,558 fishing operations during the project period.

The analysis of the sensor data (GPS, hydraulic pressure and rotation of the winches) showed that determination of where and when a fishing operation takes place can be made with a high degree of accuracy. In addition, by viewing the video imagery it



can be determined whether the vessel was actually fishing or for example, just cleaning their net.

An estimate of the total catch amount and the species composition was made by reviewing the video records of the catch handling onboard. The focal point for this project has been the documentation of discards of cod. The results of the pilot project showed that the estimate of discards of cod by viewing the video records can be made with high accuracy (table x), especially if the vessel had a sorting conveyor belt where the discarded fish passed the discard chute individually.

Differences between the image viewer's estimate of discard quantity and the amount reported by the vessels were more common when the discard volume was large. The results suggest that it was difficult for the viewer to estimate with accuracy when a large number of fish were discarded and there was a clear tendency for the viewers to underestimate discards in these situations. If these large quantity discards events are removed from the analyses the percentages for vessel C, for instance, drop to 21% which then aligns with the other trial participants.

**Table 6.3.4 The percentage of fishing events where the image viewer either had estimated less, more or the same amount of discard cod as the fishers.**

Vessel	Fisher < Viewer	Fisher = Viewer	Fisher > Viewer	Total no.
A	4	85	11	53
B	8	69	23	39
C	12	57	31	77
D	0	90	10	10
E	0	82	18	17
F	5	62	33	21
G	35	60	5	20
<b>Mean</b>	<b>9%</b>	<b>72%</b>	<b>19%</b>	<b>Total 237</b>

The results show that image recording of catch sorting can with a high degree accuracy be used to verify the actual amount of fish and shell fish that are discarded if the catch sorting working area onboard is arranged in a optimal way for image recording.

The cost for documenting a vessels fishery using EM is significant lower than obtaining the same documentation using onboard observers. The analysis showed that on average less than one hour data analysis and image viewing was required for verifying one fishing event and the associated catch handling.

The experiences gained during the pilot project have shown that the fishers have been more active in avoiding catches of small cod. If large quantities of small cod were caught the fisher would change fishing grounds or even try to change mesh size. Furthermore, there has been a positive reaction from the fishers and they have shown an increased awareness of their fishing patterns. The idea of giving the individual fishers an incentive to reduce discards by introducing a catch quota system where all catches (retained and discarded part) are counted against the quota and the fisher is responsible for documenting his fishery can be seen as a way forward toward sustainable fishing where the catches are utilized optimal.

The electronic monitoring system has proven its reliability. The experiences obtained during this pilot project have shown that the EM system can be applied on almost all types of pelagic vessels and the vessels fishing for sandeel, sprat, blue whiting and

Norway pout and larger demersal fishing vessels fishing for human consumption purposes, where it can give a 100% documentation of the fishing activities. Onboard some other vessels it may be necessary to modify vessel deck setups and interior catch handling flow in order to obtain appropriate image coverage for the full documentation processes.

### **6.3.5 Further analyses of self sampling programme are proposed by the Netherlands**

At IMARES, it has been suggested to start a case study on data quality of discard data of North Sea plaice collected in the Dutch self sampling programme. For several years discard data is used in the stock assessment of North Sea plaice. The discard data used for this stock assessment is collected by observers. A general problem encountered is a high annual variability in these datasets due to low sampling effort and, therefore, have negative effect on stock assessment outcomes. Self sampling increased sampling effort, spatial and temporal, at low costs. However, do these programmes reach the high quality standards which are needed for stock assessment purposes and overcome the problems observer programmes encounter when data is raised to fleet level.

In addition a study on how to use this detailed information, e.g. fishing grounds, seasonality, etc. for management is proposed. Communication between scientist and fishers is an important theme in self sampling programmes. Through intensive dialog between researcher and fishermen a new form of information, which can be best described as fishermen's knowledge, comes available for fishery research and management purposes.

### **6.3.6 Further recommendations regarding self-sampling programmes**

The PG encourages the countries to analyse the data collected from the self-sampling programmes and observer programmes to be able to validate the effectiveness and quality of the data collected.

The PGCCDBS recommends that data collected from self-sampling programmes are analysed. The PGCCDBS also recommends that the importance of prioritizing the validation of collected data could be discussed by EFARO (The European Fisheries and Aquaculture Research Organisation; an association composed of the Directors of the main European Research Institutes involved in Fisheries and Aquaculture research; [www.efaro.eu](http://www.efaro.eu)) in order to get support on such a focus. Furthermore, the PG recommends that the outcome of the analysis is published and reported to the PGCCDBS meeting in 2011.

## **6.4 Recommendations to the PGCCDBS from other ICES groups**

The WKROUND has at its meeting in 2009 stated that currently standardised research survey cruises are the method of choice for tuning stock assessment models and this approach is hence used in the North Sea. In the Baltic and Kattegat cod stock assessments a combination of commercial fleets and research surveys are used for tuning. However, research surveys have better spatial coverage and attempt to ensure that catchability is constant from year to year. Commercial fleets tend to have higher catches of larger fish, but suffer from poor spatial coverage, difficult to estimate technology-creep, improvements in catchability, difficulties in standardising gear types and cross-correlation issues. To improve transparency with the industry

and to guide working groups, the WK recommended that a group be struck to provide reference criteria on the use of commercial fleets in tuning assessments.

Further, that a future workshop should be set up to develop guidelines on the types of data and information that need to be supplied, and the relevant factors that need to be taken into account, in order to maximize the utility of commercial CPUE and VMS data as inputs to assessment models, or as ancillary information to evaluate the credibility of assessment results. Substantial input from fishing industry representatives, including active participation in such a working group, is required for such a workshop to be successful.

The PGCCDBS discussed these recommendations. In general EU fishers' logbook recordings are made according to the EU legislation. For Norway and some EU MS where the national legislation requires more detailed information the logbooks have to be filled in on a haul by haul basis. Additionally, some countries have made it mandatory also to record actual fishing time.

VMS data could give a significant contribution in improving the quality of the CPUE estimates. The PG realized that even the Council Regulation 199/2008 article 15 prescribes that the use of the data also covers e.g. logbook data as well as VMS data not all fisheries research institute have access to these data and therefore not able to carry out analysis such as CPUE estimates. In Table 6.4, an overview of the countries/institutes access the two data types is shown. The PGCCDBS suggest that STECF – SGRN take this issue into account.

In order to support further development, improvement and better use of collected fisheries data the PGCCDBS recommends that a workshop Methods for adjustment for technology creeping and effort estimation methods should be established in the autumn of 2011.

Tentative ToRs for the suggested workshop could be:

- a) Methods to adjust for technology creeping.
- b) Define necessary criteria and suggest estimation methods to derive proper and standardized time series of effort to be used for tuning fishing mortalities in stock assessments taking all new electronic opportunities into account (e.g. VMS, electronic logbooks, automatic electronic monitoring).

A DCF Study project: Lot 2: Development of tools for logbook and VMS data analysis (Call for Tenders – MARE 2008/10) is at present running. The main aim of this study is:

- 1) To create a method to deal with classification of Logbooks data for the fleet based approach. This method should assure a standardized approach at a Regional level assuring the criteria homogeneity between Member states. As a result, it shall be possible to automatically classify trips into metiers based on Logbooks species composition, gear or group of gears and area of operation.
- 2) To facilitate and develop the scientific use of VMS data as the basis for the estimation of pressure indicators in support of an ecosystem approach to fisheries management.

This project should be finalized ultimo 2010. The outcome from this project could probably provide useful information for the suggested workshop.

Table 6.4. Review of methods in use for length measurement and weighing of fish by country and sampling type (RV= Research vessel, SS= Sea sampling; M/H = Market / Harbour sampling).

Country	Traditional length measurement using pen and paper (Y/N)			Semi automatic /automatic method (Y/N)			Short explanation of the semi / automatic method (i.e electronic measuring board)			Data transported directly to the database			Access to VMS data (Y/N)	Access to Logbook data (Y/N)
	RV	SS	M/H	RV	SS	M/H	RV	SS	M/H	RV	SS	M/H		
	Belgium	Y	Y	N	Y	N	Y	Electronic measuring board - used for most species except some small exclusively discards species		Electronic measuring board	Y	N	Y	Y
Cyprus														
Denmark	Y	Y	Y	N	Y	N	NA	Electronic caliper stored in portable media and exported to the National Database	NA	N	Y	N	Y	Y
Estonia	Y	Y	Y	N	N	N	NA	NA	NA	N	N	N	Y	Y
Finland	Y	NA	N	N	NA	Y	NA	NA	Length and weight data recording electronic measuring boards connected to scale	N	NA	Y	N	N
France	Y	Y	Y	Y	Y	Y	Electronic measuring board (NKE) and electronic caliper for crustaceans	Electronic measuring board (NKE) and electronic caliper for crustaceans	Electronic measuring board (NKE) and electronic caliper for crustaceans	Y	Y	Y	Y	Y
Germany	Y	Y	Y	Y*	N	Y*	Electronic measuring board - tested on some Baltic sea surveys	NA	Electronic measuring board - tested on some Baltic sea surveys	N	N	N	Y	Y
Greece														
Ireland	N	Y	Y	Y	Y	Y	Electronic Data Capture (EDC) System Electronic measuring boards uploading L/W, sex, maturity data directly to central database	Digital calipers for Nephrops. Electronic measuring boards in shorttime.	Digital calipers for Nephrops. Electronic measuring boards in shorttime.	Y	Y	Y	Y	Y
Italy	Y	Y	Y	N	Y	Y	NA	Tape recorder	Tape recorder	N	N	N	Y	Y
Latvia	Y	Y	Y	N	N	N	NA	NA	NA	N	N	N	Y	Y
Lithuania														
Malta	Y	Y	Y	Y	Y	N	Electronic caliper for crustaceans	Electronic caliper for crustaceans	NA	N	N	N	Y	Y
Norway	N	Y	Y	Y	Y	N	Electronic measuring board (Scanrol and Marel scales) in a network	Electronic measuring board (Scanrol Fishmeter) for reference fleet and inspectors	NA	N	N	N	Y	Y
Poland	Y	Y	Y	N	N	N	NA	NA	NA	N	N	N	Y (but restricted)	Y
Portugal/IPIMAR	Y	Y	Y	Y	Y	Y	Electronic caliper for crustaceans	Digital/Tape Recorder Electronic caliper for crustaceans	Digital/Tape Recorder Electronic caliper for crustaceans	N	N	N	Y	Y
Portugal/DOP/Uaç	Y	Y	Y	Y	N	Y	Electronic measuring board	NA	FishMetrics (experimental)	Y	N	N	Y	N
Spain	Y	Y	Y	N	Y	Y	NA	MP3 Recorders	MP3 Recorders	N	N	N	N	N
Sweden	Y	Y	Y	Y*	N	Y*	*Some surveys electronic measuring board (scanrol) is used	NA	*Some samples worked up using electronic measured board. Nephrops and shrimp measurement using electronic caliper	Y	N	N	Y	Y
The Netherlands	Y	Y	Y	N	N	N				N	N	N	Y	Y
UK England	Y	Y	Y	Y	Y	Y	Cefas electronic measuring board	Cefas electronic measuring board	Cefas electronic measuring board	Y	Y	Y	Y	Y
UK Scotland	Y	Y	Y	N	N	Y	NA	NA	For sampling of Nephrops, length measurements, and sex are also recorded on PDPs linked to electronic calipers	N	N	Y	Y	Y

## 7 Agree a workplan for 2011 for further developing and finalising standards and best practices for sampling commercial fisheries (ToR f)

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### 7.1 Methodology-related issues

The formation of a Study Group or EU contract would be appropriate to consider methods and tools for optimisation of sampling schemes between MS to achieve international precision targets and consistent collection of data to allow analysis by domains covering international strata within regions (e.g. metiers), see section 5.2. Further development of the data basis and COST tools should aim to cater for different possible sampling designs and associated procedures described in WKMERGE.

PGCCDBS recommends that a series of workshops be set up, based on case studies allowing for a more thorough discussion on the details of design and implementation of catch sampling schemes (see section 5.3). The case studies should from a methodological point of view be of general interest and should be well prepared prior to the workshop. Special attention should be given to design and implementation of regional sampling schemes. The PGCCDBS further consider it beneficial to collate the findings from the series of workshop into a reference book as this at present time is missing. This book should contain documentations and estimators for the basic statistics and how it is should be implemented in the assessment. PGCCDBS would like to maintain the recommendations from last year and hope that the ICES Secretariat can allocate sufficient resources to complete the above worklist for 2010 before the PGCCDBS 2011 meeting.

PGCCDBS recommends that the outcome of the workshops, conferences or symposia on data collection from commercial fisheries (see section 6.2) should be reviewed as an intersessional work (see section 7.4) and reported to the 2011 PG meeting.

PGCCDBS recommends that all countries, before starting new self-sampling programmes, to look at the outcomes from these two WKs (WKUFS, WKSC) to get some valuable guidance. PGCCDBS recommends that countries analyse the data collected from the self-sampling programmes and observer programmes to be able to validate the effectiveness and quality of the data collected (see section 6.3.6). The PGCCDBS recommends that the importance of prioritizing the validation of data collected from self-sampling programmes could be discussed by EFARO in order to get support on such a focus. Furthermore, the PG recommends that the outcome of the analysis is published and reported to the PGCCDBS meeting in 2011.

### 7.2 Age-related issues

#### 7.2.1 Otolith exchange programme and Workshop planning

PGCCDBS updated the age reading long-term planning table, see Annex 9.

According to the DCF (Commission Decision 2010/93/EU), the various fish and shellfish species are divided into three groups:

**Group 1:** Species that drive the international management process including species under EU management plans or EU recovery plans or EU long term multiannual plans or EU action plans for conservation and management based on Council Regulation (EC) No 2371/2002 of 20 December 2002 on the conservation and sustainable exploitation of fisheries resources under the common fisheries policy,

**Group 2:** Other internationally regulated species and major non-internationally regulated by-catch species,

**Group 3:** All other by-catch (fish and shellfish) species. The list of Group 3 species shall be established at the regional level by the relevant regional coordination meeting and agreed by STECF.

All group 1 and group 2 fish species have been included in Annex 8. As age determination of the group 3 species is not required, these species were not taken into account by the PGCCDBS.

Annex 8 shows that focus on age determination has been on a limited number of species, as these species have been the commercially most important species for which scientific advice has been given for a number of years.

The PGCCDBS discussed how to deal with all the species for which age determination routinely rarely - if ever - has been carried out. The PG agreed the following 'three-step approach' to be implemented:

- 1) If an analytical assessment for a species is carried out and advice is given, or if otoliths are available and future assessments are being prepared, a 'small' otolith exchange programme has to be carried out every three years.
- 2) If the age reading performance in the small otolith exchange programme is medium or bad, ToRs must be drafted to solve identified problems and a full-size exchange must be carried out.
- 3) If the age reading remains medium or bad, an age calibration workshop must be planned,
- 4) Workshops consist of a series of discussions and exchanges designed to resolve the problems identified in a pre-workshop exchange. If the problems are not resolved or new problems are identified, another full-size exchange must be carried out before a further workshop can take place.
- 5) If the age reading performance in the small otolith exchange programme is good, a further small otolith exchange programme should be carried out in three years time.

Additionally, PGCCDBS emphasises that exceptions to the 'three-step-approach' can be allowed in certain cases. For instance, when a WK didn't solve the age reading problems they faced, but the people involved still know how to proceed in improving the performance, it can be decided that a new workshop can follow a previous one without an intermediate exchange. Also when species of special conservation concern are involved, it can make more sense to immediately have a second workshop gathering the relevant experts, instead of going through an exchange first.

The procedure for planning otolith exchanges and workshops is illustrated in Fig. 7.2.1.

PGCCDBS recommends the following criteria for classifying ageing performance into 'good', 'medium' or 'bad'.

- **Bad** ageing performance: There are serious concerns about the reliability of the age data and/or its value to stock assessment WGs. Indicators may include poor agreement between age readers and age data that do not appear to agree with other methods of growth estimation for the stock/species. Causes may include difficulty in observing/interpreting cal-

cified structure (CS) growth patterns, no protocol for preparation/age reading and the use of inappropriate CS or preparation methods.

- **Medium** ageing performance: The quality of the age data is unknown or there is minor concern about its reliability. The age data is used by stock assessment WGs, but improvement is required. Indicators may include levels of agreement between age readers that are below the preferred target value for the stock/species (e.g. VIIa cod - 90%?, redfish - 40%?). Causes may include difficulty in interpreting aspects of (CS) growth patterns, e.g. disagreement over the location of the first annulus or otolith edge interpretation, protocols for age reading are used but may need revision, or the use of less reliable preparation/observation methods.
- **Good** ageing performance: The age data is considered reliable and to be of high value to stock assessment WGs. Indicators may include repeated high levels of agreement between age readers at successive ex-changes or workshops. Causes may include calcified structure (CS) growth patterns that are easier to interpret, good protocols for preparation/age reading and the implementation of QA and/or QC procedures at individual institutes.

In this context, target levels for percentages of agreement amongst readers and allowable CV's, should be set by the respective stock coordinators, or consensus on this should be reached in the relevant assessment working groups (also taking advice from experienced age readers/age reader coordinators into account, if needed). Only when the target levels are met for a certain stock, will this stock be considered as one with a good ageing performance (not meaning that age data can only be used in an analytical assessment in these cases, see above). PGCCDBS therefore recommends that the request to set target levels for the percentage of agreement and CV's for the different stocks, is included in the ToRs of the assessment working groups. During the AWG's, the data contact persons should stress this request and make sure the target levels list is completed and included in the WG's reports.

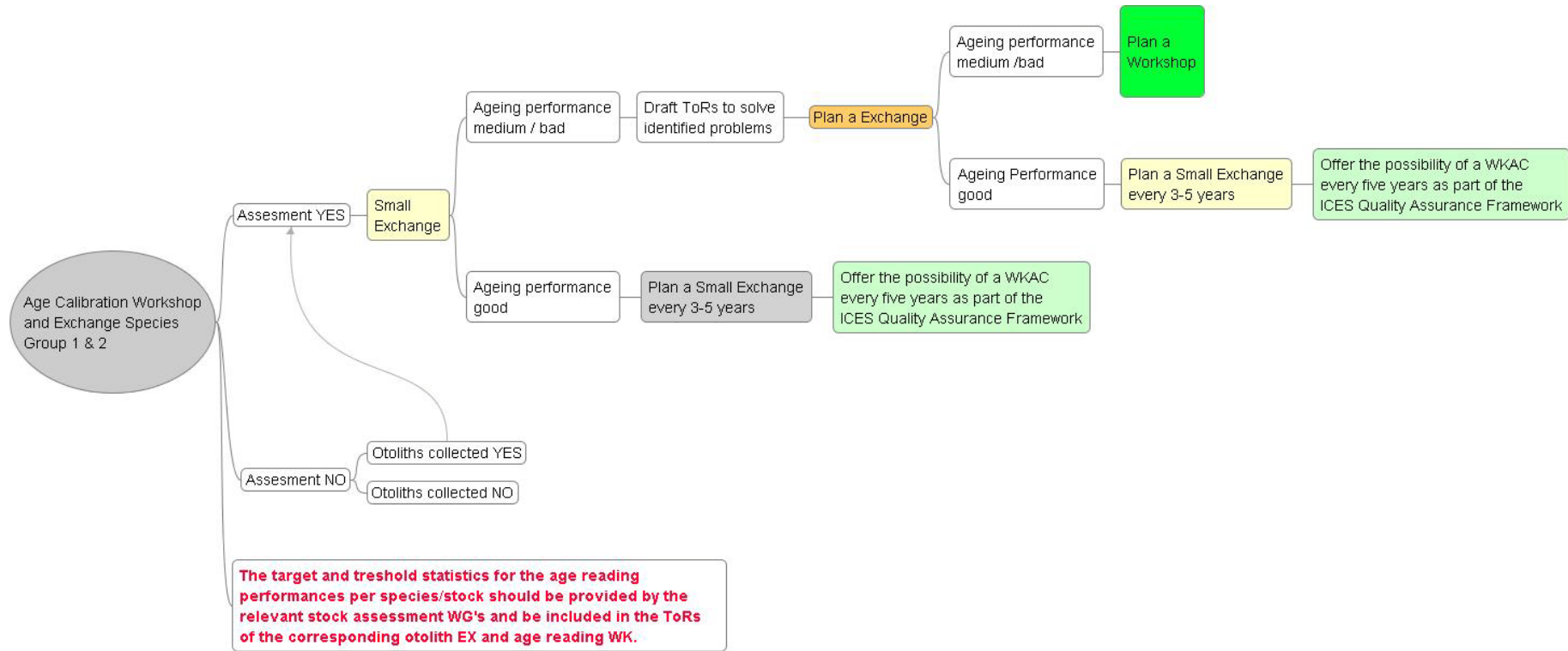


Fig. 7.2.1 Decision diagram for planning otolith exchanges and age reading workshops.



## 7.2.2 Otolith exchanges for 2010/2011

### Small exchanges:

#### 7.2.2.1 Brill (*Scophthalmus rhombus*)

The last brill otolith exchange took place in 2005. A small exchange will be carried out in 2010. Annemie Zenner (Belgium) will act as coordinator for the exchange.

#### 7.2.2.2 Black spot sea bream (*Pagellus bogaraveo*)

Currently, only two age readers are involved in age reading of black spot sea bream in Sub-area X. Another stock in ICES division IXa, also has annual age readings and the consistency of the age readings between the two areas should be checked. Therefore, a small otolith exchange between all countries that are currently ageing this species, is recommended for 2010-11. Portugal (DOP) and Spain (Gulf of Cadiz) will participate. Juan Gil Herrera (Spain) will act as coordinator.

#### 7.2.2.3 Red mullet (*Mullus surmuletus*) and striped red mullet (*M. barbatus*)

An exchange for a new set of *M. barbatus* otoliths from the Mediterranean should be examined and new sets of *M. surmuletus* otoliths from the Mediterranean, the Gulf of Biscay and the English Channel should be organised, in order to detect differences between areas. PGCCDBS recommends a small exchange in 2011 in order to clarify the ageing in these species and to compare age reading from otoliths and scales (PGMED). Kélig Mahé (France) will act as coordinator.

#### 7.2.2.4 North Sea sprat (*Sprattus sprattus*)

The last exchange of otoliths took place in 2002 and a workshop took place in 2004. WKSHORT 2009 is unclear as to whether the age reading of sprat otoliths can be achieved with sufficient accuracy and precision for generation of age structured data. Given that there has not been an age reading comparison for this stock since 2004, the Benchmark Workshop therefore recommended an age reading workshop with the aims of reviewing past work, investigating new techniques for age reading and answering this important and unresolved question. Lotte Worsøe Clausen (Denmark) will act as coordinator for a small exchange in 2010-11.

#### 7.2.2.5 Spanish mackerel (*Scomber japonicus*)

Spanish mackerel is only fished by Spain and Portugal. Spain has only recently started sampling this species and PGCCDBS recommends that Spain sends an age reader to Portugal for age reader inter-calibration. Thereafter, a small exchange is recommended for 2012-13. Maria Manuel Martins (Portugal) will act as coordinator

#### 7.2.2.6 Tusk (*Brosme brosme*)

Tusk assessment would be improved by greater availability of length-at-age data. All MS with tusk landings are required to collect age data, but only Norway and Iceland read tusk otoliths. A small exchange should be carried in 2010-11 out between all MS with tusk landings. Gróa Pétursdóttir (Iceland) will act as coordinator.

#### 7.2.2.7 Megrin (*Lepidorhombus whiffiagonis*)

A small exchange is recommended for 2011 as there has not been a workshop since 2004. WKAGME recommends that measures be taken to achieve international con-

sensus among age readings for megrim, particularly in stock unit areas such as the northern shelf. UK-England (Mark Etherton) will act as coordinator.

#### **7.2.2.8 Sea bass (*Dicentrarchus labrax*) and Sparidae spp.**

There has never been an exchange of fish scales for age calibration. Several institutes are currently using scales for the routine age reading of species such as sea bass, and sea bream. Scales are used for age determination of Sparidae spp. in the Mediterranean. A comprehensive exchange is recommended to identify if there are any issues with using scales for age determination. The exchange will be organised during 2010-11. The coordinator will identify which species are currently being read using scales and will incorporate a maximum of five of these species in the exchange. Kélig Mahé (France) will act as coordinator for the exchange and the potential workshop.

#### **Full exchanges:**

##### **7.2.2.9 European eel (*Anguilla anguilla*)**

There has been a request for another workshop from WGEEL, but PGCCDBS recommends that another exchange should be arranged in the first instance. Françoise Daverat (France), with assistance by Mark Etherton (UK-England), to arrange in 2010. Furthermore, PGCCDBS supports WGEEL's request for a new workshop (see section 7.2.3).

##### **7.2.2.10 European Atlantic sardine (*Sardina pilchardus*)**

PGCCDBS recommends an otolith exchange for European Atlantic sardine in 2010 to precede the planned workshop on this species in 2010-11, focussing on the standardisation of age reading methodology and criteria between the different areas (WGANS, ICES 2009c). Eduardo Soares (Portugal) and Isabel Riveiro (Spain) will act as coordinators.

##### **7.2.2.11 Angler (*Lophius piscatorius*) and black-bellied angler (*L. budegassa*)**

The last angler (*Lophius* spp.) otolith exchange took place in 2001 and the last black-bellied angler (*L. budegassa*) otolith exchange took place in 2004. Landa *et al.* (2008), however, noted that previously used ageing criteria are not accurate. There is ongoing research to establish if a new protocol should be established when using illicia to estimate age. Full exchanges of otoliths and illicia are therefore recommended for 2011, when new ageing criteria are expected. Jorge Landa (Santander, Spain) will act as coordinator. As there will be a Benchmark WK for anglerfish in 2012, the results from these exchanges will be of high importance and should be reported in due time before the WK.

##### **7.2.2.12 Baltic, North Sea and Black Sea turbot (*Psetta maxima*)**

The last Turbot exchange took place in 2004, and was followed by the WKART in 2008. WKART 2008 and PGCCDBS 2009 recommended a new exchange. Three sets of samples should be included: from the Baltic, North Sea and Black Sea. Otoliths from the other countries will be required, especially for the Baltic and the Black Sea stocks. A questionnaire will be sent to all institutes with the objective of reviewing which material is available for inclusion in the otolith exchange. Annemie Zenner (Belgium) will act as coordinator for the exchange which will be carried out in 2010-2011.

### 7.2.2.13 Roundnose grenadier (*Coryphaenoides rupestris*)

Another workshop was requested by WKARRG (ICES 2007b), but PGCCDBS recommends that another exchange should be arranged in the first instance in 2011 to address the issues that arose during the previous workshop. Kélig Mahé (France) will act as coordinator.

### 7.2.3 Age Reading Workshop proposals

As an outcome of the 2010 PGCCDBS recommendations, a number of workshops have been suggested to be established. The full details of these workshop proposals are given in Annex 15.

The Study Group on **Salmon** Age Determination [SGSAD] will meet in the winter period of 2010/11. One of SGSAD's conclusions in 2008 was that it would be good to widen the SGSAD from the Baltic Sea to the Atlantic side.

**European Atlantic sardine:** A workshop in 2011 on sardine age reading was proposed by WGANSA 2009 (ICES 2009c) and is recommended by PGCCDBS, to standardize age reading methodology and criteria between the different areas.

**Anchovy:** The age composition of anchovy in ICES Div. IXa by age readings of otoliths in the Spring Portuguese acoustic surveys has to be investigated due to recent significant changes (decrease in biomass by 30% from 2008 to 2009, while abundance remained on same level). Reliable age data are required for this purpose. The support by ICES for such an effort should be communicated to the Portuguese institute (IPIMAR). A methodological workshop is planned for 2012. PGCCDBS, however, notes that several preparatory steps are necessary for this workshop, and a proposed workshop on microincrement growth in 2011 is of relevance. PGCCDBS also considers the expansion to other anchovy distribution areas appropriate for an age reading workshop on anchovy. These issues will further be discussed before and at the next PGCCDBS meeting.

The Workshop on Age Reading of **European and American Eel** [WKAREA-2] (Chair: Françoise Daverat, France) will exchange information by correspondence in 2010 and meet in Bordeaux, France in March 2011. Although a workshop on the age reading of European (*Anguilla anguilla*) and American (*Anguilla rostrata*) eels was organised in 2009 [WKAREA, ICES 2009b], there has been a request for another workshop from WGEEL (ICES 2009d). According to the three-step approach (see section 7.2.1), there should first be a new exchange focussing on the issues that could not be solved during the last workshop, before a new workshop can be organised. However, given the solid request from WGEEL, and the conservation status of the species concerned, PGCCDBS considers this a good example of species requiring urgent action, and thus deserving the immediate addressing of the issues concerning age reading in a new workshop. PGCCDBS therefore supports the request for a WKAREA2.

The **Workshop of National Age Reader Coordinators** [WKNARC] (Co-Chairs: Kélig Mahé and Willie McCurdy) will take place in Boulogne-sur-Mer (IFREMER) France, in September-October 2011, as a clear need for a forum for national age reading coordinators has been identified.

Age reading of **Deepwater Sharks** deserves further discussion at the next PGCCDBS meeting, as current fishing and sampling levels are very low due to fisheries restrictions and as there are specific requirements for ageing elasmobranch fishes.

#### 7.2.4 Age Reading Workshops previously approved

The Workshop on Age Reading of **Greenland Halibut** [WKARGH] (Chairs: Ole Thomas Albert, Norway, and Karen Dwyer, Canada), will be established and take place in Vigo, Spain, 14–17 February 2011 [already approved by ACOM, resolution 2009/2/ACOM44]. The resolution is given in Annex 15 for reasons of completeness for the 2011 workplan.

The Workshop on Age Reading of **Dab** (*Limanda limanda*) [WKARDAB] (Chair: Ulrich Damm, Germany) will be established and take place in Hamburg, Germany, 17-20 Nov 2010. Recommended by PGCCDBS 2009.

The Workshop on Age Reading of North Sea (IV) and Skagerrak-Kattegat (IIIa) **Plaice** (*Pleuronectes platessa*) [WKARP] (Chair: Loes Bolle, The Netherlands) will be established and take place in IJmuiden (Wageningen-IMARES), The Netherlands, 2-5 November 2010. Recommended by PGCCDBS 2009.

The Workshop on the Age Reading of **Mackerel** (*Scomber scombrus*) [WKARMAC] (Chair: Lotte Worsøe Clausen, Denmark) will be established and take place in Lowestoft, England, 1-4 November 2010. Recommended by PGCCDBS 2009.

### 7.3 Maturity-related issues

#### 7.3.1 Maturity Workshop proposals

For species where maturity data already exists and discrepancies have been found among laboratories, there is a clear need of workshops on maturity staging. To aid planning of these workshops, PGCCDBS used tables describing maturity sampling developed by RCM-NS&EA and RCM-NA (Annex 10). PGCCDBS acknowledges this work and recommends that RCM-NS-EA and RCM-NA maintain and update these maturity sampling tables, and that RCM Baltic documents maturity sampling in the same way as the other RCMs.

The following maturity staging workshops that are proposed by PGCCDBS to take place in 2011-12:

- Workshop on Sexual Maturity Staging of **Herring and Sprat** [WKMSHS] (already approved by ACOM, resolution 2009/2/ACOM49), in 2011
- Workshop on Sexual Maturity Staging of **Cod, Whiting, Haddock, Saithe** and other **gadoids** [WKMSGAD], in 2011, as follow-up of WKMSCWHS 2007
- Workshop on sexual maturity staging of **sole, plaice, dab** and **flounder** [WKMSPDF2], in 2012
- After reviewing the species list of Appendix VII of the DCF against the details of previously held workshops, PGCCDBS considered that there is sufficient interest and need to hold a market staging workshop on **turbot and brill**, as national maturity scales exist for these species but no maturity staging workshop has previously been held. An outline proposal for this workshop (WKMSTB) is given in Annex 15. As there are these are group 2 species in the DCF and there are constraints on the number of workshops that should be held in 2011, the workshop is proposed for 2012. This will provide sufficient opportunity to organise the collection of suitable fresh samples.

PGCCDBS investigating the need on holding maturity staging workshops in 2011-12 regarding **blue whiting, megrim, deep-sea species** and **salmon**.

A workshop on **blue whiting** maturity was discussed with the blue whiting stock coordinator and there is not considered to be an urgent need for a workshop at present. If needed, this gadoid species could be included in the WKMSGAD (see Annex 15).

After discussion with the chair and members of WGHMM it was decided that there is not an urgent need for a **megrim** maturity workshop, so a proposal will not be presented (although any additional information that can improve the assessment will of course be welcomed).

WGDEEP recommended a maturity workshop on **deep-sea sharks**, but this species should be included in the WK on maturity staging elasmobranchs (WKMSSEL) so a specific workshop is not needed.

WGNAS and WGBAST were contacted for the need of a **salmon** maturity staging workshop. There was no need identified by WGNAS to have a workshop on this topic. Maturity in salmon is well understood. Only the Faroese fishery in the past targeted maturing and non-maturing fish, but for North Atlantic salmon, size is a good proxy for maturity. For Baltic salmon (WGBAST), regional differences in the maturation or differences between wild-reared salmon in different areas could be of interest, and some of these issues may even have implications for assessment. As a matter of prioritisation of tasks to improve assessment, however, WGBAST concluded that there is not an urgent need for a workshop on this topic.

### 7.3.2 Maturity Workshops previously approved

The following maturity staging workshops that were proposed by PGCCDBS in 2009 are due to take place in 2010:

- 1) Workshop on Estimation of Maturity Ogive in **Norwegian spring spawning herring** [WKHERMAT], 1-3 Mar 2010
- 2) Workshop on Sexual Maturity Staging of **Redfish** and **Greenland Halibut** [WKMSREGH], planned for 25-28 May 2010, but postponed to autumn 2011 along with the following two workshops established in conjunction with the PGMed:
- 3) Workshop on Sexual Maturity Staging of **Elasmobranchs** [WKMSSEL], 11-15 Oct 2010
- 4) Workshop on Sexual Maturity Staging of **Cephalopods** [WKMSCEPH], 8-11 Nov 2010

## 7.4 Intersession work

The group has recommended the following tasks for intersession work until the next PG meeting:

PGCCDBS recommends developing the 'Guus Eltink spreadsheet' for comparisons of age readings further and into a non-Excel based shape (see section 4.2.3). The outcomes of calibration exercises should feed directly into assessment models, e.g. by producing a matrix stating the variance or CV around the estimation of a given age and quantifying this into a variance parameter for the age distribution of the stock.

PGCCDBS recommends that precision levels and acceptable 'widths' of confidence bands for age estimates should be evaluated by species, based on simulations with various degrees of disagreement by age (see section 4.2.3).

Regarding the 'Age readers forum' (section 4.2.4), the PG discussed establishing a "SharePoint team" who would take responsibility for updating the content of the site. PGCCDBS recommends that one person be appointed to monitor the forum and update information. Gráinne Ní Chonchúir (Ireland) has volunteered to do this in 2010. This role should be rotated annually, amongst the various laboratories, ensuring the various laboratories become familiar with the forum.

PCCDBS recommends that a workplan on the analysis of between-reader variation in maturity staging is being developed in close collaboration with the FRESH-COST action, considering general techniques to assess maturity and improve agreement between investigators (section 4.3.6). Fran Saborido-Rey (Spain), Francesca Vitale (Sweden), David Maxwell (UK-England) and Ernesto Jardim (Portugal) will act as coordinators.

Concerning improvements and further development of InterCatch, PGCCDBS expresses the necessity to the ICES Secretariat to keep the plan of progress and allocate sufficient resources to complete the worklist for 2010 before the PGCCDBS 2011 meeting.

It has been agreed that the outcome of the workshops, conferences and symposia in 2010 on data collection from commercial fisheries (see section 6.2) should be reviewed as an intersessional work and reported to the 2011 PG meeting.

The PGCCDBS recommends that data collected from self-sampling programmes are being analysed (see section 6.3.6). The PGCCDBS also recommends that the importance of prioritizing the validation of collected data could be discussed by EFARO in order to get support on such a focus. Furthermore, the PG recommends that the outcome of the analysis is published and reported to the PGCCDBS meeting in 2011.

The creation of a clickable HTML version of Annex 8 will facilitate the long-term planning of age reading workshops. The group will update and simplify Annex 9, and construct a clickable html-version in which coloured cells will contain links to existing age calibration Exchange and Workshop reports. This tool should be constructed in collaboration with the ICES Secretariat, and hosted on the PGCCDBS documents repository, enabling open reader access and downloading for these reports.

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## Annexes

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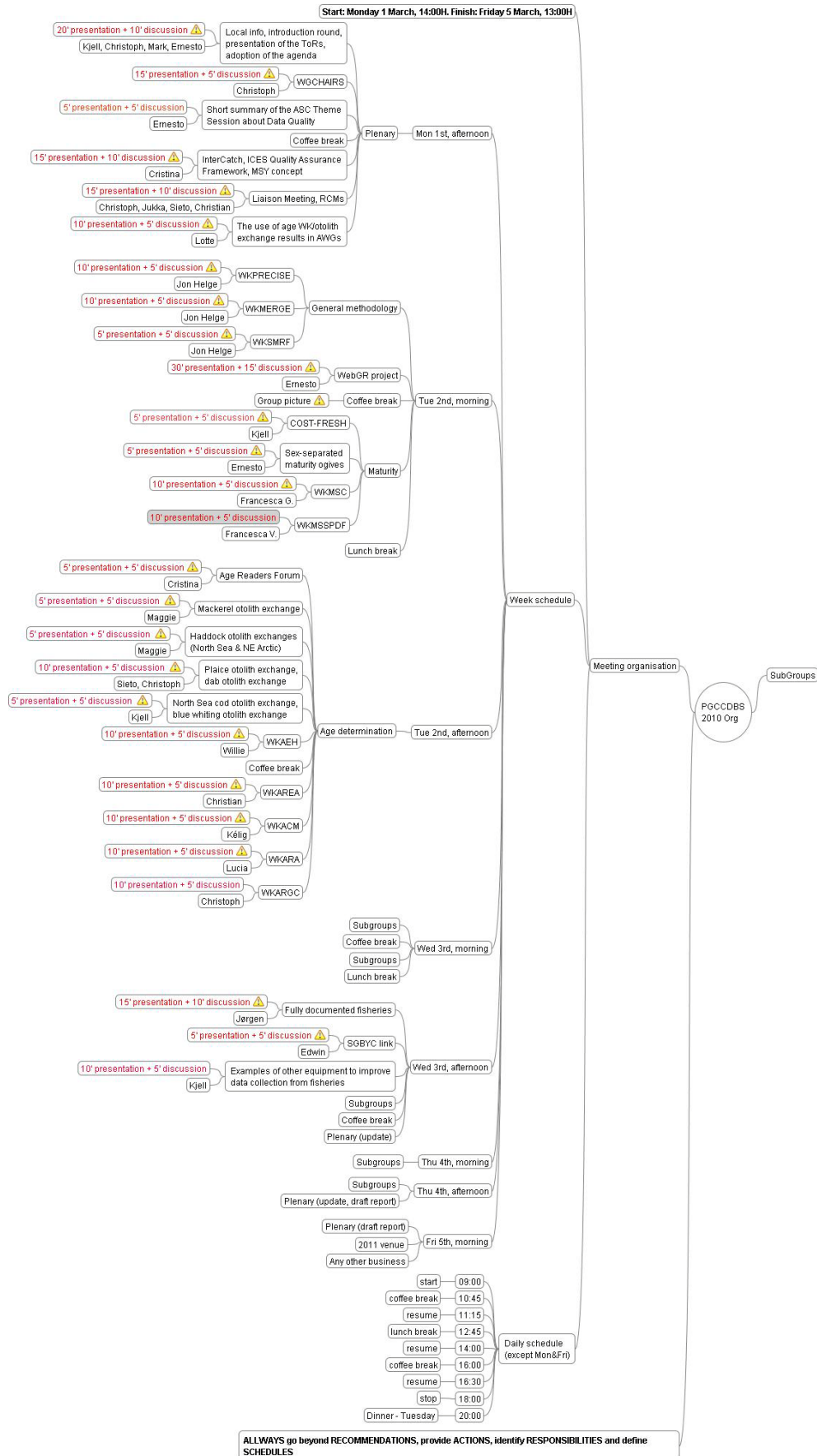


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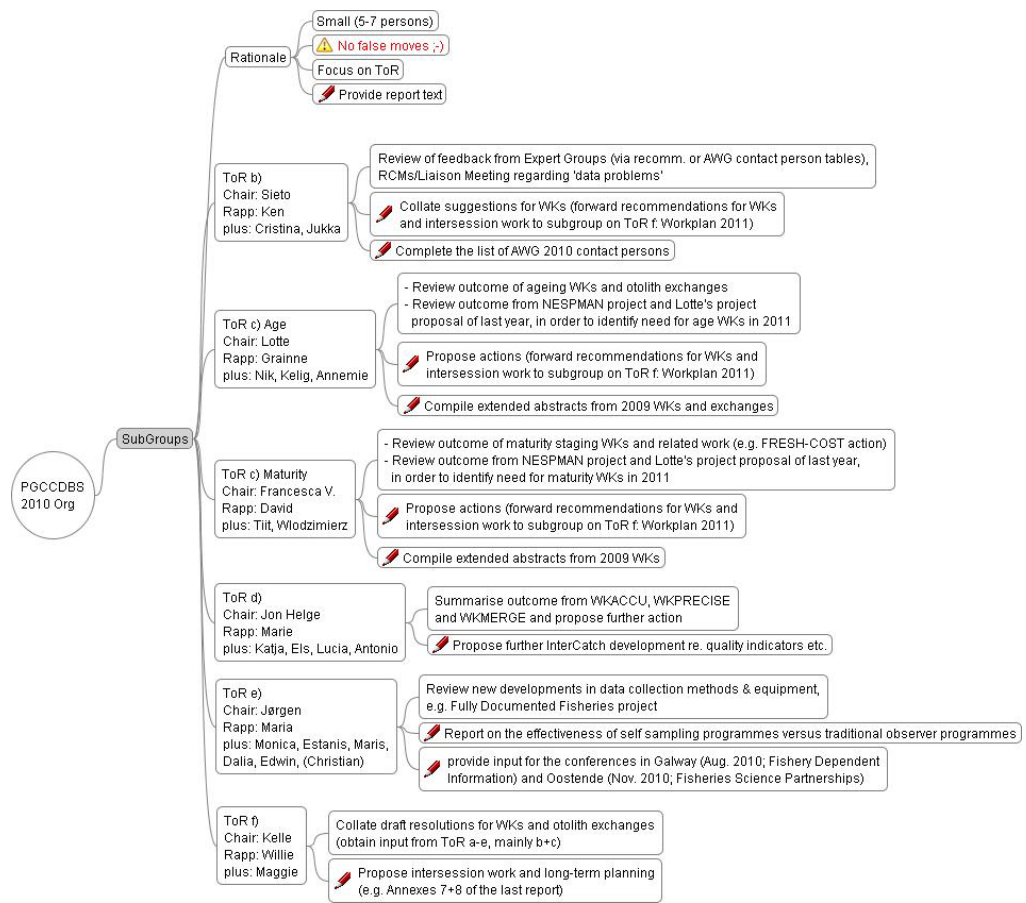
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## Annex 2: Agenda



### Annex 3: Sub-groups



## Annex 4: PGCCDBS terms of reference for the next meeting

2010/x/ACOMxx. The **Planning Group on Commercial Catches, Discards and Biological Sampling** [PGCCDBS] (Co-Chairs: Christoph Stransky, Germany, and Kjell Nedreaas, Norway) will meet in Vienna, Austria, 28 February – 4 March 2011, to:

- a) Review and follow up of last year's recommendations and intersession work;
- b) Review reports from PGCCDBS contact persons with Assessment Working Groups. Where appropriate, propose changes to sampling strategies, protocols, and levels for implementation within the EU Data Collection Framework and national centres responsible for sampling commercial catches
- c) Identify changes or proposals for changes in data collection, that may have a potential impact on stock assessment, and summarise these changes for consideration by the Assessment Working Groups.
- d) Report on the implementation of the Quality Assurance Framework (QAF) into stock assessments
- e) Review progress in methods and equipment for data collection from fisheries.
- f) Agree on a workplan for 2012 for further developing and finalising standards and best practices for sampling commercial fisheries;

PGCCDBS will report for the attention of ACOM by 20 March 2011.

Supporting Information:

Priority:	Essential
Scientific justification:	<p>The Planning Group and workshops are proposed in response to the EC-ICES MoU that requests ICES to provide support for the Data Collection Framework (DCF; EC Reg. 199/2008 and 665/2008, Decisions 2008/949/EC and 2010/93/EU). PGCCDBS is the ICES forum for planning and co-ordination of collection of data for stock assessment purposes; it coordinates and initiates the development of methods and adopts sampling standards and guidelines. Many activities in this group are closely linked to the activities of the EU DCF and DG MARE is a member of PGCCDBS to ensure proper coordination with the DCF activities. Stock assessment requires data covering the total removal from the fish stocks and the PG serves as a forum for coordination with non-EU member countries where appropriate.</p> <p>The PG shall develop and approve standards for best sampling practices within its remits and for fisheries in the ICES area. The implementation of these practices is discussed regionally and implemented nationally.</p> <p>The PG coordinates initiatives for workshops and other activities to address specific problems. The success of the workshops requires a substantial amount of preparatory work in the laboratories. This preparatory work is the responsibility of the national laboratories. ICES have been informed that this work is included in the national annual DCF work plans.</p> <p>The meeting is placed in Vienna, Austria, and shall be held in parallel with the corresponding planning group for the Mediterranean EU fisheries (PGMED).</p>
Resource requirements:	
Participants:	Scientists involved in the EU Data Collection Framework and other data collection schemes, usually 30-40 participants.

<b>Priority:</b>	<b>Essential</b>
Secretariat facilities:	
Financial:	
Linkages to advisory committees:	ACOM
Linkages to other committees or groups:	SciCom, fish stock assessment working groups (AFWG, HAWG, NWWG, NIPAG, WGWIDE, WGBAST, WGBFAS, WGNSSK, WGCSE, WGDEEP, WGHMM, and WGANSA)
Linkages to other organizations:	DG MARE (DCF)

### Annex 5: Examples of PGCCDBS contact persons – Stock data problems relevant to data collection (included in Report from the Assessment Working Groups / Benchmark Workshops)

Stock	Description	How to be addressed?	By whom?
Red seabream in sub-area X	Red seabream species have a hermaphroditic reproduction strategy. More understanding on red seabream reproductive strategy is needed. Maturity staging of hermaphrodite species is in general problematic.	Standard maturity criteria (and scale) should be developed to correctly identify when the two sexes are presented in the gonads.  Histology analysis would be to the advantage of the validation of the macroscopic identification.  Recommendation:  Workshop on hermaphrodite species (or in red seabream in particular).	PGCCDBS
Western Baltic cod	Recreational fisheries are not considered in the assessment although there are indications that recreational fisheries have a high contribution on total removals.	A WK on recreational fisheries will be held this year. The outcome of the WK should provide recommendations on recreational sampling. These recommendations should be taken into consideration in the National Data collection programmes.	Baltic RCM
Megrim and anglerfish	Age reading precision	WKAGME recommends that measures be taken to achieve international consensus among age readings for anglerfish and megrim, particularly in stock unit areas such as the northern shelf. This might best be achieved through a collaborative project whose aims should take into account recommendations of previous workshops.	PGCCDBS



**Annex 6: List of members attending PGCCDBS 2010 and PGMED 2010 and their involvement in assessment working groups, benchmark workshops and regional coordinating meetings**

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## Annex 7: Age reader contacts

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**Annex 8: List of species with indications on the frequency of otolith exchanges and workshops**

Species (Eng.)	Species (Latin)	Super Area	Area/Stock	Species group	Assessment	Previous exchanges	Previous workshops	Workshops 2010/2011	Exchanges proposed by PGCCDBS 2010	Workshops proposed by PGCCDBS 2010
Atlanto-Scandian herring	<i>Clupea harengus</i>	Area I and II	I, II, V	G1	yes		1999			
Blue whiting	<i>Micromesistius poutassou</i>	Area I and II	I-IX, XII, XIV	G1	yes	see NEA			exchange going on	
Capelin	<i>Mallotus villosus</i>	Area I and II	I, II	G2	yes					
Cod	<i>Gadus morhua</i>	Area I and II	I, II	G1	yes	2006	2006		annual NO - RU	annual NO - RU
Deep sea Redfish	<i>Sebastes mentella</i>	Area I and II	I, II	G1	yes	see NEA				
European Eel	<i>Anguilla anguilla</i>	Area I and II	I, II	G1	yes		2009 (FR)	WKAREA2 (FR, 2011)	yes	
Golden Redfish	<i>Sebastes marinus</i>	Area I and II	I, II	G1	yes	see NEA (Deep Sea Rec)				
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	Area I and II	I, II	G1	no	see NEA		WKARGH (NO, 2010/11)		
Haddock	<i>Melanogrammus aeglefinus</i>	Area I and II	I, II	G1	yes	see North Sea				
Horse mackerel	<i>Trachurus trachurus</i>	Area I and II	IIa, IVa, Vb, VIa, VIIa-c, e-k, VIIIabde	G2	yes	see NEA (IIa, IVa, Vb, V)				
Mackerel	<i>Scomber scombrus</i>	Area I and II	II, IIIa, IV, V, VI, VII, VIII, IX	G1	yes	see NEA		WKARMAC (UK-E, 2010)		
Saithe	<i>Pollachius virens</i>	Area I and II	I, II	G1	yes	see North Sea				
Salmon	<i>Salmo salar</i>	Area I and II	I, II	G1	yes	see Baltic				
Tusk	<i>Brosme brosme</i>	Area I and II	I, II	G2	no					
Brill	<i>Scophthalmus rhombus</i>	Baltic	22-32	G2	no	see North Sea				
Cod	<i>Gadus morhua</i>	Baltic	22-24/25-32	G1	yes	2004-2005 (SE), 2006	2001, 2005 (LT), 2006 (PL)			
Common Whitefish	<i>Coregonus lavaretus</i>	Baltic	III d	G2	no					
Dab	<i>Limanda limanda</i>	Baltic	22-32	G2	no	see North Sea		WKARDAB (GE, 2010)		
European Eel	<i>Anguilla anguilla</i>	Baltic	IIIb-d	G1	yes		2009 (FR)			
Flounder	<i>Platichthys flesus</i>	Baltic	22-32	G2	no	2006	2006 (GE), 2007 (SE), 200			
Herring	<i>Clupea harengus</i>	Baltic	25-32	G1	yes	2001, 2003, 2005, 2006	1998 (LV), 2000 (FI), 2008			
Perch	<i>Perca fluviatilis</i>	Baltic	III d	G2	no					
Pike	<i>Esox lucius</i>	Baltic	III d	G2	no					
Pike-perch	<i>Sirizostedion lucioperca</i>	Baltic	III d	G2	no					
Plaice	<i>Pleuronectes platessa</i>	Baltic	22-32	G2	no	see North Sea				
Salmon	<i>Salmo salar</i>	Baltic	22-31 / 32	G1	yes	2002, 2003, 2005	2002, 2003, 2006 (LV)			
Sea trout	<i>Salmo trutta</i>	Baltic	22-32	G2	yes					
Sole	<i>Solea solea</i>	Baltic	22	G1	no	see North Sea (IV)				
Sprat	<i>Sprattus sprattus</i>	Baltic	22-32	G1	yes	2004, 2007, 2008-2009	2006 (DK), 2008 (LT)			
Turbot	<i>Psetta maxima</i>	Baltic	22-32	G2	no	2004	2008 (BE)		yes	
Alfonsinos	<i>Beryx spp.</i>	NEA	all areas, excluding X and IXa	G1	no					
Alfonsinos	<i>Beryx spp.</i>	NEA	IXa and X	G1	no					
Anchovy	<i>Engraulis encrasicolus</i>	NEA	IXa (only Cádiz)	G1	yes	see NEA (VIII)				yes
Anchovy	<i>Engraulis encrasicolus</i>	NEA	VIII	G1	yes	2001 (ES), 2005	2002 (ES), 2006 (ES), 2009 (IT)			yes
Anglerfish	<i>Lophius piscatorius</i>	NEA	IV, VI/VIIIb-k, VIIIabd	G1	yes	see North Sea			yes	
Anglerfish	<i>Lophius piscatorius</i>	NEA	VIIIc, IXa	G1	yes	see North Sea			yes	
Argentine	<i>Argentina spp.</i>	NEA	V, VI, VII (excl. VII d), VIII, IX, X, XII, XIV	G2	no					
Birdbeak dogfish	<i>Deania calcea</i>	NEA	V, VI, VII (excl. VII d), VIII, IX, X, XII, XIV	G1	no					
Black-bellied angler	<i>Lophius budegassa</i>	NEA	IV, VI/VIIIb-k, VIIIabd	G1	no	2001, 2004	1991 (FR, ES), 1997 (FR, ES, PT), 1999 (PT), 2002, 2		yes	
Black-bellied angler	<i>Lophius budegassa</i>	NEA	VIIIc, IXa	G1	no	see NEA (IV, V, VII, VI)			yes	
Black Spot Sea bream	<i>Pagellus bogaraveo</i>	NEA	IXa, X	G1	no				yes	
Blonde ray	<i>Raja brachyura</i>	NEA	all areas	G1	no					
Blue jack mackerel	<i>Trachurus picturatus</i>	NEA	X	G2	no					
Blue ling	<i>Molva dypterygia</i>	NEA	all areas, excluding X	G1	no					
Blue ling	<i>Molva dypterygia</i>	NEA	X	G1	no					
Blue whiting	<i>Micromesistius poutassou</i>	NEA	I-IX, XII, XIV	G1	yes	2003, 2004 (DK)	2005 (DK)		exchange going on	
Bluemouth rockfish	<i>Helicolenus dactylopterus</i>	NEA	V, VI, VII (excl. VII d), VIII, IX, X, XII, XIV	G2	no					
Brill	<i>Scophthalmus rhombus</i>	NEA	V, VI, VII (excl. VII d), VIII, IX, X, XII, XIV	G2	no	see North Sea			exchange going on	
Capelin	<i>Mallotus villosus</i>	NEA	XIV	G2	yes					
Cod	<i>Gadus morhua</i>	NEA	Va/Vb/VIa/VIb/VIIa/VIIe-k	G1	yes	2006 (IE)				
Cod (Greenland Cod)	<i>Gadus morhua</i>	NEA	XIV	G1	yes		2010 (IS)			
Conger	<i>Conger conger</i>	NEA	V, VI, VII (excl. VII d), VIII, IX, XII, XIV	G2	no					
Conger	<i>Conger conger</i>	NEA	X	G2	no					
Cuckoo ray	<i>Raja naevus</i>	NEA	all areas	G1	no					
Dab	<i>Limanda limanda</i>	NEA	VIIe/VIIa, f-h	G2	no	2009 (GE)		WKARDAB (GE, 2010)		
Deep sea Redfish	<i>Sebastes mentella</i>	NEA	ICES Sub areas V, VI, XII, XIV & NAFO SA	G1	yes	2000-2003 (GE), 2007	1983 (GE), 1984 (GE), 199			
European Eel	<i>Anguilla anguilla</i>	NEA	V, VI, VII (excl. VII d), VIII, IX, X, XII, XIV	G1	yes		2009 (FR)	WKAREA2 (FR, 2011)	yes	
Forkbeard	<i>Phycis phycis</i>	NEA	V, VI, VII (excl. VII d), VIII, IX, X, XII, XIV	G2	no					
Four-spot megrim	<i>Lepidorhombus boschii</i>	NEA	VIIIc, IXa	G1	no	2004 (ES)	1997 (ES)			
Golden Redfish	<i>Sebastes marinus</i>	NEA	ICES Sub areas V, VI, XII, XIV & NAFO SA	G1	yes	see NEA (Deep Sea Rec)				

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Greater Forkbeard	<i>Phycis blennoides</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G2	no					
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	NEA	V, XIV/VI		G1	yes	2005	1996 (IS), 2006 (CA)	WKARGH (NO, 2010/11)		
Grey gurnard	<i>Eutrigla gurnardus</i>	NEA	V.IId.e		G2	no					
Gulper shark	<i>Centrophorus granulosus</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G1	no					
Haddock	<i>Melanogrammus aeglefinus</i>	NEA	Va/Vb	see North Sea	G1	yes					
Haddock	<i>Melanogrammus aeglefinus</i>	NEA	V.Ia/V.Ib/V.IIa/V.IIb-k	see North Sea	G1	yes					
Hake	<i>Merluccius merluccius</i>	NEA	IIIa, IV, VI, VII, VIIIab / VIIIc, IXa		G1	yes	1994 (FR,ES), 1997 (ES)	1997 (ES), 1999 (ES), 2004 (ES), 2006 (ES), 2009 (ES)			
Herring	<i>Clupea harengus</i>	NEA	V.Ia/V.IaN/V.Ia S, VIIIbc / V.IIa/V.IIj	see North Sea	G1	yes					
Horse mackerel	<i>Trachurus trachurus</i>	NEA	IIa, IVa, Vb, VIa, VIIa-e, e-k, VIIIabde/X		G2	yes	2005 (NL), 2006	1999 (NL), 2006 (NL)			
Horse mackerel	<i>Trachurus trachurus</i>	NEA	VIIIc, IXa	see NEA (IIa, IVa, Vb, V	G2	yes					
John Dory	<i>Zeus faber</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G2	no					
Leafscale gulper shark	<i>Centrophorus squamosus</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G1	no					
Lemon sole	<i>Microstomus kitt</i>	NEA	all areas		G2	no					
Ling	<i>Molva molva</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G2	no					
Mackerel	<i>Scomber scombrus</i>	NEA	II, IIIa, IV, V, VI, VII, VIII, IX		G1	yes	2008-... (going on)	1995	WKARMAC (UK-E, 2010)		
Meagre	<i>Argyrosomus regius</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G2	no					
Mediterranean horse mackerel	<i>Trachurus mediterraneus</i>	NEA	VIII, IX		G2	no					
Megrim	<i>Lepidorhombus whiffiagonis</i>	NEA	VI/VII, VIIIab/VIIIc, IXa		G1	yes	1997, 2003, 2004 (PT)	1997, 2004 (ES)		yes	
Orange roughy	<i>Hoplostethus atlanticus</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G1	no					
Other rays and skates	<i>Rajidae</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G1	no					
Plaice	<i>Pleuronectes platessa</i>	NEA	V.IIa/V.IIe/ VIIIg	see North Sea	G1	yes					
Plaice	<i>Pleuronectes platessa</i>	NEA	V.IIbc/V.IIh-k/ VIII, IX, X	see North Sea	G1	no					
Pollack	<i>Pollachius pollachius</i>	NEA	V.VI.VII (excl. V.IId), VIII, XII.XIV		G2	no					
Pollack	<i>Pollachius pollachius</i>	NEA	IX, X		G2	no					
Portuguese dogfish	<i>Centroscyllium coelelepis</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G1	no					
Pouting	<i>Trisopterus spp.</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G2	no					
Red gurnard	<i>Aspirtigla cuculus</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G2	no					
Roundnose grenadier	<i>Coryphaenoides rupestris</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G1	no	2005 (FR), 2006 (FR)	2006 (FR), 2007 (FR)		yes	
Saithe	<i>Pollachius virens</i>	NEA	Va/Vb/IV, IIIa, VI	see North Sea	G1	yes					
Saithe	<i>Pollachius virens</i>	NEA	VII, VIII	see North Sea	G2	yes					
Salmon	<i>Salmo salar</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV	see Baltic	G1	no					
Sandeel	<i>Ammodytidae</i>	NEA	VIa	see North Sea	G2	no					
Sardine	<i>Sardina pilchardus</i>	NEA	VIIIab/VIIIc, IXa		G1	yes	2004 (PT)	2001 (RU), 2005 (PT)		yes	yes
Scabbardfish	<i>Aphanopus spp.</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G1	no	1998-1999 (ES)	2000		yes (scales)	
Sea bass	<i>Dicentrarchus labrax</i>	NEA	V.VI.VII (excl. V.IId), VIII, X, XII.XIV		G2	no	1997-1998 (ES)			yes (scales)	
Sea bass	<i>Dicentrarchus labrax</i>	NEA	IX	see NEA (V.VI.VII (excl	G2	no				yes (scales)	
Sea breams (in plural)	<i>Sparidae</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G2	no				yes (scales)	
Silver scabbardfish	<i>Lepidopus caudatus</i>	NEA	IXa		G2	no					
Smoothhead	<i>Alepocephalus bairdii</i>	NEA	VI, XII		G2	no					
Sole	<i>Solea solea</i>	NEA	V.IIa/V.IIlg	see North Sea (IV)	G1	yes					
Sole	<i>Solea solea</i>	NEA	V.IIbc / V.IIhjk / IXa / VIIIc	see North Sea (IV)	G1	no					
Sole	<i>Solea solea</i>	NEA	V.IIe	see North Sea (IV)	G1	yes					
Sole	<i>Solea solea</i>	NEA	V.IIlab	see North Sea (IV)	G1	yes					
Spanish mackerel	<i>Scomber colias</i>	NEA	VIII, IX		G2	no				yes	
Spotted ray	<i>Raja montagui</i>	NEA	all areas		G1	no					
Spurdog	<i>Squalus acanthias</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G1	no					
Striped red mullet	<i>Mullus surmuletus</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G2	no	2006-2007	2009 (FR)		yes	
Thickback Sole	<i>Microchirus variegatus</i>	NEA	V.VI.VII (excl. V.IId), VIII, IX.X, XII.XIV		G2	no					
Thornback ray	<i>Raja clavata</i>	NEA	all areas		G1	no					
Turbot	<i>Psetta maxima</i>	NEA	all areas	see North Sea	G2	no				yes	
Wedge sole	<i>Dicologlossa cuneata</i>	NEA	VIIIc, IX		G2	no					
Whiting	<i>Merlangius merlangus</i>	NEA	VIII/IX, X	see North Sea	G2	no					
Whiting	<i>Merlangius merlangus</i>	NEA	Vb/V.Ia/V.Ib/V.IIa/V.IIe-k	see North Sea	G1	no					
Witch flounder	<i>Glyptocephalus cynoglossus</i>	NEA	VI, VII		G2	no					
Wreckfish	<i>Polyprion americanus</i>	NEA	X		G2	no					
Anglerfish	<i>Lophius piscatorius</i>	North Sea	IIIa, IV, VI		G1	yes	2001	1999 (PT), 2002, 2004 (PT)		yes	
Argentine	<i>Argentina spp.</i>	North Sea	IV		G2	no					
Black-bellied angler	<i>Lophius budegassa</i>	North Sea	IV, V.IId	see NEA (IV, V, VII, VI	G1	no				yes	
Blue ling	<i>Molva dypterygia</i>	North Sea	IV, IIIa		G1	no					
Blue whiting	<i>Micromesistius poutassou</i>	North Sea	I-IX, XII, XIV	see NEA	G1	yes				exchange going on	
Bluemouth rockfish	<i>Helicolenus dactylopterus</i>	North Sea	IV		G2	no					
Brill	<i>Scophthalmus rhombus</i>	North Sea	IV, V.IId		G2	no	2004, 2005 (NL)			exchange going on	
Catfish	<i>Anarhichas spp.</i>	North Sea	IV		G2	no					
Cod	<i>Gadus morhua</i>	North Sea	IV, V.IId, IIIa		G1	yes	1997-1998 (SC), 2000-	2001, 2008 (DK)		exchange going on	
Cuckoo ray	<i>Raja naevus</i>	North Sea	IV, V.IId		G1	no					
Dab	<i>Limanda limanda</i>	North Sea	IV, V.IId		G2	no	2009 (GE)		WKARDAB (GE, 2010)		
Deep sea Redfish	<i>Sebastes mentella</i>	North Sea	IV	see NEA	G1	no					

Deepwater shark	<i>Shark-like Selachii</i>	North Sea	IV		G1	no						2012
European Eel	<i>Anguilla anguilla</i>	North Sea	IV, VIII		G1	yes		2009 (FR)	WKAREA2 (FR, 2011)	yes		
Flounder	<i>Platichthys flesus</i>	North Sea	IV		G2	no						
Forkbeard	<i>Phycis phycis</i>	North Sea	IV		G2	no						
Four-spot megrim	<i>Lepidorhombus boscii</i>	North Sea	IV, VIII	see NEA	G2	no						
Greater Forkbeard	<i>Phycis blennoides</i>	North Sea	IV		G2	no						
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	North Sea	IV	see NEA	G2	no				WKARGH (NO, 2010/11)		
Grey gurnard	<i>Eutrigla gurnardus</i>	North Sea	IV		G2	no						
Haddock	<i>Melanogrammus aeglefinus</i>	North Sea	IV, IIIa		G1	yes	2008-... (going on)					
Hake	<i>Merluccius merluccius</i>	North Sea	IIIa, IV, VI, VII, VIIIab	see NEA	G1	yes						
Herring	<i>Clupea harengus</i>	North Sea	IV, VIII, IIIa		G1	yes	2004	2005 (FI)				
Horse mackerel	<i>Trachurus trachurus</i>	North Sea	IIa, IVa, Vb, VIa, VIIa-c, e-k, VIIIabde/IIIa	see NEA (IIa, IVa, Vb, V	G2	yes						
John Dory	<i>Zeus faber</i>	North Sea	IV, VIII		G2	no						
Lemon sole	<i>Microstomus kitt</i>	North Sea	IV, VIII		G2	no						
Ling	<i>Molva molva</i>	North Sea	IV, IIIa		G2	no						
Mackerel	<i>Scomber scombrus</i>	North Sea	II, IIIa, IV, V, VI, VII, VIII, IX	see NEA	G1	yes				WKARMAC (UK-E, 2010)		
Megrim	<i>Lepidorhombus whiffiagonis</i>	North Sea	IV, VIII	see NEA	G2	yes					yes	
Norway pout	<i>Trisopterus esmarki</i>	North Sea	IV, IIIa		G2	yes						
Other rays and skates	<i>Rajidae</i>	North Sea	IV, VIII		G1	no						
Plaice	<i>Pleuronectes platessa</i>	North Sea	IV		G1	yes	2003, 2009 (NL)	2003		WKARP (NL, 2010)		
Plaice	<i>Pleuronectes platessa</i>	North Sea	VIII	see North Sea	G1	yes				WKARP (NL, 2010)		
Red gurnard	<i>Aspitrigla cuculus</i>	North Sea	IV		G2	no						
Red mullet	<i>Mullus barbatus</i>	North Sea	IV, VIII		G2	no	2006-2007	2009 (FR)			yes	
Roughhead grenadier	<i>Macrourus berglax</i>	North Sea	IV, IIIa		G2	no					yes	
Saithe	<i>Pollachius virens</i>	North Sea	IV, IIIa, VI		G1	yes	2007 (FR)					
Salmon	<i>Salmo salar</i>	North Sea	IV	see Baltic	G1	no						
Sandeel	<i>Ammodytidae</i>	North Sea	IV		G2	yes	2005 (DK), 2006 (DK)	2005 (DK), 2006 (DK)				
Sea bass	<i>Dicentrarchus labrax</i>	North Sea	IV, VIII	see NEA	G2	no					yes (scales)	
Small sharks	<i>Shark-like Selachii</i>	North Sea	IV, VIII		G1	no						
Sole	<i>Solea solea</i>	North Sea	IV		G1	yes	2001 (UKE), 2006	2002 (UK-E), 2005 (UK-E), 2009 (GE)				
Sole	<i>Solea solea</i>	North Sea	VIII	see North Sea (IV)	G1	yes						
Spotted ray	<i>Raja montagui</i>	North Sea	IV, VIII		G1	no						
Sprat	<i>Sprattus sprattus</i>	North Sea	IV/VIII		G1	yes	1994, 1996, 2001, 2002	1992, 1994, 2004 (NO)			yes	
Spurdog	<i>Squalus acanthias</i>	North Sea	IV, VIII		G1	no						
Starry ray	<i>Raja radiata</i>	North Sea	IV, VIII		G1	no						
Striped red mullet	<i>Mullus surmuletus</i>	North Sea	IV, VIII	see NEA	G2	no		2009 (FR)			yes	
Thornback ray	<i>Raja clavata</i>	North Sea	IV, VIII		G1	no						
Tub gurnard	<i>Trigla lucerna</i>	North Sea	IV		G2	no						
Turbot	<i>Psetta maxima</i>	North Sea	IV, VIII		G2	no	2005 (NL), 2008	2008 (BE)			yes	
Tusk	<i>Brosme brosme</i>	North Sea	IV, IIIa		G2	no					yes	
Whiting	<i>Merlangius merlangus</i>	North Sea	IV, VIII		G1	yes	1999, 2004 (SC)	1997 (ES), 1998 (DK), 1999 (UK), 2000, 2005 (UK)				
Witch flounder	<i>Glyptocephalus cynoglossus</i>	North Sea	IV		G2	no						
Blue whiting	<i>Micromesistius poutassou</i>	Skag + Kat	I-IX, XII, XIV	see NEA	G1	yes					exchange going on	
Brill	<i>Scophthalmus rhombus</i>	Skag + Kat	IIIa	see North Sea	G2	no					exchange going on	
Cod	<i>Gadus morhua</i>	Skag + Kat	IV, VIII, IIIaN	see North Sea	G1	yes						
Cod	<i>Gadus morhua</i>	Skag + Kat	IIIaS	see North Sea	G1	yes						
Dab	<i>Limanda limanda</i>	Skag + Kat	IIIa	see North Sea	G2	no	2009 (GE)			WKARDAB (GE, 2010)		
European Eel	<i>Anguilla anguilla</i>	Skag + Kat	IIIa		G1	yes		2009 (FR)				
Grey gurnard	<i>Eutrigla gurnardus</i>	Skag + Kat	IIIa		G2	no						
Haddock	<i>Melanogrammus aeglefinus</i>	Skag + Kat	IV, IIIa	see North Sea	G1	yes						
Hake	<i>Merluccius merluccius</i>	Skag + Kat	IIIa, IV, VI, VII, VIIIab	see NEA	G1	yes						
Herring	<i>Clupea harengus</i>	Skag + Kat	IV, VIII, IIIa/22-24, IIIa	see North Sea	G1	yes						
Mackerel	<i>Scomber scombrus</i>	Skag + Kat	II, IIIa, IV, V, VI, VII, VIII, IX	see NEA	G1	yes						
Norway pout	<i>Trisopterus esmarki</i>	Skag + Kat	IV, IIIa		G2	yes						
Plaice	<i>Pleuronectes platessa</i>	Skag + Kat	IIIa	see North Sea	G1	yes	2009 (NL)			WKARP (NL, 2010)		
Roundnose grenadier	<i>Coryphaenoides rupestris</i>	Skag + Kat	IIIa	see NEA	G2	no						
Saithe	<i>Pollachius virens</i>	Skag + Kat	IV, IIIa, VI	see North Sea	G1	yes						
Sandeel	<i>Ammodytidae</i>	Skag + Kat	IIIa	see North Sea	G2	no						
Sharks	<i>Squalidae</i>	Skag + Kat	IIIa N		G1	no						
Sole	<i>Solea solea</i>	Skag + Kat	IIIa, 22	see North Sea (IV)	G1	yes		2009 (GE)				
Sprat	<i>Sprattus sprattus</i>	Skag + Kat	IIIa	see North Sea	G1	no						
Turbot	<i>Psetta maxima</i>	Skag + Kat	all areas	see North Sea	G2	no						
Whiting	<i>Merlangius merlangus</i>	Skag + Kat	IIIa	see North Sea	G2	yes						
Witch flounder	<i>Glyptocephalus cynoglossus</i>	Skag + Kat	IIIa		G2	no						

<sup>1</sup> validation showed ageing was wrong



Species	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	1988	1987	1986	1985	1984	1983	1982	1981	Remarks	
Beryx Spp																																				
Conger Eel																																				
Seabass																																				
Witch																																				WGNEW
Bluemouth Rockfish																																				WGNEW
4-Spot Mesgrim																																				
Lemon Sole																																				
Blue Ling																																				
Forkbeards																																				NESPMAN
Dab					WKARDAB																															WGNEW
Sea Trout																																				
Spanish Mackerels						EX																														
Sea Breems																																				
Blue Jack Mackerel																																				
Norway Pout																																				
Pouting																																				
Striped Red Mullet						wkacm	WKARRM		EX																											WGNEW
Red Mullet						Dissolved 2010			EX																											
Red Gurnard																																				WGNEW
Grey Gurnard																																				WGNEW
Tub Gurnard																																				WGNEW
Wolf Fish																																				
Spurdog (Spiny Dogfish)																																				
Longnose Spurdog																																				
Lesser Spotted Dogfish																																				
Rays and Skates																																				
Pollack																																				
Mediterranean Horse Mackerel																																				
John Dory																																				WGNEW
Haddock						ex																														
Ballan Wrasse																																				

WG	Working Group
SG	Study Group
EX	Exchange (Pre-Workst
	Small Exchange
WK	Workshop
	New Species Studies
EX	Document awaiting transmission to docs repository

1  
 ICES CM 2004/K79  
 Power, G.R., Kelly, C.J., King, P.A. & McGrath, D. 2004. Precision in age determination of blue whiting (*Micromesistius poutassou*), within and between "readers", using stereo microscopy of sagittal otoliths under reflected light. ICES CM 2004/K79.

## Annex 10: Overview of present maturity sampling and guidelines for future maturity sampling (based on DCF Appendix VII), tables from RCMs NS&EA and RCM NA 2009

Species (Engl.)	Species (Latin)	Area/Stock	Species group(a)	Maturity sampl Freq.	Spawning period (month)	Recom. Sampling period (month)	WK ref	Present appropriate sampling source	Possible countries for sampling	Presently involved countries in sampling (2009-2010)
<b>ICES areas I, II</b>										
European Eel	<i>Anguilla anguilla</i>	I, II	G1	T	This species is not relevant for the area or very limited catches					
Tusk	<i>Brosme brosme</i>	I, II	G2	T	EU landings less than 5% of the total international landings					
Atlanto-Scandian herring	<i>Clupea harengus</i>	I, II, V	G1	Y	1-3	12	WGWIDE 2009 WKMSHS 2010	Market	NOR	DNK, UK
Cod	<i>Gadus morhua</i>	I, II	G1	Y	1-4	1-4	AFWG2009, WKMSCWHS07, IMR Norway	survey	NOR	POL
Haddock	<i>Melanogrammus aeglefinus</i>	I, II	G1	Y	3-5	1-4	AFWG2009, WKMSCWHS07, IMR Norway	survey	NOR	?
Blue whiting	<i>Micromesistius pouassou</i>	I-IX, XII, XIV	G1	Y	Covered by RCM NEA					
Northern shrimp	<i>Pandalus borealis</i>	I, II	G1	Y	autumn	autumn	?	?	?	LIT
Saithe	<i>Pollachius virens</i>	I, II	G1	Y	1-5	1-4	AFWG2009, WKMSCWHS07, IMR Norway	?	?	?
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	I, II	G1	Y	EU landings less than 5% of the total international landings					
Mackerel	<i>Scomber scombrus</i>	II, IIIa, IV, V, VI, VII, VIII, IX	G1	Y	Covered by RCM NEA					
Redfish	<i>Sebastes mentella</i>	I, II	G1	Y	3-5		WKMSREGH 2010	At-sea	ESP, PRT, POL	ESP, PRT, POL
Horse mackerel	<i>Trachurus trachurus</i>	IIa, IVa, Vb, VIa, VIIa-c, e-k, VIIIabde	G2	T	Covered by RCM NEA					
Capelin	<i>Mallotus villosus</i>	I, II	G2		No EU quota or landings for the area.					
Salmon	<i>Salmo salar</i>	I, II	G1	T	This species is not relevant for the area or very limited catches					
<b>Skagerrak and Kattegat - ICES area IIIa</b>										
Sand eel	<i>Ammodytidae</i>	IIIa	G2							
European Eel	<i>Anguilla anguilla</i>	IIIa	G1	T	NA	NA				SWE
Herring	<i>Clupea harengus</i>	IV, VIId, IIIa/22-24, IIIa	G1	Y	1-3	12-1 or 2	WKMSHS 2010		Germany	DNK, SWE
Roundnose grenadier	<i>Coryphaenoides rupestris</i>	IIIa	G2	T	The fishery for this species has been stopped and therefore no landings					
Grey gurnard	<i>Eutrigla gurnardus</i>	IIIa	G2	T	This species is not relevant for the area or very limited catches					
Cod	<i>Gadus morhua</i>	IV, VIId, IIIaN	G1	Y	1-3	1-3	WKMSCWHS 2007 b	IBTS Q1		DNK, SWE
Cod	<i>Gadus morhua</i>	IIIaS	G1	Y	1	1-3	WKMSCWHS 2007 b	IBTS Q1		DNK, SWE
Witch flounder	<i>Glyptocephalus cynoglossus</i>	IIIa	G2	T			WKMSSPDF 2010			SWE
Dab	<i>Limanda limanda</i>	IIIa	G2	T			WKMSSPDF 2010			
Haddock	<i>Melanogrammus aeglefinus</i>	IV, IIIa	G1	Y	3-4	1-3	WKMSCWHS 2007 b	IBTS Q1		
Whiting	<i>Merlangius merlangus</i>	IIIa	G2	T	2-6 <sup>1</sup>	1-3	WKMSCWHS 2007 b	IBTS Q1		
Hake	<i>Merluccius merluccius</i>	IIIa, IV, VI, VII, VIIIab	G1	Y	Covered by RCM NEA					
Blue whiting	<i>Micromesistius pouassou</i>	I-IX, XII, XIV	G1	Y	Covered by RCM NEA					
Norway lobster	<i>Nephrops norvegicus</i>	Functional unit	G1	Y	spawn. 8 hatch. 5-6	1-12	WKNEPH 2006	At-sea		SWE
Northern shrimp	<i>Pandalus borealis</i>	IIIa, IVa east/ IVa/IVb	G1	Y	spawn. 10-11 hatch. 3-4	1-12	C.M1994/K:8	At-sea		DNK, SWE
Plaice	<i>Pleuronectes platessa</i>	IIIa	G1	Y	1-3	12-3	WKMSSPDF 2010	IBTS Q1		DNK, SWE
Saithe	<i>Pollachius virens</i>	IV, IIIa, VI	G1	Y	1-3	12-3	WKMSCWHS	IBTS Q1		
Turbot	<i>Psetta maxima</i>	all areas	G2	T	4-8	4-8				
Mackerel	<i>Scomber scombrus</i>	II, IIIa, IV, V, VI, VII, VIII, IX	G1	Y	6-7	IIIa				
Brill	<i>Scophthalmus rhombus</i>	IIIa	G2	T	4-8	4-8				
Sole	<i>Solea solea</i>	IIIa, 22	G1	Y	4-7	2-7	WKMSSPDF 2010			DNK
Sprat	<i>Sprattus sprattus</i>	IIIa	G1	Y	4-7	3-7	WKMSHS 2010	Market, IBTS Q1		SWE
Sharks	<i>Squalidae</i>	IIIa N	G1		variable					
Norway pout	<i>Trisopterus esmarki</i>	IV, IIIa	G2		1-3	12-3		IBTS Q1		

North Sea and Eastern Channel — ICES areas IV, VIId										
Sand eel	<i>Ammodytidae</i>	IV	G2							
European Eel	<i>Anguilla anguilla</i>	IV, VIId	G1	T						NL
Catfish	<i>Anarhichas spp.</i>	IV	G2		Species not relevant for the area					
Argentine	<i>Argentina spp.</i>	IV	G2							
Red gurnard	<i>Aspitrigla cuculus</i>	IV	G2	T						
Tusk	<i>Brosme brosme</i>	IV, IIIa	G2	T	EU landings is less than 10% of the total international landings					
Herring	<i>Clupea harengus</i>	IV, VIId, IIIa	G1	Y			WKMSCH 2010			DEN, NDL, UK
Common Shrimp	<i>Crangon crangon</i>	IV, VIId	G2	T						
Sea bass	<i>Dicentrarchus labrax</i>	IV, VIId	G2	T	2-5		WGNEW 2006			FRA, UK
Grey gurnard	<i>Eutrigla gurnardus</i>	IV	G2	T	The sampling for red gurnard and grey gurnard is combined					
Cod	<i>Gadus morhua</i>	IV, VIId, IIIa	G1	Y	1-2 (till 4 in North) <sup>1</sup>	1-3	WKMSCWH 07	IBTS Q1	DEN, FRA, NED, UK, GER	DEN, FRA, NED, UK, GER
Witch flounder	<i>Glyptocephalus cynoglossus</i>	IV	G2	T						UK
Blue-mouth rockfish	<i>Helicolenus dactylopterus</i>	IV	G2	T	This species is not relevant for the area or very limited catches					
Four-spot megrim	<i>Lepidorhombus boscii</i>	IV, VIId	G2	T	This species is not relevant for the area or very limited catches					
Megrim	<i>Lepidorhombus whiffiagonis</i>	IV, VIId	G2	T			Foreseen in 2011-2012			UK
Dab	<i>Limanda limanda</i>	IV, VIId	G2	T	1-9		Rinjsdorp et al, 1992	Market	NL	NDL
Black-bellied angler	<i>Lophius budegassa</i>	IV, VIId	G1	Y	The sampling for the two anglerfish species is combined					
Anglerfish	<i>Lophius piscatorius</i>	IIIa, IV, VI	G1	Y						DEN, UK
Roughhead grenadier	<i>Macrourus berglax</i>	IV, IIIa	G2	T	This species is not relevant for the area or very limited catches					
Haddock	<i>Melanogrammus aeglefinus</i>	IV, IIIa	G1	Y	3-4 <sup>2</sup>	1-3	WKMSCWH 07	IBTS Q1	DEN, FRA, NED, UK, GER	FRA, SWE, UK
Whiting	<i>Merlangius merlangus</i>	IV, VIId	G1	Y	2-6 <sup>2</sup>	1-3	WKMSCWH 07	IBTS Q1	DEN, FRA, NED, UK, GER	FRA, UK
Hake	<i>Merluccius merluccius</i>	IIIa, IV, VI, VII	G1	Y						DNK, FRA
Blue whiting	<i>Micromesistius poutassou</i>	I-IX, XII, XIV	G1	Y	Should be combined with the RCM NEA					
Lemon sole	<i>Microstomus kitt</i>	IV, VIId	G2	T						DNK, UK
Blue ling	<i>Molva dypterygia</i>	IV, IIIa	G1	T	This species is not relevant for the area or very limited catches					
Ling	<i>Molva molva</i>	IV, IIIa	G2	T			No ref in WGDEEP			UK
Red mullet	<i>Mullus barbatus</i>	IV, VIId	G2	T	The sampling for the two mullet species is combined					
Striped red mullet	<i>Mullus surmuleus</i>	IV, VIId	G2	T	4-7		No ref in WGNEW <sup>3)</sup>			FRA
Norway lobster	<i>Nephrops norvegicus</i>	all functional units	G1	Y	10-12	8-11				DNK, UK
Northern shrimp	<i>Pandalus borealis</i>	IIIa, IVa east/IVa/IVb	G1	T	10-12	8-11				DNK
Common scallop	<i>Pecten maximus</i>	VIId	G2	T						UK
Greater Forkbeard	<i>Phycis blennoides</i>	IV	G2	T	This species is not relevant for the area or very limited catches					
Forkbeard	<i>Phycis phycis</i>	IV	G2	T	This species is not relevant for the area or very limited catches					
Flounder	<i>Platichthys flesus</i>	IV	G2	T	2-5	2-3				NL
Plaice	<i>Pleuronectes platessa</i>	IV	G1	Y	1-3	1-2				
Plaice	<i>Pleuronectes platessa</i>	VIId	G1	Y						BEL, DNK, FRA, NL, UK
Saithe	<i>Pollachius virens</i>	IV, IIIa, VI	G1	Y	1-5 <sup>2</sup>	1-3	WKMSCWH 07	IBTS Q1	UK	DEN, FRA, NED, UK, GER
Turbot	<i>Psetta maxima</i>	IV, VIId	G2	T	4-8	4-5				BEL, NL
Thornback ray	<i>Raja clavata</i>	IV, VIId	G1	T	6-8					
Spotted ray	<i>Raja montagui</i>	IV, VIId	G1	T						UK
Cuckoo ray	<i>Raja naevus</i>	IV, VIId	G1	T						UK
Starry ray	<i>Raja radiata</i>	IV, VIId	G1	T						UK
Other rays and skates	<i>Rajidae</i>	IV, VIId	G1	T						UK
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	IV	G2	T	This species is not relevant for the area or very limited catches					
Salmon	<i>Salmo salar</i>	IV	G1	T	This species is not relevant for the area or very limited catches					
Mackerel	<i>Scomber scombrus</i>	II, IIIa, IV, V, VI, VII, VIII, IX	G1	Y						DNK
Brill	<i>Scophthalmus rhombus</i>	IV, VIId	G2	T	2/3-6		No ref in WGNEW <sup>4)</sup>			NL
Redfish	<i>Sebastes mentella</i>	IV	G1	Y	This species is not relevant for the area or very limited catches					
Deepwater shark	<i>Shark-like Selachii</i>	IV	G1	T	This species is not relevant for the area or very limited catches					
Small shark	<i>Shark-like Selachii</i>	IV, VIId	G1	T	This species is not relevant for the area or very limited catches					

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Sole	<i>Solea solea</i>	IV	G1	Y							BEL, FRA, NL, UK
Sole	<i>Solea solea</i>	VIIId	G1	Y	2-4	-	Stock Annex sol-eche	Market		BEL, FRA, UK	BEL, FRA, UK
Sprat	<i>Sprattus sprattus</i>	IV/VIIId	G1	T	5-6(1-6)	5					DNK
Spurdog	<i>Squalus acanthias</i>	IV, VIIId	G1	T							UK
Horse mackerel	<i>Trachurus trachurus</i>	IIa, IVa, Vb, VIa, VIIa-c, e-k, VIIIabde/IIIa, IVbc, VIIId	G2	T							Covered by RCM NEA
Tub gurnard	<i>Trigla lucerna</i>	IV	G2	T	5-6		WGNEW 07				NL
Norway pout	<i>Trisopterus esmarki</i>	IV, IIIa	G2		1-3	1-2					DNK
John Dory	<i>Zeus faber</i>	IV, VIIId	G2	T	end of winter and at the start of spring		No information in WGNEW ref from Fishbase				UK
<b>North East Atlantic and Western .....</b>											
Golden redfish	<i>Sebastes marinus</i>	ICES Sub-areas V, VI, XII, XIV, & NAFO SA 2 + (Div. 1F + 3K)	G1	Y	3-5		WKMSREGH 2010	At-sea		ESP, PRT, POL	ESP, PRT, POL
Deep sea redfish	<i>Sebastes mentella</i>	ICES Sub-areas V, VI, XII, XIV, & NAFO SA 2 + (Div. 1F + 3K)	G1	Y	3-5		WKMSREGH 2010	At-sea		ESP, PRT, POL	ESP, PRT, POL
<b>NAFO areas</b>											
Cod	<i>Gadus morhua</i>	2J 3KL	G1	Y			Not assessed in NAFO SC, EU catches than 5% of the total international catches				
Cod	<i>Gadus morhua</i>	3M	G1	Y	3-4	1-4	Working Group on Reproductive Potential	EU - Flemish Cap survey	SPN		SPN
Cod	<i>Gadus morhua</i>	3NO	G1	Y	4-6	2-6	Working Group on Reproductive Potential	Canadian Spring survey	Canada		Canada
Cod	<i>Gadus morhua</i>	3Ps	G2	T			Not assessed in NAFO SC, EU catches than 5% of the total international catches				
Cod	<i>Gadus morhua</i>	SA 1	G1	Y			Not assessed in NAFO SC, EU catches than 5% of the total international catches				
Witch flounder	<i>Glyptocephalus cynoglossus</i>	3NO	G2	T	3-5	1-5	Working Group on Reproductive Potential	Canadian Spring survey	Canada		Canada
American plaice	<i>Hippoglossoides platessoides</i>	3LNO	G1	Y	4-6	1-6	Working Group on Reproductive Potential	Canadian Spring survey		Canada	Canada
American plaice	<i>Hippoglossoides platessoides</i>	3M	G1	T	3-5	2-7	Working Group on Reproductive Potential	EU - Flemish Cap survey		PRT-SPN	PRT-SPN
Yellowtail flounder	<i>Limanda ferruginea</i>	3LNO	G2	T	4-7	1-7	Working Group on Reproductive Potential	Canadian Spring survey	Canada		Canada
Grenadier	<i>Macrouridae</i>	SA 2+3	G2	T			Working Group on Reproductive Potential				
Pandalid shrimp	<i>Pandalus</i> spp.	3L	G1	Y			Working Group on Reproductive Potential				
Pandalid shrimp	<i>Pandalus</i> spp.	3M	G1	Y			Working Group on Reproductive Potential				
Rays and skates	<i>Raja</i> spp.	SA 3	G1	T			Working Group on Reproductive Potential				
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	3KLMNO	G1	Y	?		Working Group on Reproductive Potential				
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	SA 1	G1	Y			EU landings less than 10% of the total international landings				
Salmon	<i>Salmo salar</i>	ICES Sub-area XIV % NAFO Sub-area 1	G1	Y			Not assessed in NAFO SC, EU catches than 5% of the total international catches				
Redfish	<i>Sebastes</i> spp.	3LN	G1		5-6	2-6	Working Group on Reproductive Potential	Canadian Spring survey	Canada		Canada
Redfish	<i>Sebastes</i> spp.	3M	G1		2-4	2-6	Working Group on Reproductive Potential	EU - Flemish Cap survey		PRT-SPN	PRT-SPN
Redfish	<i>Sebastes</i> spp.	3O	G1		5-6	2-6	Working Group on Reproductive Potential	Canadian Spring survey	Canada		Canada
Redfish	<i>Sebastes mentella</i>	SA 1	G1	Y			Demersal Redfish caught as by-catches in the Greenland shrimp fishery. No EU landings in recent years.				

1) Maturity staging should be carried out on all cod from 15 cm and above-below 15 no staging-no sex and maturity

2) Maturity staging should be carried out on all length class groups

Report of the study group on life histories and assessment of pandalus stocks in the North Atlantic (Reykjavik, 6-10 sept 1993)

3) ref= Le rouget barbet de roche *Mullus surmuletus* (L. 1758) en Manche orientale et mer du Nord. Mahé, K. et al. 2005

4) ref= Delbare, D. and De Clerck, R. (1999). Stock discrimination in relation to the assessment of the brill fishery - Study in support of the Common Fisheries Policy. Final Report EC-Study Contract DG XIV 96/001.



TABLE 1 Overview of present maturity sampling and guidelines for future maturity sampling (based on Appendix VII)

Species	Species (Latin)	Area/Stock	Species group	Maturity sampl Freq.	Spawning period (month)	Recom. Sampling period (month)	WK ref	Optimal way to sample =surveys			Stock coordinated by ICES (Y/N)
								Present appropriate sampling source	Possible countries for sampling	Presently involved countries in sampling	
<b>NEA</b>											
Smoothhead	Alepocephalus bairdii	VI, XII	G2	T				Observer on board (ESP)	ESP		
Sand eel	Ammodytidae	Via	G2								Y
European Eel	Anguilla anguilla	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G1	T				Port sampling(IRL)	IRL		
Scabbardfish	Aphanopus spp.	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G1	Y	10-12		WKMAT07	Purchase of fish - Surveys (IPRT)			
Argentine	Argentina spp.	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2	T				Auction purchase (NL)	NL		Y
Meagre	Argyrosomus regius	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2	T							
Red gurnard	Aspitrigla cuculus	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2	T				EVHoesurvey (FR), Market	FR, UK		
Alfonosinos	Beryx spp.	all areas, excluding X and IXa	G1	Y							Y
Alfonosinos	Beryx spp.	IXa and X	G1	T							Y
Edible crab	Cancer pagurus	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2	T				Fish purchase(UK)	FR, UK		
Gulper shark	Centrophorus granulosus	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G1	T							
Leafscale gulper shark	Centrophorus squamosus	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G1	T	3-4		WKMAT07				
Portuguese dogfish	Centroscymnus coeleolepis	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G1	T							
Herring	Clupea harengus	Via/VIaN/VIa S, VIIb/ VIIa/VIIj	G1	Y				Port sampling/Survey(IRL), I,NL, IRL, UK			Y
Conger	Conger conger	V,VI,VII (excl. VIId), VIII, IX, XII,XIV	G2	T				Market samples/Surveys (E!ESP)			
Conger	Conger conger	X	G2	T							
Roundnose grenadier	Coryphaenoides rupestris	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G1	Y				Observer on board (ESP)	ESP		Y
Birdbeak dogfish	Deania calcea	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G1	Y							
Sea bass	Dicentrarchus labrax	V,VI,VII (excl. VIId), VIII, X, XII,XIV	G2	T	1-3		WKMAT07				
Sea bass	Dicentrarchus labrax	IX	G2	T							
Wedge sole	Dicologoglosa cuneata	VIIIc, IX	G2	T							
Anchovy	Engraulis encrasicolus	IXa (only Cádiz)	G1	T	4-7		WKMAT07	Market samples/Surveys (E!ESP			Y
Anchovy	Engraulis encrasicolus	VIII	G1	Y	4-8		WKMAT07	Surveys(ESP)	ESP, FR??		Y
Grey gurnard	Eutrigla gurnardus	VIIId,e	G2	T							
Cod	Gadus morhua	Va/Vb/VIa/VIb/VIIa/VIIe-k	G1	Y	2-5		WKMAT07	Survey(IRL), Market sample	GER, IRL, UK	Y	
Witch	Glyptocephalus cynoglossus	VI, VII	G2								
Bluemouth rockfish	Helicolenus dactylopterus	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2		4-9		WKMAT07				
Lobster	Homarus gammarus	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2	T					FR		
Orange roughy	Hoplostethus atlanticus	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G1	Y							Y
Silver scabbardfish	Lepidopus caudatus	IXa	G2	T							
Four-spot megrim	Lepidorhombus boscii	VIIIc, IXa	G1	Y	12-5		WKMAT07	Market samples/Surveys (E!ESP, PRT			Y
Megrim	Lepidorhombus whiffiagonis	VI/VII, VIIIab/VIIIc, IXa	G1	Y	1-4		WKMAT07	Market samples/Surveys (E!ESP,IRL, UK			Y
Dab	Limanda limanda	VIIe/VIIa,f-h	G2	T							
Common squid	Loligo vulgaris	all areas, excluding VIIIc, IXa	G2								
Common squid	Loligo vulgaris	VIIIc, IXa	G2	T	1-12		WKMAT07	Purchase of fish - Surveys(FESP, PRT			
Black-bellied angler	Lophius budegassa	IV, VI/VIIb-k, VIIIabd	G1	Y	12-2; 5-7		WKMSHM07	Market samples/Surveys (E!ESP,IRL			Y
Black-bellied angler	Lophius budegassa	VIIIc, IXa	G1	Y	12-2; 5-7		WKMSHM07	Market samples/Surveys (E!ESP, PRT			Y
Anglerfish	Lophius piscatorius	IV, VI/VIIb-k, VIIIabd	G1	Y	12-3; 5-7		WKMSHM07	Market samples/Surveys (E!ESP,IRL, UK			Y
Anglerfish	Lophius piscatorius	VIIIc, IXa	G1	Y	12-3; 5-7		WKMSHM07	Market samples/Surveys (E!ESP, PRT			Y
Capelin	Mallotus villosus	XIV	G2								
Haddock	Melanogrammus aeglefinus	Va/Vb	G1	Y	2-5		WKMAT07				
Haddock	Melanogrammus aeglefinus	Via/VIb/VIIa/VIIb-k	G1	Y	2-5		WKMAT07	Survey(IRL), Survey (UK)	IRL, UK		Y
Whiting	Merlangius merlangus	VIII/IX, X	G2	T	1-5		WKMAT07	Market samples/Surveys (E!ESP			
Whiting	Merlangius merlangus	Vb/VIa/VIb/VIIa/VIIe-k	G1	Y	1-5		WKMAT07	Survey(IRL), Survey (UK)	IRL, UK		Y
Hake	Merluccius merluccius	IIla, IV, VI, VII, VIIIab / VIIIc, IXa	G1	Y	12-6		WKMAT07	Market samples/Surveys (E!ESP,IRL, PRT, Y			
Wedge sole	Microchirus variegatus	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2								
Blue whiting	Micromesistius poutassou	I-IX, XII, XIV	G1	Y	1-5		WKMAT07	Survey(IRL), Market sample	IRL, UK, NL	Y	
Lemon sole	Microstomus kitt	all areas	G2	T				Market samples/Surveys (UI UK			
Blue ling	Molva dypterygia	all areas, excluding X	G1	T				Market samples/Surveys (E!ESP			Y
Blue ling	Molva dypterygia	X	G1	T				Market samples/Surveys (E!PRT			Y
Ling	Molva molva	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2	T				Market samples/Surveys (E!ESP, UK			Y
Striped red mullet	Mullus surmuletus	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2	T							
Norway lobster	Nephrops norvegicus	VI Functional unit	G1	Y				Surveys (UK)	UK		Y
Norway lobster	Nephrops norvegicus	VII Functional unit	G1	Y				Port sampling/Survey(IRL), I,FR, IRL, UK			Y
Norway lobster	Nephrops norvegicus	VIII, IX Functional unit	G1	Y	4-9		WKMAT07	Market samples(ESP), MarkESP, FR			Y
Common octopus	Octopus vulgaris	all areas, excluding VIIIc, IXa	G2	T							
Common octopus	Octopus vulgaris	VIIIc, IXa	G2	T	2-10		WKMAT07	Market samples/Surveys (E!ESP, PRT			
Pandalid shrimps	Pandalus spp.	all areas	G2								
White shrimp	Parapenaeus longirostris	IXa	G2	T	4-10		WKMAT07	Market samples/Surveys (E!ESP, PRT			
Greater Forkbeard	Phycis biennoides	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2	T				EVHoesurvey (FR)	FR		Y
Forkbeard	Phycis phycis	V,VI,VII (excl. VIId), VIII, IX,X, XII,XIV	G2	T				Market samples/Surveys (E!ESP			

Species	Species (Latin)	Area/Stock	Species group	Maturity sampl Freq.	Spawning period (month)	Recom. Sampling period (month)	WK ref	Present appropriate sampling source	Possible countries for sampling	Presently involved countries in sampling	Stock coordinated by ICES (Y/N)
<b>NEA</b>											
Plaice	Pleuronectes platessa	VIIa/VIIe/ VIIfg	G1	Y	9-4		WKMAT07	Survey (IRL), Market Sampl	IRL, UK, BEL	Y	
Plaice	Pleuronectes platessa	VIIbc/VIIh-k/ VIII, IX, X	G1	Y				Survey (IRL)	IRL		Y
Pollack	Pollachius pollachius	V,VI,VII (excl. VIIId), VIII, XII,XIV	G2	T				Surveys (UK)	UK		
Pollack	Pollachius pollachius	IX, X	G2	T							
Saithe	Pollachius virens	Va/Vb/IV, IIIa, VI	G1	Y	2-4		WKMAT07	Surveys (UK)	UK		Y
Saithe	Pollachius virens	VII, VIII	G2	T	2-4		WKMAT07	Survey(IRL), Surveys (UK)	IRL, UK		
Wreckfish	Polyprion americanus	X	G2								
Turbot	Psetta maxima	all areas	G2	T				Maket Samples/Surveys (U)	UK		
Blond ray	Raja brachyura	all areas	G1	T			WKMAT07	Survey (IRL),Purchase of fis	IRL, PRT		
Thornback ray	Raja clavata	all areas	G1	T	1-3; 5-11		WKMAT07	Survey (IRL),Purchase of fis	IRL, PRT,UK		
Spotted ray	Raja montagui	all areas	G1	T	4-7		WKMAT07	Survey (IRL),Purchase of fis	IRL, PRT,UK		
Cuckoo ray	Raja naevus	all areas	G1	T				Survey (IRL),Maket Sample:	IRL,UK		
Other rays and skates	Rajidae	V,VI,VII (excl. VIIId), VIII, IX,X, XII,XIV	G1					Maket Samples/Surveys (U)	UK		
Greenland halibut	Reinhardtius hippoglossoides	V, XIV/VI	G1	Y							
Salmon	Salmo salar	V,VI,VII (excl. VIIId), VIII, IX,X, XII,XIV	G1								
Sardine	Sardina pilchardus	VIIIab/VIIIc, IXa	G1	Y	10-5		WKMAT07	Market samples/Surveys (E)	ESP, PRT,FR	Y	
Brill	Scophthalmus rhombus	V,VI,VII (excl. VIIId), VIII, IX,X, XII,XIV	G2	T				Maket Samples/Surveys (U)	UK		
Spanish mackerel	Scomber japonicus	VIII, IX	G2	T	1-6		WKMAT07				
Mackerel	Scomber scombrus	II, IIIa, IV, V, VI, VII, VIII, IX	G1	Y	1-6		WKMAT07	Market samples/Surveys (E)	IRL, ESP,UK,I	Y	
Golden Redfish	Sebastes marinus	ICES Sub areas V, VI, XII, XIV & NAFO S/	G1	Y	3-5		WKMSREGH	Observer on board (ESP)	ESP, PRT, POL,GER		
Deep sea Redfish	Sebastes mentella	ICES Sub areas V, VI, XII, XIV & NAFO S/	G1	Y	3-5		WKMSREGH	Observer on board (ESP)	ESP, PRT, POL,GER		
Cuttlefish	Sepia officinalis	all areas	G2	T	3-10		WKMAT07				
Sole	Solea solea	VIIa/VIIfg	G1	Y	1-6		WKMAT07	Survey (IRL), Maket Sample	IRL, UK, BEL		
Sole	Solea solea	VIIbc / VIIhjk / IXa / VIIIc	G1	Y	1-6		WKMAT07	Survey (IRL), Maket Sample	IRL, UK		Y
Sole	Solea solea	VIIe	G1	Y	1-6		WKMAT07	Market (FR), Maket Sample	FR, UK		
Sole	Solea solea	VIIIab	G1	Y	1-6		WKMAT07	Market (FR)	FR		Y
Sea breams (in plural)	Sparidae	V,VI,VII (excl. VIIId), VIII, IX,X, XII,XIV	G2		1-3		WKMAT07		ESP		
Sea bream	Pagellus bogaraveo	IXa, X	G1	T							Y
Spurdog	Squalus acanthias	V,VI,VII (excl. VIIId), VIII, IX,X, XII,XIV	G1	T				Survey(IRL), Maket Sample:	IRL, UK		
Mediterranean horse mackerel	Trachurus mediterraneus	VIII, IX	G2	T							
Blue jack mackerel	Trachurus picturatus	X	G2	T							
Horse mackerel	Trachurus trachurus	IIa, IVa, Vb, VIa, VIIa-c, e-k, VIIIabde/X	G2	T	1-6		WKMAT07	Market samples/Surveys (E)	ESP, NL, GER	Y	
Horse mackerel	Trachurus trachurus	VIIIc, IXa	G2	T				Market samples/Surveys (E)	ESP, PRT		Y
Pouting	Trisopterus spp.	V,VI,VII (excl. VIIId), VIII, IX,X, XII,XIV	G2		1-4		WKMAT07		ESP		
John Dory	Zeus faber	V,VI,VII (excl. VIIId), VIII, IX,X, XII,XIV	G2	T							

**Annex 11: Guidelines for otolith exchanges (update)**

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# PGCCDBS Guidelines for Otolith Exchanges

1–5 March 2010

Lisbon, Portugal

## Introduction

The objective of exchanges of calcified structures is to estimate precision and relative/absolute bias in the age estimations from age readers of the different age reading laboratories, to check that this is still within acceptable levels. The frequency of exchanges and workshops mainly depends on the quality of the age determination and will be revised by national age reading coordinators and by expert groups. Exchange programmes obtain more objective estimations of the precision and bias in age reading, since the readers use their own equipment and are not subject to a tight time schedule (criteria which may not be applicable in a workshop). Exchange organisers should ensure they have read EFAN Report 3-2000 (Eltink *et al.*, 2000) particularly Section 3.9 “Comparison of sets of different preparation techniques” or of different calcified structures, Section 3.13 “Age reading comparisons” and Section 4.7.2.12 “Age reading of the last set for estimating improvement in age reading”.

PGCCDBS recommends a threestage process. (This process is illustrated in a schematic figure still under construction.) A **small scale exchange** should take place to ascertain if the precision of the age readers providing data for stock assessment is acceptable for a species or stock. If the small-scale exchange reveals reading problems that need to be addressed, then a **full scale exchange** must be carried out. In case the full scale exchange confirms the existence of age estimation problems a workshop needs to be set up. Workshops should be organised in accordance with the PGCCDBS Guidelines for Workshops on Age Calibration. The frequency of exchanges and workshops mainly depends on the quality of the age determination and will be revised by national age reading coordinators and by expert groups. Even if no age reading issues were revealed in workshops or exchanges, quality assurance requires the organisation of an exchange at least once every 3-5 years. The possibility for a workshop should be offered every 5 years.

PGCCDBS highly recommends the use of the **Age Reader Forum** (<http://groupnet.ices.dk/AgeForum/default.aspx>) in tandem with the **WebGR** tool (<http://webgr.berlios.de>) to streamline the preparation and the implementation of age calibration exchanges and workshops. Age calibration exchanges and workshops should be announced and marked on the calendar of the Age Reader Forum. Their reports should also be posted on the forum. The use of WebGR needs to be evaluated on the next PGCCDBS after which these guidelines might be updated.

### Small scale Exchanges

**Images are not required** for small scale exchanges, but could be considered as an option to ease the exchange speed. The suggested sample size for small scale exchanges is 3-5 recently collected otoliths for each length class, from the period when the otoliths have translucent edges (e.g. Q1) and a sample of the same size from the period when the otoliths have opaque edges (e.g. Q3/Q4). If two methods are used for age reading, e.g. sectioning and breaking otoliths, there should be two collections in the exchange. Otoliths should be read by the preferred method.

### Full scale exchanges

**If a full scale exchange** is carried out, it should include **both images and samples of calcified structures**.

**Because comparisons between different methods or comparisons in reading ability between the start and end of a workshop might be required, these possible com-**

parisons need to be planned from the start of the full scale exchange and carried out using the principles of designed experiments (see for example, Heath (1995)). The most important ideas for experimental design are to compare like with like and to control for other variables that affect age reading ability. For example, do not provide otoliths for the full scale exchange from one area to be followed by the age estimation of otoliths from a different area at the end of the workshop. This comparison could show increased agreement in ageing due to increased ability gained at the workshop or due to the 2nd area being easier to read and it will be impossible to separate the two effects. Similarly, avoid running the before and after comparisons on exactly the same set of otoliths. This is necessary if there are small numbers of otoliths but otherwise is undesirable as improvements seen in agreement may be from remembering specific cases and not apply in general.

Building on the guidance in the EFAN report, the PGCCDBS recommended that the procedure for setting up two sets of otoliths for comparison should be by randomly assigning otoliths (described in the paragraph Selecting Calcified Structures (see below)) of each strata defined group to either the first or second set. The two sets do not have to be of the same size. When the first set will be used for the exchange and the second set for recalibration at the end of the workshop, it is sensible to make the second set smaller. If the age workshop coordinator can specify changes in estimation bias or CV that are biologically meaningful, then sample size calculations can be carried out to help decide how big the data sets should be.

### **Identifying Exchange Participants**

The coordinator is required to contact other age reading laboratories to identify the age readers who will participate in the exchange. Generally this will be the readers whose age readings are used for stock or environmental assessments. At the same time he/she needs to inquire how much experience the readers have in age reading this and other stocks. Participants can be asked to provide a brief statement describing the species that they read (including details on the stock(s)) and the number of years they have been reading these stock(s). This information is also needed to identify the most experienced readers. Participants should also provide a summary of the quality management procedures used at their institute.

### **Selecting Calcified Structures**

Where there is a requirement for an exchange of the same species from areas or different stocks with widely differing growth rates, separate sampling sets must be set up for each area and care must be taken that the sample sets are analysed separately in case appropriate.

The age span in an exchange set of calcified structures (CS) should, if possible, be from age 0 to the maximum age possible (try to exceed the age range as used for stock or environmental assessment purposes).

As a rule of thumb, a minimum of two sets of otoliths from fish caught in the same year are needed for a reliable estimation of CV at age, each with 10 specimens within each age group, to ensure that the number with translucent edges and the number with opaque edges are representative of the annual distribution, e.g. from January to March and July to September for many Northeast Atlantic continental shelf spp. This is to ensure that the estimated precision and bias are representative for the age readings over the whole year as used for stock assessment purposes.

Identify variables that you suspect influence the ability to age. The **number of possible age reading problems** that you want to check, **determines the number of sets in the exchange**. Identify variables that you suspect influence the quality of the age readings. Compare years and quarters to look for identifiable features that may reveal faults, e.g. abundant years classes becoming less abundant and vice versa. For variables that are not of interest control their effect by standardising them. For variables that are of interest or cannot be fixed, define strata based on these variables. The co-ordinator might also decide to assemble a set of calcified structures, which consists of a number of sub-sets. Control the effect of variables that are not of interest by standardising them. For example: keep laboratory procedures consistent, define strata based on variables that are of interest or cannot be fixed. For example: month and fish length group. (We suggest strata based on fish length group to help balance the age distributions in the first and second set.)

The CS for the exchange should be completely representative of the CS used for stock or environmental assessment. Bearing this in mind, the coordinator should try to limit the total number of calcified structures; otherwise the burden for the age readers will be too much. The co-ordinator should inquire whether calcified structures of known age are available to be included as an extra set in the exchange. He should do his very best to include such a separate set of calcified structures of known age.

Exclude otoliths you know are poorly prepared or have other obvious reasons why they are different from the rest of the otoliths in the exchange.

### Instructions to Participants

It is important to read the exchange programme otoliths in exactly the same way as they are read for stock or environmental assessment and not to make a special effort to get the best possible result. Participants **must be provided with** the area and date of capture for each CS in the exchange. Participants should be **strongly encouraged** to make a **first 'blind' age reading**, for each CS and then make a second reading using the available biological information. Making an initial 'blind' reading can lower unintentional bias in assigning age and may eventually improve reader self-confidence.

### Using Images of CS

Where images of CS are to be included in the exchange, it is important to ask each reader to annotate the position of each annual translucent zone on every otolith. These annotated images enable comparisons of how readers derive their age readings and form a valuable record of the exchange that can also be used as a training resource for less experienced readers. The positions of the annual translucent zones are marked on raster layers. The images of the CS should all be prepared at one laboratory. This may either be the co-ordinator's laboratory or another participating laboratory who has agreed to do this work for the co-ordinator.

The coordinator will choose an appropriate value for 'brush size', so that this is not more than 75% of the width of the smallest annual translucent zone and instruct participants to set the brush tool 'hardness' at 100 (no opacity). The coordinator will assign a colour to each age reader at the outset to avoid any duplication. To facilitate the collation of the annotated image data by the coordinator, each participant selects a new raster layer when opening each image and names it with their name or reader identity, before marking the annuli on this layer with their assigned colour and saving it as a '.jpg' image. [See: Report of Irish Sea Celtic Sea Cod Otolith International

Exchange scheme 2006 Appendix 1: Instructions for using Paint Shop Pro for more information].

### **Technical specifications for images**

Photo quality is very important and proper preparation of otoliths is necessary for obtaining good photographs. Avoid over-exposed pictures. The same magnification needs to be used for the whole set of images and for all the sets within 1 exchange. Remember to calibrate image, information of resolution in the file name is recommended. Pictures should be saved in Jpeg- or Tiff-format. Use only one microscope for each stock, there might be microscope-specific calibration variance. Recalibrate the setup regularly. The minimum camera specifications are good light sensitivity and a minimum of 6 MP. High speed connection between camera and computer is recommended. Processing pictures can be done with specialized software as WebGR, TNPC, or more general software as ImagePro, ImageJ, or others. A high resolution screen is important. (Based on the Report of the Workshop on Age Reading of North Sea Cod (WKARNSC), paragraph 3.7.)

### **Use of WebGR**

When possible, use WebGR to distribute pictures for use in exchanges and workshops.

WebGR is a European project that aims to develop Open Source software for supporting studies of fish growth and reproduction. In particular it promotes the usage of online services to organize calibration workshops. The application facilitates the whole workshop and exercise cycle. Multiple images can be uploaded and assigned to an individual fish. The workshop manager uses attribute-based filters to create a specific image set for an exercise. Each participant annotates the contained image sequence under condition of an appointed key. A group accepted annotation gets a reference state. These reference images will also be used for training purpose.

The key functions of WebGR are:

- Set up of workshops and calibration exercises
- Make and share annotations (coordinates, text-fields, graphical settings)
- Compare annotations
- Set reference annotations
- Upload images
- Manage fish samples
- Export lists and tables to process in spread sheet- and statistical software
- Training exercises without administrative overhead
- Let users choose their expertise coverage
- Define different key tables (research standards)
- Comprehensive search and filter abilities

Technical details of the WebGR application:

- Intranet application, only authorized access
- Web browser based
- Self registration with e-mail confirmation

- Free definable form fields with multiple values and ranges for image search
- Free definable value lists for fields
- Data validation and filtering
- Access control for different roles and actions.

### Managing the Exchange

One of the major problems in an exchange of calcified structures is the length of time taken for the successful completion of an exchange scheme. The co-ordinator should contact the participating laboratories to find when the readers are available for the most efficient circulation of the exchange otoliths. Once a schedule has been agreed it then becomes the responsibility of the individual age reader to inform the exchange coordinator of any changes necessary to revise the schedule due to other unforeseen work commitments, illness etc., in order to ensure the timely circulation of the exchange material. "Only images"-exchanges possibly in combination with the use of WebGR, will relieve the co-ordinator of these particular problems there the images can/will be available for all participants at the same time.

The individual age reader is responsible for informing the coordinator when he/she has received the exchange set. Each reader is required to e-mail both the coordinator and the next participant on the exchange schedule before the exchange set is passed on to ensure that the next person on the list is still available to receive the otoliths. If this is not the case the coordinator can arrange for another participant to receive the exchange material. Before sending on the exchange material the age reader must ensure that all the age reading material is present and accounted for. If at this stage any problems with missing material are identified, the individual age reader must inform the coordinator. Participants should ensure the CS are securely wrapped in protective packaging to minimise the risk of damage during shipment to the next laboratory. Caution should be taken to pack the otoliths in a way that the otoliths are safely packed, but still easily handled.

At the end of the planned exchange, the CS can be returned to the reader(s) who were not able to read these at the planned time, before being shipped back to the co-ordinator. The co-ordinator should recommend sending the sets **by special courier** in order to speed up the exchange and to reduce the possibility of losing one of the sets.

### Analysing the Exchange Results

There are several ways of comparing age readings. However, the best way is by making age bias plots, which are easy to understand for the age readers (ICES, 1994 and Campana *et al.*, 1995). The "Age Comparison Tool" (Eltink *et al.*, 2000) offers an easy tool to analyse the data. The output of this tool is now widely used within fisheries laboratories in Europe. However, other tools also exist and their use should be examined because the "Age Comparison Tool" by Eltink is not applicable to all species.

Basic statistics are in the output of the WebGR tool.

### Reporting the Results of the Exchange

The co-ordinator is responsible for the report of the exchange. Preferably, the report of the age reading exchange contains the following sections:

- Abstract



- Introduction
- Material and methods
- Results
- Discussions
- Conclusions
- Recommendations.

Valid statistical tests and measures should be used to quantify the conclusions of the exchange. The co-ordinator should try to get firm conclusions concerning what preparation techniques or calcified structures to use (aim for standardising methods).

The co-ordinator should return the otoliths to the appropriate age reading laboratories.

He/she should discuss by e-mail the first draft of the report and incorporate the comments. Finally he/she should distribute the report to all participants and post the report on the Age Reader Forum so it is available for the whole ICES - age estimation community. In case an agreed reference image set is one of the outcomes of an exchange, this reference set should be made available to the participants of the exchange. Existence of reference sets and their whereabouts should also be specified on the forum.

**Annex 12: Guidelines for Workshops on Maturity Staging (final  
version)**

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**PGCCDBS Guidelines for Work-  
shops on Maturity Staging**  
Version 3

1-5 March 2010  
Lisbon, Portugal

## Version history

Version	Author	Date	Changes
Version 3	ICES PGCCDBS	4 March 2010	<p><b>Changes based on WKMSSPDF. Topics to consider when preparing a Workshop</b> f) modified and i) added.</p> <p><b>Topics to consider during the Workshop</b> e) added. b)ii) modified Guidelines for collecting maturity data and histological analyses for maturity workshops 8) modified</p>

## Introduction

The main objectives of a maturity staging workshop are: i) to agree on a common maturity scale for the species/stock of concern across laboratories, based on a comparison of existing scales and standardization of maturity determination criteria; ii) to establish correspondence between old and new scales so that time series of previous data can be converted; iii) to reduce sources of error in maturity determination by validating macroscopic staging, and iv) to propose an optimal sampling strategy to estimate accurate maturity ogives.

## Topics to consider when preparing a Workshop

- a) Identify sources of data that, at present, are used to collect maturity data and their current sampling protocols.
- b) Gather information on the reproductive biology and ecology of the species / stock of concern with emphasis on the timing of the different stages of the reproductive cycle, particularly spawning time, delimitating clearly its duration.
- c) Studies are required on spawning synchronicity among individuals within a stock, as low synchronicity will mean there is temporal overlap of different stages (developing, spawning, spent and/or resting).
- d) The organization for the collection of the samples and the methods for histological analysis need to be decided amongst the experts but guidance can be found below (Guidelines for collecting maturity data).
- e) Maintain contact with participating countries to ensure adequate sample coverage is obtained prior to the workshop's analyses of samples. In this sense the following should be ensured:
  - Laboratories participating in stock assessment or data collection of the stock of concern should participate even if they do not collect routinely maturity data.
  - However, there are practical limits to the number of participants; in this case each laboratory will need to ensure that only the most suitable people attend.
  - Experts on histology, maturation process and the reproductive ecology/biology of the species of concern or at least a related species should participate in the workshop.

- f) Ideally, a fresh sample should be provided during the workshops. This needs to be taken into account when setting the timing of the meeting. The best time of year to do a workshop on maturity staging is when the diversity in maturity stages is high.
- g) Identify the metadata that are needed to accompany samples collected for analyses and specify it in the sampling protocols (see guidelines below).
- h) Provide detailed protocols on collecting images of the gonads sampled, including at least a precise description of the quality of images (set-up of camera and format) and image calibration. Additionally, in case of histological images, agree on the histological protocol and microscope set-up (see guidelines for histological process below).
- i) Use images as a tool for calibration prior to a workshop.
- j) Gather information on how the data are, or could be used, in the assessment process.
- k) Put in place arrangements for histological analyses of collected material taking into account that all participants may not have facilities or resources to meet this requirement. Arranging for centrally located analyses has proved effective in the past and has ensured that adequate samples are validated. Consider bi-lateral agreements to cover the cost of such work.
- l) Each laboratory should carry out investigations into potential discrepancies in maturity staging between scientists within the laboratory. They should consider macroscopic staging and, if available, microscopic staging. If possible provide statistical analysis of precision and accuracy within the laboratory. Potential causes for lack of precision and accuracy should also be analyzed.
- m) Prepare a full set of reference material covering both the spatial and temporal aspect of the species/stock of concern. These consist of pictures of all maturity stages together with their histology report.
- n) The meeting should be held in an institute with suitable wet laboratory facilities and ideally with histological facilities. If not histological facilities are not available at least with sufficiently high quality research microscopes with attached high definition cameras.

### **Topics to consider during the Workshop**

- a) Provide information on participating laboratory procedures, including sampling procedures, macroscopic maturity determination process, maturity scale definitions and if applicable gonad preservation and histological methods, and protocols used to determine microscopic maturity.
- b) Resolve interpretation differences between readers and laboratories both at macroscopic and microscopic scales. Differences may arise from:
  - i) Using different maturity scales
  - ii) Different interpretation of the same macroscopic stages (terminology and precise definition of stages are critical issues)
  - iii) Different sampling protocols, e.g. timing and/or gear selectivity or availability, see guidelines for collecting maturity data below.
  - iv) Different interpretation of gonad structures and gamete development in histological slides. This should not be an issue, so experts on gametogenesis should be involved in workshops.

- c) Agree and create a single maturity scale. Consider the following aspects:
  - i) Keep the scale as simple and efficient as possible. Not everything can be extracted from a maturity scale and a complex maturity scale may introduce more errors than relevant information (See WKMAT report)
  - ii) Describe the stages precisely avoiding ambiguity and overly subjective description (like colour descriptions), for example, give measurements instead of saying “bigger”.
  - iii) If two stages are hard to distinguish macroscopically, they should normally be merged. This often occurs with resting and/or mature inactive stages that are confused with immature or developing (at early stages).
  - iv) In these cases, histology must be used to separate the merged maturity stage into the different real stages. It is necessary to define the minimum number of samples to be collected, the timing of the sampling, how they should be histologically processed, and what criteria should be used to distinguish between stages, and if possible define a reference lab (see below).
- d) As a calibration exercise, each participant should classify the workshop sample collection using the agreed maturity scale. This will provide a test of the new scale and any discrepancies in interpretation should be identified and resolved.
- e) Based on the experiences e.g. of the WKMSSPDF (22-26.02.2010) it is recommended to set the maximum fish to stage in one session to 120. However, the total numbers to stage should also take into account the species and any sample size requirements for statistical comparisons. This applies to fresh samples as well as pictures.
- f) The results from the calibration exercise should be recorded to provide data for statistical analysis. If you want to measure improvements in agreement due to the workshop then ideally a different set of samples should be used, not the ones already staged earlier in the workshop.
- g) Provide a statistical report comparing observed maturity stage with validated histological stage for the workshop participants to consider.
- h) Differences in staging between laboratories should be statistically analyzed in terms of precision and accuracy; sources of discrepancies should also be analyzed.
- i) Try to use standard terminology (Murua and Saborido-Rey, 2003; Brown-Peterson *et al.*, 2007) during the workshop and in the report. Try to keep the recommended maturity scale as similar to the standard as possible.
- j) When a new agreed maturity scale is proposed the impact on maturity historical series should be evaluated
- k) Produce an agreed reference collection of preserved gonads, histological slides and images that should be stored in a reference lab and always available for the scientific community. Copies of histological slides can be made and distributed with referenced images of these slides.
- l) A reference laboratory should be defined, for each species, with experience and equipments to define, with precision, maturity stages and to “solve problems”.

- m) The minimum output from species-specific workshops should be an illustrated manual.
- n) Provide recommendations to stock assessment Working Groups and Benchmarks on relevant issues derived from maturity stage studies, such as timing of sampling, changes on maturity time series, spatial differences on maturity, differential sex maturation, etc.

**Annex 13: Guidelines for collecting maturity data and histological analyses for maturity workshops**

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# Guidelines for collecting maturity data and histological analyses for maturity workshops

1-5 March 2010  
Lisbon, Portugal

These guidelines are partly taken from Workshop on sexual maturity staging of Cod, Whiting, Haddock and Saithe (WKMSCWHS). The guidelines should be regularly evaluated based on research developments and the experience from maturity staging workshops.

- 1) Sampling has to be conducted by cooperation between the participating laboratories.
- 2) The number of samples by length range, sex and location has to be clearly defined considering number of countries involved, timing, and spatial overlap of sampling.
- 3) Preferably, the sampling procedure should be executed several times during a year to follow the reproductive cycle and development of the gonads. At least 4 times at year, or more frequent depending on species.
- 4) However, cruises are normally not conducted each quarter or several times at year at the same location and hence limitations in sampling capacity are recognised. Commercial fleet samples (e.g., from observers onboard) can be used to complete sampling if gonads are properly preserved and observers properly trained for maturity staging.
- 5) Sampling at landing should generally be avoided as in most occasions gonads have already undergone lyses. Sampling at landing can only be used if a known catch has occurred recently before landing and the location of the catch is known.
- 6) For data collection and histology samples, each specimen should be given a fish ID including the following information: Country, station, date and fish number
- 7) For each specimen the following information should be collected:
  - Procedures made to collect maturity data
  - Location of sample collection
  - Date of sample collection
  - Fish total length
  - Sex
  - Maturity (as noted at time of collection)
  - Fish total weight
  - Gonad weight
  - Fish gutted weight
  - Age if available
  - Additionally, other parameters should be taken if demonstrated to be relevant to assess temporal patterns in gonad development, like liver weight.
- 8) A series of photographs of the fish and gonad including the identification number should be taken during the sampling process. The WKMSSPDF 2010 clearly showed that staging from pictures is more difficult than staging from fresh materials. Generic comments were that some of the stage descriptions were only suitable for fresh samples and the characteristics were not visible on the pictures. There is a need for clear descriptions on pictures to be taken. When staging from pictures, it is necessary to standardise the way the pictures are taken. There have to be stringent proce-



dures even down to equipment and/or settings used. General marks for staging from pictures:

- pictures have to be taken on fresh fish,
  - add at least sampling time, area, unique sampling number, fish length and species in the picture,
  - take care that the samples should be clean/tidy, preferable without intestines,
  - take at least six pictures, in case of flat fish, four in case of round fish. The differentiation between dorsal and ventral side is necessary only in case of flatfish:
    - from the dorsal side: overview of the fish on a measuring board, with the gonads visible in the fish; the ability to look at the whole fish with the gonads intact is vital to get the ratio of gonads to body length
    - from the dorsal side: detail of picture 1, zoomed in on the gonads; show the pressure characteristic on the picture to see if fish is running
    - from the ventral side: overview of the fish on a measuring board, with the gonads visible in the fish; the ability to look at the whole fish with the gonad intact is vital to get the ratio of gonad to body length
    - from the ventral side: detail of picture 3, zoomed in on the gonads; show the pressure characteristic on the picture to see if fish is running
    - picture of gonads outside the fish, placed on a measuring board, allowing to view the gonad in more details
    - picture of longitudinally cut gonad
  - for the best results is there a certain time when the photos are not that useful or not required however, getting as many different stages is useful as an educational tool
  - the pictures needs a lot of free space on the PC and the PC system operating very slow when many participants try to use it simultaneously
  - when organising a maturity workshop, where staging from pictures will be done, a server prepared for this purpose has to be used - the WebGR tool (REF) might be the right application to support maturity staging workshops,
  - in addition, a table including biological and sampling information should be available.
- 9) The gonad or sub-samples of the gonad tissue has to be preserved immediately after collection. If only pieces of gonads are collected, these should be representative of the entire gonad (for example from the anterior, middle and posterior part of the organ). The sampled tissue has to be preserved in buffered 4% formaldehyde.
- 10) Histological process has to be done in similar manner across laboratories or a single laboratory selected to process the samples.
- 11) Pieces of tissue should be embedded in wax or resin, but agreement on the location of the tissue within the gonad is very important, as differences in oocyte development across the gonad may bias the results. There is not an *a priori* preferred location, which should be investigated for each species.

- 12 ) Thickness of histological section is not critical but should not exceed 5 microns.
- 13 ) Staining protocol is a key aspect to be considered as differences in histological section interpretation may occur due to this, especially for cortical alveoli, postovulatory follicles and atresia. Haematoxylin-Eosin is a standard, but experts should advice on this. In any case the same protocol across laboratories should be used.
- 14 ) Slides should be used at the meeting, but images should also be taken for discussions and dissemination. Previous agreement is required on microscope set-up (illumination and numerical aperture is critical for microscopic image definition), setup of camera, image format (size and compression) and image calibration.

## **Annex 14: Reports on self-sampling programmes**

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### **Belgium**

#### **Framework**

Since 2005 the Celtic Sea-Trevoise box (rectangles 32 E3, 30 E4 and 31 E4) is closed for all fisheries during the months of February and March for all fisheries, with the objective to minimize the fishing mortality of mature cod during the spawning season. The Celtic Sea and particularly the rectangles of the Trevoise box are of great importance for the Belgian beam trawlers (see Figure 1).

#### **Objective**

Identification of the impact of the Belgian beam trawl fishery on cod in the Celtic Sea. Based on scientifically sound data an evaluation what the impact is can be done and a discussion and can be started for a possible reopening the Trevoise box for the Belgian fisheries. Indeed, based on historical figures? N based on findings of the fishermen, the Belgian beam is cod fishing little caught.

#### **Medium**

On request and initiative of the Belgian fisheries sector, the fisheries sector in cooperation with the ILVO, started a self-survey program to get a better picture of the Belgian total catch of cod (landing and discards) in the Celtic Sea (subareas VIIIf and VIIg).

#### **Protocol**

The crew of the participating vessels is asked to:

- in each of the studied area , record the weights of landings and discards.
- Every second haul, the lengths of (part of) the landed and discarded cod is noted.
- Meta data: engine power, length of the vessel, mesh size,
- Specific to the trip (leaving date,?) And specific to the sleep (eg total landings (all species)) note.

On a regular basis, the seagoing observers ILVO go on board with the participating ships to cross-check with respect to implement this in the context of validation of the collected data.

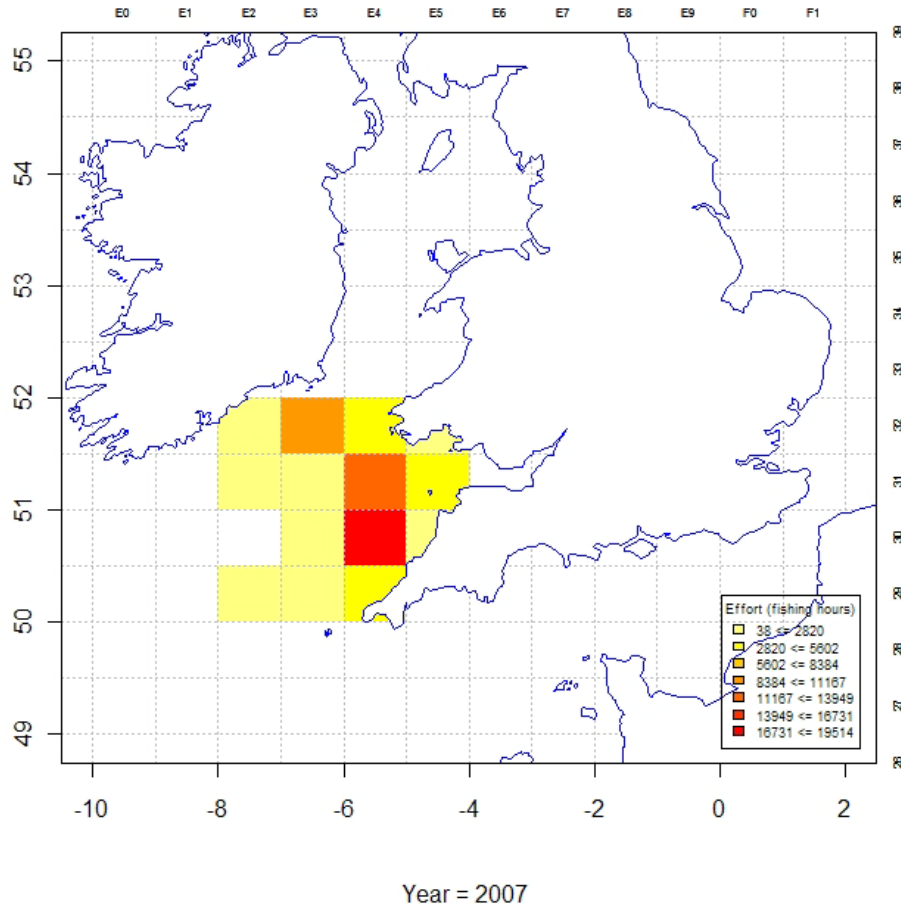
- Existing protocol on board going observers is used
- Additional, market sampling of landed cod is done (weight, length measurements and otoliths). (Check landing). For this sampling, an existing ILVO protocol is used.

#### **Validation Process**

*Training owners / crew vessels involved:*

Given the importance of correct and consistent implementation of the sampling protocol, a comprehensive training is provided for interested fishermen and crew. Besides a presentation of the Self sampling protocol, there was enough attention paid to the filling of documents / specifications. Furthermore, a contact person for fishermen

and crew is available if questions regarding the Self-survey program and practical implementation are arising.



**Fig.1: Belgian effort (in fishing hours) in areas of 2007 and VIIIf VIIg (a rectangle).**

*Communication between the industry and ILVO:*

- Interim meetings / inquiry with the all parties, combined with report on a two month basis
- feedback from the fishermen inventoried (document experiences)
- Shortly after a trip report forwarded to the owner!
- Close contact is prerequisite for the success of the project.

*Validation of the data itself:*

As part of the validation of the data collected from the Self sampling program, during the entire duration of the Self-survey project cross-checks are performed. These cross-checks will locate at multiple levels:

- Sampling in the auction:
 

In the auction, the cod landed by a number of trips, vessels involved in the Self sampling program are sampled. This task will be performed by the ILVO observers. The length distribution of cod landed from a trip, measured in fish, will be compared with the length distribution of the cod,

monitored by the fishermen during that particular trip. This type of validation is only focused on the raised part of the cod in the landings. The auction will be working with an existing protocol (including otoliths - not immediately relevant?). Note: cod landings are sampled before they are sorted in the various categories.

Auction -> length measurements of all drag (N will be greater than N from the Self-survey)

- On board going observers:

On a regular basis at seagoing observers join a vessel involved in the Self sampling program. From every second haul (not the haul measured by the crew for the Self sampling program), the seagoing observers record weight and length distributions of landings and discard cod. This cross-check is not only at the landing level (as in the validation by sampling in fish), but also at the level of discards. The details of the seagoing observers (landing + discards) can both be compared with those of other vessels in the Self-survey project and in the same period and approximately the same location on the fish (see method Ireland: triangulation plots to check with Norman Graham and co.). At the other hand, these data can be compared with data from the crew of the same as trip -> as length distribution and the weights are approximately similar, this is acceptable, but if the data are not similar, data must be handled with cautions as this can be caused by the hauls sampled rather than because of a difference in working methods (seagoing fishermen versus observers)).

- Internal Control:

length-weight keys (be careful with seasonal variations!)

## The Netherlands

### Overview

A self-sampling programme on discards monitoring started in in March 2009. Participation of 12 commercial vessels of five different métiers: large (> 300 hp engine power) and small (< 300 hp engine power) beamtrawlers with meshsize 80 and 100mm; twin-rig trawlers targeting demersal fish and twin-rig trawlers targeting *Nephrops*. Total number of trips sampled during 2009 was 63. In 2010 the number of participating vessels increased to 25 with the intention to monitor 160 trips in total.

**Table 1. number of trips sampled in 2009 per métier and the sampling target for 2010.**

Metier	# trips sampled (2009)	# trips sampled (2010)
Beam trawl < 300 hp	3	20
Beam trawl > 300 hp mesh size 80 – 89 mm	39	80
Beamt rawl > 300 hp mesh size 100 + mm	8	20
Twinrig trawl target dem. fish	4	20
Twinrig trawl targt nephrops	9	20

### Sampling method

#### Discard sample:

From each sampled trip 2 hauls are sampled:

- 1) A representative sample of a round 80 kg (~ 2 auction fish boxes) is sampled.
- 2) Samples are collected in plastic bags and labeled (ship, haul number, date). To prevent interference of third parties plastic bags are sealed with tie-wraps.
- 3) Samples arrive together with landings at auction
- 4) Samples are picked up and send to laboratory
- 5) At laboratory samples are sorted by species and biological information (length, maturity, age) is collected.
- 6) Data is entered in electronic database.

#### Effort data:

From each sampled trip effort and catch information is collected from all hauls:

- 1) Effort information includes haul duration and position.
- 2) Catch information includes: Total catch, estimated by skipper in volume, and landing is kg per species.

## Portugal – the Portuguese artisanal deep-water longline fishery

Studies and Pilot projects for carrying out the common fisheries policy: **FISH/2007/03, Lot 1: Joint data collection between the fishing sector and the scientific community in Western Waters**

### Pilot Project 4: Portuguese artisanal deep-water longline fishery

The main aim of this Pilot Project “Portuguese artisanal deep-water logline fishery” was to design and establish a self-sampling scheme for data collection from the deep-water longline fishery in ICES Area IX. The case study is the artisanal fishery for black scabbardfish operating in Sesimbra. In both components the deepwater sharks *Centroscyrnus coelolepis* and *Centrophorus squamosus* are the two most important by-catch species. A collaborative scheme between scientist and fishermen was settled for providing data that otherwise the scientists would not have access to, namely regarding fishing operations, catch composition and discards. The present case-study addressed the three tasks specified in the tender: (1) design and implementation of a pilot programme to obtain information from the fishing industry on fishing operations and the decisions made; (2) design and implementation of self-sampling programmes on board commercial vessels; (3) involvement of stakeholders in the use of the type of data described above for stock assessment and management evaluation.

The rationale for the data collection within the black scabbardfish’s pilot project were: Collect information concerning the fisheries; Collect and use of information which is not routinely available; Assess and propose management measures on fishery resources; Improve the use of existing information.

All information was collected by fishermen and workers from the subcontractor partner ArtesanalPesca (a fishermen’s association settled in Sesimbra), following a self-sampling protocol designed by the scientists in collaboration with AP. Two types of forms were designed: electronic logbooks and paper forms. In both forms the information required dealt with: Fishing effort and Catch composition.

One of the most important objectives of this pilot project was to collect information that could be used to estimate fishing effort of Sesimbra’s bottom longline targeting the black scabbardfish and also the impact of the fishery on the ecosystem. Accordingly, skippers provided a lot of information by fishing trip.

AP also assigned a team to be responsible for the monthly length frequency sampling of black scabbardfish and deep-water sharks landed by vessel. The minimum sampling effort by month was established to be one box of fish by size class landed by vessel and randomly selected from the total catch.

Industry subcontractor AP acquired and circulated between the vessels that were actually participating in the project a number of acoustic deterrent devices, known as pingers as there is a concern that the interaction between marine mammals and fisheries as it affects both the survival of wild marine mammal populations and the livelihood of the fishermen.

The final report of this project will be present in March of this year to the European Commission Directorate-General for the Fisheries and Maritime Affairs, but the preliminary results of this project show that it becomes obvious that apart from any incentives, the best way to engage fishermen to participate in a cooperative project is to first have established a strong relationship based on confidence and mutual help. One concern that arose in all of the meetings was the confidentiality of the information

they provided: it was assured that data would only be presented in an anonymous and/or aggregated way and only after their consent.



### Self sampling of trawl fisheries targeting *Pandalus* in Sweden

Trawl fisheries using sorting grids and a mesh size between 35-69 mm are exclusively targeting *Pandalus*. In 2008 was the total landing of the metier 635 tonnes of which the total share of *Pandalus* in the catches was 99%. It is according to Swedish national legislation, mandatory to use sorting grids inside 4 nautical miles (3 in the IIIaS) in the *Pandalus* fisheries. The fisheries are conducted all year around.

The metiers have been included in the sea-sampling programme since 1999 (1999-2008 on a tri annual basis). Discard rates are estimated to be above 10%, mainly due to capture of undersized *Pandalus*. The metiers will be sampled concurrently at sea throughout the fishing season by fishermen bringing subsamples of the discard fraction ashore.

The target is to sample 3 trips per quarter and 2 hauls/ trip. Vessels to sample are randomly selected from a list of active shrimp trawlers. The randomly selected fishermen are contacted and informed about the sampling strategy which depends on the catch composition in the hauls.

- a) If the catch contains a small fraction of undersize fish, they are asked to separate the fish and put it aside and label it. They are also asked to sample 3 kg of unsorted *Pandalus*. The procedure should be repeated for each of the two hauls.
- b) If the catch contain a larger fraction of undersized fish, they are asked to take 3 samples (á 3 kg) straight from the unsorted catch, from 3 different places in the bin. Each of the 3 samples should be put in separate plastic bags and labelled.

In order to get the information of the size composition of the caught *Pandalus* they are asked to take a sample of sorted *Pandalus* which is sorted on board according to size. The fraction of larger shrimps is boiled on board, the middle fraction landed fresh to the canning industry and the smallest shrimps are discarded. Samples from boiled (2 kg) and middle fraction (1 kg) and discarded part (1 kg) are purchased and transported together with the other sample to IMR for analysis.

The involved fishermen get approximately 50 EUR per trip (sampling 2 hauls) and for the *Pandalus* they get paid according to the market value of the day.

Before the trip will be conducted we send a letter with the information regarding sampling routine, labels, paper form for filling in sampling details etc. The fisheries control will be informed that this fishermen will bring ashore undersized fish for research purpose.

## Annex 15: Workshop proposals

### Methodological issues

#### Workshop on practical implementation of statistical sound catch sampling programmes [WKPICS]

A Workshop on practical implementation of statistical sound catch sampling programmes [WKPICS], Co-Chairs: Jon-Helge Vølstad (Norway) and Mike Armstrong (UK), will be established and take place in Spain in October 2011, to:

- a) On the basis of case studies examine how statistically sound programmes for sampling fishing vessels at sea can practically be implemented.
- b) On the basis of case studies examine how statistically sound port/market sampling schemes can practically be implemented.
- c) On the basis of case studies examine how statistically sound sampling schemes targeting small-scale fisheries can practically be implemented.

WKPICS will report by December 2011 for the attention of PGCCDBS, RCMs, STECF/SGRN; ACOM

#### Supporting information:

Priority:	Essential
<b>Scientific justification:</b>	<p>This Workshop is an essential follow-on to WKMERGE to establish a methodological support system to facilitate the design and practical implementation of fishery catch sampling schemes, such as are required under the EU Data Collection Framework. WKMERGE documented a number of approaches to designing shore-based and sea-based sampling schemes but did not have time to examine the detailed practical application of such schemes.</p> <p>The main aim of the workshop is to provide countries with enough support to design and implement statistically sound and transparent sampling programmes with appropriate documentation of proper sampling designs and estimation procedures, and enabling quality assessment of estimates used for stock assessment.</p> <p>The workshop will be based on a small number of representative case studies allowing for a more thorough discussion on the details of design and implementation of catch sampling schemes. The case studies should from a methodological point of view be of general interest, covering three different types of sampling schemes common in European fisheries, and should be well prepared prior to the workshop. The workshop should come up with suggestions for a robust design taking the logistic problems into account, and serving as guidelines for countries to set up similar programmes.</p> <p>The sampling programmes covered by the workshop should cover sampling on shore using area frames and access points (port/market sampling), and sampling fishing vessels at sea. Sampling on shore will include case studies taking into account the practical difficulties of accessing catches of different types of vessels and gears and the logistics of achieving representative sampling of widely dispersed access points that may have different types of fishing activities. Sampling at sea could include two sub-cases: (a) where the sample selections are from all vessels and trips in the frame (i.e., vessels/trips are the primary sampling units), versus (b) where only a fixed subset of vessels is selected from the frame in the first stage (i.e., vessels are primary sampling units), with trips or sets/hauls from each of these vessels being selected in the second stage (e.g., the Norwegian reference fleet). Case (b) impose a higher level of clustering than case (a) since all sampled trips are clustered within a fairly small sub-set of vessels in a</p>

<b>Priority:</b>	<b>Essential</b>
	<p>given year. The specific problems of sampling small-scale fisheries on shore and at sea (e.g. under-10m fleets) will be covered using suitable case studies.</p> <p>It is considered beneficial to collate the findings of the workshop (and previous workshops such as WKMERGE) into a reference book, as such a book with contemporary methodology and examples is presently missing from the fisheries literature. This book should describe how sampling schemes and associated estimators can be developed and implemented in practice for a wide range of typical fishery sampling scenarios. A book would help attract experts to the workshop which is crucial for a good outcome.</p> <p>To ensure an efficient and successful meeting, a number of participants will be asked to prepare detailed case studies as Working Documents.</p>
<b>Resource requirements:</b>	A participation of the world's leading expertise in the field of sampling statistics and design is crucial for guaranteeing a best possible outcome of the workshops. Travel and accommodation expenses need to be covered for these experts. A book will also require funding and the means for this need to be investigated.
<b>Participants:</b>	<p>Participants will include the regional experts involved in the case studies, invited experts on sampling statistics and design, and a cross section of end-users including stock assessment scientists and statisticians.</p> <p>Participants should announce their intention to participate on the workshop no later than 2 months before the meeting. More detailed information about data requirements will be given by the chairs.</p>
<b>Secretariat facilities:</b>	
<b>Financial:</b>	<p>Travel costs will be eligible for participants from Member States of the European Union through the EU Data Collection Framework. The outcome of these workshops is meant to establish a scientific sound basis for an improved and coordinated catch sampling design within the ICES area. Since this will have an influence on the current catch sampling programs, i.e., the EU-DCF and non-EU national sampling programs, an extra funding to bring invited experts to the meeting will be applied for through the EU and national institutes/programs.</p> <p>Application for financial support will also be sent to EFARO (The European Fisheries and Aquaculture Research Organisation; an association composed of the Directors of the main European Research Institutes involved in Fisheries and Aquaculture research; <a href="http://www.efaro.eu">www.efaro.eu</a>).</p>
<b>Linkages to advisory committees:</b>	ACOM
<b>Linkages to other committees or groups:</b>	Expert WGs
<b>Linkages to other organizations:</b>	NEAFC, JNRFC

**Workshop on the utility of commercial CPUE and VMS data in assessments  
[WKCPUEFFORT]**

**The Workshop on the utility of commercial CPUE and VMS data in assessments  
[WKCPUEFFORT]** (Chair: To be announced) will be established and take place in  
...2011, to:

- a) Develop guidelines on the types of data and information that need to be supplied, and the relevant factors that need to be taken into account, in order to maximize the utility of commercial CPUE and VMS data as inputs to assessment models
- b) Methods to adjust for technology creeping.
- c) Develop guidelines for when to use commercial fleet data for determining fishing mortality or tracking stock abundance
- d) Define necessary criteria and suggest estimation methods to derive proper and standardized time series of effort to be used for determining fishing mortalities in stock assessments taking all new electronic opportunities into account (e.g. VMS, electronic logbooks, automatic electronic monitoring)

WKCPUEFFORT will report by ..... for attention of PGCCDBS, RCMs, STECF/SGRN; ACOM

**Supporting information:**

<b>Priority:</b>	<b>Essential</b>
<b>Scientific justification:</b>	<p>The WKROUND has at its meeting in 2009 stated that currently standardised research survey cruises are the method of choice for tuning stock assessment models and this approach is hence used in the North Sea. In the Baltic and Kattegat cod stock assessments a combination of commercial fleets and research surveys are used for tuning. However, research surveys have better spatial coverage and attempt to ensure that catchability is constant from year to year. Commercial fleets tend to have higher catches of larger fish, but suffer from poor spatial coverage, difficult to estimate technology-creep, improvements in catchability, difficulties in standardising gear types and cross-correlation issues.</p> <p>This Workshop is essential to develop guidelines on the types of data and information that need to be supplied, and the relevant factors that need to be taken into account, in order to provide reference criteria and maximize the utility of commercial CPUE and VMS data as inputs to assessment models, or as ancillary information to evaluate the credibility of assessment results.</p> <p>The proposed ICES workshop is required to ensure the quality of commercial CPUE and VMS data as inputs to assessment models.</p> <p>To ensure an efficient and successful meeting, participants will be asked to prepare material for the meeting. More detailed information about data requirements will be given by the chair.</p>
<b>Resource requirements:</b>	
<b>Participants:</b>	Should include a cross section of end-users including stock assessment scientists; STECF; Commission, and statisticians. To understand the fishing behaviour behind commercial fleet data, and to improve transparency with the industry,

<b>Priority:</b>	<b>Essential</b>
	input from fishing industry representatives, including active participation is required for such a workshop to be successful. Participants should announce their intention to participate on the workshop no later than 2 months before the workshop.
<b>Secretariat facilities:</b>	
<b>Financial:</b>	Travel costs will be eligible for participants from Member States of the European Union through the EU Data Collection Framework.
<b>Linkages to advisory committees:</b>	ACOM
<b>Linkages to other committees or groups:</b>	Expert WGs
<b>Linkages to other organizations:</b>	

## Age determination

### Workshop on Age Reading of Greenland Halibut [WKARGH] (already approved by ACOM in 2009)

2009/2/ACOM44 The **Workshop on Age Reading of Greenland Halibut [WKARGH]** (Chairs: Ole Thomas Albert, Norway, and Karen Dwyer, Canada), will be established and take place in Vigo, Spain, 14–17 February 2011, to:

- a) Review information on age estimations, otolith exchanges, workshops and validation work done so far.
- b) Evaluate all available information on individual growth patterns in order to achieve a general consensus about the most probable levels of longevity and growth rates for the different stocks.
- c) Report on progress in studies of otolith growth axes based on samples from Greenland halibut injected with OTC or similar substances that makes a mark in the ageing structure.
- d) Report on progress of the compilation of biometrics data of Greenland halibut otoliths from all areas where such information has been collected and analysed.
- e) To revise the age estimation procedures and explore the possibilities to use supplementary information to verify estimated ages, this include: Otolith weight and/or morphometry, as well as Length distribution in surveys and catches.
- f) Exploring mathematical methods for estimating age composition of Greenland halibut catches to be used by ICES WG.
- g) To join international experts on growth, age estimation and assessment in order to progress towards a recommended procedure for future age determination of Greenland halibut.
- h) Based on results, conclusions and recommendations from this workshop to initiate and design an international exchange of otoliths for age reading after the workshop.
- i) Address the generic ToRs adopted for workshops on age calibration (see ['PGCCDBS Guidelines for Workshops on Age Calibration'](#))

WKARGH will report by 15 March 2011 for attention to ACOM.

### Supporting information:

<b>Priority:</b>	Essential. Age determination is an essential feature in fish stock assessment to estimate the rates of mortalities and growth. Assessment of Greenland halibut stocks using age structured models has proved useful in establishing a diagnosis on stock status. However, the approach has several limitations and shortcomings such as stock structure, natural mortality and growth. Age data is provided by different countries and are estimated using international ageing criteria which have not been validated. Therefore, a WK should be carried out in order to evaluate available information on otolith growth patterns, age determination issues and the current situation of age estimation of Greenland halibut which has been subject of concern of ICES AFWG and NWWG and make progress towards a solution.
<b>Scientific justification:</b>	Recently, several publications suggest that what is at present the most commonly used age interpretation method for Greenland halibut severely

	<p>underestimates age of older specimens. The last workshop (St. Johns, 2006) demonstrated that there was no agreement or understanding of the underlying growth patterns of this species. Since then several institutions have conducted tagging programs, ageing structure comparisons, and other work in order to validate seasonal zones in otoliths.</p> <p>Since stock assessments are severely hampered by this lack of clarification, it is appropriate to arrange a workshop where the results of these investigations can be presented and discussed.</p> <p>For the purpose of inter-calibration between ageing labs an appropriate exchange programme will be carried out after the workshop in 2011. This will include a set of otoliths (images) collected partially from tagging material and from previous Wks.</p> <p>The aim of the workshop is to identify the state of art of age estimation after validation studies conducted so far.</p>
<b>Resource requirements:</b>	Before starting the exchange programme, the scientific institutions should make a concerted effort to compile the existing tagging material (digital otolith images) that can be used as a reference collection.
<b>Participants::</b>	In view of its relevance to the DCF, ICES NWWG and AFWG, and NAFO, the Workshop should try to include international experts on growth, age estimation and assessment in order to progress towards a solution. Participants should inform ICES secretariat and chairs no later than 1 November 2010 on their intention to attend the WKARGH.
<b>Secretariat facilities:</b>	
<b>Financial:</b>	None
<b>Linkages to advisory committee:</b>	ACOM
<b>Linkages to other committees or groups:</b>	PGCCDBS, NWWG, AFWG and NAFO
<b>Linkages to other organizations cost:</b>	There is a direct link with the EU

### Study Group on Salmon Age Determination [SGSAD]

The **Study Group on Salmon Age Determination [SGSAD]** (Chair to be announced) will meet in early 2011 to:

- a) evaluate the status of examination of thin slice from salmon pelvic fin ray;
- b) evaluate the possibility to differentiate real spawning marks from other erosion marks;
- c) evaluate the status of the preparation of a description of salmon life cycle (ref. blue book of IBSFC);
- d) evaluate the status of the investigations on possibilities to assess post smolt survival rate on the basis of scale growth pattern;
- e) evaluate the possibilities to use the number and width of striae as an aid in the interpretation of difficult scales; and
- f) evaluate the experiences from the use of strontium-calcium relationship in the research on e.g. early emigration behaviour of fry.
- g) develop an age reading protocol for salmon
- h) Address the generic ToRs adopted for workshops on age calibration (see ['PGCCDBS Guidelines for Workshops on Age Calibration'](#))

SGSAD will report by 1 June 2011 (depending on the date of SGSAD meeting) for the attention of WGBAST, WGRECORDS and SSGEF.

#### Supporting Information:

<b>Priority:</b>	<p>The highest priority of SGSAD is to increase and maintain a high level of reliability in age determination of salmon as a basis for the stock assessment and other research concerning salmon. This is integral to the ability of institutes to support the delivery of ageing data under the DCF.</p> <p>The scope of the SGSAD should be widened from the Baltic Sea to also include the Atlantic side.</p> <p>It is important for the management of salmon that the development and mortality of year-classes can be followed through the life cycle, independent of how long time the fish stays in freshwater and how many winters at sea. The Study Group should therefore start the development of an age reading protocol for salmon.</p>
<b>Scientific justification:</b>	<p>In age determination of fish, quality assurance is vital to ensuring the reliability of age determinations. With the Baltic populations of salmon, cooperation of age readers from different countries and laboratories can be used as a means to improve and validate the age determinations and to maintain high quality and repeatability.</p> <p>In addition to age determination, SGSAD contributes to the use of scientific methods that utilize calcified structures e.g. scale, otoliths and fin rays.</p> <p>Stock assessment of salmon and investigations into marine mortality will also be linked to the work of SGSAD.</p>
<b>Resource requirements:</b>	None
<b>Participants:</b>	<p>The Group is normally attended by some 10–20 members and guests. Participants should announce their intention to participate in the study group no later than 2 months before the meeting starts.</p>
<b>Secretariat facilities:</b>	None.
<b>Financial:</b>	BSRP has supported the work of SGSAD by funding travelling expenses of the participants from countries under the BSRP.



<b>Linkages to advisory committees:</b>	Direct linkages to ACOM in terms of provision of advice and accurate stock assessment.
<b>Linkages to other committees or groups:</b>	There are linkages with WGBAST and WGNAS in relation to the use of age data in salmon stock assessments and with SCICOM and TGRECORDS in relation to improving scientific understanding of salmon and co-ordinating science on diadromous species.
<b>Linkages to other organizations:</b>	Links to ongoing initiatives within NASCO, particularly in relation to marine survival investigations.

### Workshop on Age Reading of European and American Eel [WKAREA-2]

The **Workshop on Age Reading of European and American Eel [WKAREA-2]** (Chair: Françoise Daverat, France) will exchange information by correspondence in 2010 and meet in Bordeaux, France in March 2011:

- a) to exchange samples (>100 per species) of European and American eel otolith pictures, including known age eels, with samples prepared using different protocols and representing a range of eel subpopulations, and environment types encountered in both species range;
- b) to apply the age estimation criteria defined during the previous meeting in an inter-calibration process involving the exchanged images and a significant number of readers (>20);
- c) to analyse readings and interpret the results of the inter-calibration of European and American eel age reading;
- d) to make recommendations and feed back on the age estimation criteria to increase age estimation precision and accuracy and improve the inter reader agreement; and
- e) to incorporate the findings with the report and manual developed by WKAREA 2009 for formal publication.
- f) Address the generic ToRs adopted for workshops on age calibration (see ['PGCCDBS Guidelines for Workshops on Age Calibration'](#))

WKAREA-2 will report by 1 May 2011 for the attention of WGRECORDS, WGEEL, SGEF and PGCCDBS.

#### Supporting Information:

<b>Priority:</b>	The work of the Group is essential if ICES is to be appropriately placed to advise on the development of recovery plans for eels. This is integral to the ability of institutes to support the delivery of ageing data under the DCF.
<b>Scientific justification:</b>	European and American eel stocks are currently in a severely depleted state. ICES has proposed that biological reference points for eels could be derived from spawner-per-recruit (SPR) analysis and the EU Regulation for the Recovery of the Eel Stock requires biomass estimates of current silver eel escapement. For this approach to provide meaningful results at the local and stock (species) scale, biologists need to estimate eel age with precision. The previous meeting (WKAREA) setup a process for otolith preparation, image exchange, established age estimation criteria for European and American eel and printed a manual of eel age determination and images. A small scale age intercalibration was conducted during the meeting based on known age eel samples. This exercise pointed out the need for a larger scale age intercalibration reading in order to apply the newly established age estimation criteria, and to measure the accuracy and precision of readers.
<b>Resource requirements:</b>	No specific resource requirements beyond the need for members to prepare for and participate in the meeting.
<b>Participants:</b>	Members of WGEEL and invited experts from areas of the North Atlantic and elsewhere with eel populations. Participants should announce their intention to participate in the workshop no later than 2 months before the meeting starts.
<b>Secretariat facilities:</b>	No additional software/hardware is anticipated beyond that which is currently available.
<b>Financial:</b>	Covering the expenses of travel & meetings would be appropriate
<b>Linkages to advisory</b>	Links to ACOM relate to the development of appropriate assessment methods for eel.

<b>committees:</b>	
<b>Linkages to other committees or groups:</b>	WGEEL, WGRECORDS, SCICOM , other Working Groups on inshore fisheries, Canadian Eel Science Working Group, U.S. Atlantic States Marine Fisheries Commission Eel Technical Committee
<b>Linkages to other organizations:</b>	EU FP7 EELIAD, European Union Recovery Plans

### Workshop of National Age Readings Coordinators [WKNARC]

The **Workshop of National Age Readings Coordinators [WKNARC]** (Co-Chairs: Kelig Mahe and Willie McCurdy) will be established and take place in Boulogne-sur-Mer (IFREMER) France, in September-October 2011 to:

- a) Review preparation methods by species and areas,
- b) Review material and techniques development,
- c) Review methods in images processing,
- d) Review of the validation methods,
- e) Review possibility of sending otoliths to central labs for processing age reading,
- f) Review tools for the exchanges and workshops (WebGR, PGCCDBS Guidelines for Otolith Exchanges, age readers forum),
- g) Collate information on the quality status of age reading at MS institutes,
- h) The workshop will be preceded by a questionnaire to obtain information on the status of ToRs a, b, c, d, e and g at MS institutes,
- i) Address the generic ToRs adopted for workshops on age calibration (see ['PGCCDBS Guidelines for Workshops on Age Calibration'](#))

WKNARC will report by October 2011 for attention of ACOM.

### Supporting Information:

<b>Priority:</b>	Essential.
<b>Scientific justification:</b>	<p>Age determination is an essential feature in fish stock assessment to estimate the rates of mortalities and growth. Assessment of species/stocks using age structured models has proved useful in establishing a diagnosis on stock status. However, the approach has several limitations and shortcomings such as stock structure, natural mortality and growth. Age data is provided by different countries and are estimated using international ageing criteria which have not been validated.</p> <p>For the purpose of inter-calibration between ageing labs WKNARC will review preparation methods by species and areas, material and techniques development, methods in images processing, and the validation methods.</p> <p>WKNARC will review tools for the exchanges and workshops (WegGR, PGCCDBS Guidelines for Otolith Exchanges) and will take into account, the recommendations of the EFAN, TACADAR final reports and the report of the EFARO meeting Brest, 2-4 December 2004 (How can otolith research contribute at improving fisheries sciences?), with the purpose of inter-calibration age readers involved in stock assessment.</p> <p>WKNARC will collate information on the quality status of age reading at MS institutes.</p> <p>The aim of the workshop is to identify the current ageing problems between readers from both stocks through a reference collection. To identify the state of art of age estimation after validation studies conducted so far.</p>
<b>Resource requirements :</b>	The workshop will be preceded by a questionnaire to obtain information on the status of ToRs a, b, c, d, e and g at MS institutes.
<b>Participants:</b>	National age reading co-ordinators of MS. Participants should announce their intention to participate in the workshop no later than 2 months before the meeting starts.
<b>Secretariat facilities:</b>	

<b>Priority:</b>	Essential.
<b>Financial:</b>	
<b>Linkages to advisory committee:</b>	ACOM
<b>Linkages to other committees or groups:</b>	PGCCDBS, ACOM
<b>Linkages to other organizations cost:</b>	There is a direct link with the EU DCF There is a link to PGMED
<b>Secretariat marginal cost share:</b>	

### Workshop on Age Reading of European Atlantic Sardine [WKARAS]

A Workshop on Age reading of European Atlantic Sardine [WKARAS] (Co-Chairs: Alexandra Silva and Eduardo Soares, Portugal, Isabel Riveiro, Spain) will be established and take place in Lisbon, Portugal, 14–18 February 2011, to:

- a) Estimate (relative) accuracy and precision of sardine age determination in the main fishing areas of the European Atlantic region;
- b) Identify causes of age determination error and provide specific guidelines for the improvement of precision and reduction of bias between readers and laboratories;
- c) Review age reading conventions and criteria (e.g. related to assumptions of birth date and seasonality of the otolith edge) and update the age reading protocol.
- d) Create a reference collection of otoliths and start the development of a data base of otolith images from each fishing area;
- e) Address the generic ToRs adopted for workshops on age calibration (see ['PGCCDBS Guidelines for Workshops on Age Calibration'](#))

WKARAS will report by 1 March 2011 for the attention of PGCCDBS and ACOM

### Supporting Information

<b>Priority:</b>	A benchmark assessment has been proposed for 2012, thus it is essential to update information on the quality of age determination for sardine assessment. A workshop in 2011 is timely to provide results for the benchmark. The last age determination workshop took place in 2005. Some of the age readers have changed since then. It is also essential to standardize age reading procedures and criteria between the VIIIc-IXa stock area and VIIIa,b (and further north) areas. Fisheries have increased in the latter areas and advice may be required in the future for sardine in those areas.
<b>Scientific justification:</b>	The aim of the workshop is to identify the present problems in sardine age determination, improve the accuracy and precision of age determinations and revise age reading conventions and criteria. Web tools developed to support the organization and data analysis of calibration workshops (e.g. WebGR), will be explored. An otolith exchange will start in 2010 and at the workshop, in 2011, results from the otoliths circulation will be presented and discussed.
<b>Resource requirements:</b>	No specific resource requirements beyond the need for members to prepare for and participate in the meeting.
<b>Participants:</b>	These would include scientists and technicians working in sardine age determination, growth and stock assessment. Participation is sought from laboratories that provide age data for sardine assessment within ICES. Expert in growth studies from an EU MS. Participants should announce their intention to participate in the workshop no later than 2 months before the meeting starts.
<b>Secretariat facilities:</b>	
<b>Financial:</b>	None
<b>Linkages to advisory committees:</b>	ACOM
<b>Linkages to other committees or groups:</b>	The results of this group are of interest to WGANSA and WGACEGG.
<b>Linkages to other organizations:</b>	There is a direct link with the EU DCF and outcomes from this Workshop will be of interest to several RFOs

## Maturity staging

### Workshop on Sexual Maturity Staging of Herring and Sprat [WKMSHS] (already approved by ACOM)

2009/2/ACOM49 A Workshop on Sexual Maturity Staging of Herring and Sprat [WKMSHS] (Chairs: Jonna Tomkiewicz\*, Denmark and Gerd Kraus\*, Germany) will be established and take place in Copenhagen, Denmark, end of February or June 2011 to:

- a) propose standardised maturity scales for Herring and Sprat for common use among laboratories including a comparison of existing scales and identification of reliable maturity determination criteria for females and males.
- b) reduce sources of error on maturity determination through validation of macroscopic maturity criteria using e.g. histological analysis and light microscopy.
- c) establish correspondence between old and new scales to convert presently applied maturity scales and interpret former time series.
- d) propose optimal sampling strategies and sampling times for accurate classification of maturity and.
- e) define procedures to estimate spawning frequency for sprat for use in the daily egg production method (DEPM).
- f) address the generic ToRs adopted for maturity staging workshops (see ['PGCCDBS Guidelines for Workshops on Maturity Staging'](#))

WKMSHS will report by xx 2011 for the attention of ACOM.

### Supporting Information:

<b>Priority:</b>	Essential. Age/size at sexual maturity is a biological parameter used in the calculation of maturity ogives and subsequently of the Spawning Stock Biomass (SSB), while gonadal maturity status is important for the definition of the spawning season of a species, for the monitoring of long-term changes in the spawning cycle, and other research issues focusing on the reproduction biology of fish.
<b>Scientific justification:</b>	<p>Laboratories involved in collection maturity data for the various stock assessment purposes are using different macroscopic maturity scales for the same species. Even those that use the same scale, may focus on slightly different aspects. This may lead to bias of data used in fisheries stock assessment models and other studies on reproduction biology. Therefore, this workshop has the objective to define objective criteria to classify the maturity status and propose reliable common scales to be used by all laboratoires involved with the assessment of herring and sprat in ICES areas.</p> <p>The expectation of TOR a) is to develop a standardised scales and criteria for maturity determination of herring and sprat to be used by all relevant labs. TOR c) is requested to validate the macroscopic maturity stage using histological analysis and light microscopy, with emphasis on developmental stages that are often incorrectly classified (e.g. resting). TOR c) should be addressed to assess the effects of converting historical maturity series to the new standardised maturity scale. TOR d) should consider the ecology of the species, existent surveys, opportunities to include commercial sampling and other considerations to define and recommend the optimal sampling strategy to estimate accurate maturity. Finally, TOR e) should for sprat define procedures to estimate spawning frequency as required for the application of the DEPM that may be successfully applied to sprat as an alternative to catch based stock assessments.</p>

<b>Resource requirements:</b>	<p>Before the Workshop the organising institutes will elaborate a sampling plan to obtain samples for to be application in the workshop. The sampling will be carried out during from August 2009 through July 2010.</p> <p>Guidelines on how to prepare the Workshop, as well for collecting maturity data and histological analysis for the Workshop have been prepared and available in the PGCCDBS 2009 report (Annex 12)</p>
<b>Participants:</b>	In view of its relevance to the DCF, the Workshop is expected to attract wide interest from ICES Member States that participate in biological sampling of Herring and Sprat.
<b>Secretariat facilities:</b>	
<b>Financial:</b>	None
<b>Linkages to advisory committee:</b>	ACOM
<b>Linkages to other committees or groups:</b>	This workshop is proposed by PGCCDBS. Outcomes from this Workshop will be of interest to all Working and Study Groups related to Herring and Sprat stock assesemnt, namely HAWG, WGWIDE and WGBFAS, as well as to survey groups (PGIPS, PGNAPES, WGBIFS).
<b>Linkages to other organizations:</b>	There is a direct link with the EU DCF.



### **Workshop on Sexual Maturity Staging of Cod, Whiting, Haddock, Saithe and other gadoids [WKMSGAD]**

A **Workshop on Sexual Maturity Staging of Cod, Whiting, Haddock, Saithe and other gadoids [WKMSGAD]** (Chair: Jonna Tomkiewicz, Denmark, and Francesca Vitale, Sweden) will be established and take place in Copenhagen, Denmark, in November 2011 to:

- a) Report on the use of the 2007 proposed common 6 stages scale;
- b) Validate macroscopic maturity determination with histological analysis.
- c) Evaluate staging of Cod, Whiting, Haddock and Saithe using pictures and fresh samples respectively before and during the WK with histology and light microscopy as ground truthing for determination of staging error.
- d) Enhance the macroscopic and microscopic description of the characteristics of the stages of the 2007 scale;
- e) Finalize the illustrated manuals initiated in 2007 for the 4 species.
- f) Develop a training program for scientists and technicians sampling gadoids.
- g) Investigate material from pilot sampling of Pollack and Blue Whiting
- h) address the generic ToRs adopted for maturity staging workshops (see ['PGCCDBS Guidelines for Workshops on Maturity Staging](#)

WKMSGAD will report to ACFM, RMC and PGCCDBS by 1 March 2012.

#### **Supporting Information:**

<b>Priority:</b>	The maturity stage is an important biological parameter to be used in the calculation of maturity ogives and the proportion spawning (and therefore of Spawning Stock Biomass), for the definition of the spawning season of a species, for the monitoring of long-term changes in the spawning cycle, and for many other research needs regarding the biology of fish.
<b>Scientific justification:</b>	<p>During the 2007 workshop (WKMSCWHS), a common maturity scale with objective histologically validated criteria was proposed for Cod, Whiting, Haddock and Saithe. Laboratories involved in collecting maturity data agreed to use the common scale for reporting.</p> <p>This workshop has the objective to report on the use of the 2007 proposed scale and to evaluate and improve the consistency in maturity staging among laboratories.</p> <p>The expectation of</p> <p>TOR a) is an evaluation of the use and usefulness of the 2007 maturity scales.</p> <p>TOR b) is validation of criteria and descriptions to the classify maturity stages used in the 2007 scales and determination of the maturity stage of samples collected by participants.</p> <p>TOR c) is histological ground thruthing of stage determination of samples and estimation of the effect of training and discussion during the workshop on the accuracy of maturity determinations. Staging of fresh gonads will be validated histologically after the workshop.</p> <p>TOR d) is the identification of critical stages and improvement of the description of the characteristics of these stage using input from TOR b and c.</p> <p>TOR e) is the publication of the four species-specific illustrated manuals that were initiated in 2007.</p> <p>TOR f) is an improvement of maturity determination on a broad scale using the experience of the participants locally in laboratories.</p>

	<p>TOR g) is an evaluation of need of a workshop for Pollack and Blue Whiting maturity staging based on a pilot study.</p> <p>It is recommended that the Workshop be organised in November 2011. Participating institutes will be able to test the new scale, collect and analyse samples during 2010 and 2011.</p>
<b>Resource requirements:</b>	<p>Before the Workshop, the organising institute will setup a sampling plan for collecting samples for to be used during workshop. The sampling will be carried out during 2010 and 2011.</p> <p>For all species, the sampling parameters are: total length; gonad visual inspection - maturity stage by a standard maturity scale and the usual maturity scale used by the institute; total weight; gonad weight; liver weight; gutted weight; gonad photo; age; histological maturity stage; photos of histological microscopy.</p> <p>This workshop will be based on the analysis of both digital photos of gonads, examination of fresh gonads and histological validation. Selected laboratories will conduct the histology. Without this ground truthing verification, comparison of maturity data is hypothetical. Facilities suitable to examine fresh biological material should be available during the workshop. It would be useful also to have availability of space on a web server for storage and easy access to the photos collected by the participants before the workshop.</p>
<b>Participants:</b>	In view of its relevance to the DCF, the Workshop is expected to attract wide interest from ICES Member States that participate in biological sampling of gadoids.
<b>Secretariat facilities:</b>	
<b>Financial:</b>	<p>To ensure wide attendance of relevant experts and to fulfill the aim to obtain all biological data before the Workshop including sampling and histological processing of gonads, funding will be required, preferably through the EU, e.g. by making attendance to the Workshop eligible under the DCF.</p> <p>Purchase of fresh ungutted fish and the following histological analyses.</p>
<b>Linkages to advisory committees:</b>	
<b>Linkages to other committees or groups:</b>	This workshop is proposed by PGCCDBS. Outcomes from this Workshop will be of interest to all Expert Groups related to Cod, Whiting, Haddock and Saithe, inter alia WGNSSK, WGBFAS, WGCSE , WGBIFS, IBTSWG.
<b>Linkages to other organizations:</b>	There is in direct link with the EU DCF.

## Workshop on sexual maturity staging of sole, plaice, dab and flounder [WKMSSPDF2]

The **Workshop on sexual maturity staging of sole, plaice, dab and flounder [WKMSSPDF2]** (Chairs: Ingeborg de Boois and Cindy van Damme, The Netherlands) will meet in Oostende, Belgium, 9-13 January 2012 to:

- a) Report on the use of the common maturity scale proposed in 2010;
- b) Check the description of the characteristics of the stages of the 2010 scale;
- c) Calibrate staging of sole, plaice, dab and flounder using fresh fish, following the pattern of trial-discussion-retrial;
- d) Calibrate staging of sole, plaice, dab and flounder using photographs, following the pattern of trial-discussion-retrial;
- e) Validate macroscopic maturity determination with histological analysis.
- f) address the generic ToRs adopted for maturity staging workshops (see ['PGCCDBS Guidelines for Workshops on Maturity Staging](#)

WKMSSPDF2 will report by February 2012 for the attention of ACOM and PGCCDBS.

### Supporting Information:

<b>Priority:</b>	The maturity stage is an important biological parameter to be used in the calculation of maturity ogives (and therefore of Spawning Stock Biomass), for the definition of the spawning season of a species, for the monitoring of long-term changes in the spawning cycle, and for many other research needs regarding the biology of fish.
<b>Scientific justification:</b>	<p>During the 2010 workshop a common maturity scale with objective common criteria was proposed for sole, plaice, dab and flounder. Laboratories involved in collection maturity data agreed to use the common scale for reporting.</p> <p>This workshop has the objective to report on the use of the 2010 proposed scale and to calibrate maturity staging between the different laboratories involved in staging.</p> <p>The expectation of TOR a) has the goal of measuring the usefulness of the new 2010 maturity scales.</p> <p>TOR b) to validate the criteria and descriptions to classify maturity stages of the new 2010 scales.</p> <p>TOR c and d) calibrate maturity staging between the different laboratories.</p> <p>TOR e) validate with histological analysis the macroscopic maturity stage, mainly the resting stages that are incorrectly classified as immature.</p> <p>It is recommended that the Workshop be organised in January 2012.</p> <p>Participating institutes will be able to test the new scale and collect samples during 2010 and 2011.</p>
<b>Resource requirements:</b>	<p>Before the Workshop the chairs will setup a sampling plan for collecting samples for to be used during workshop. The sampling will be carried out during 2010-11.</p> <p>For all species, the sampling parameters are: total length; gonad visual inspection - maturity stage by the new common maturity scale; total weight; gonad weight; liver weight; gutted weight; gonad photo; age; histological maturity stage; microscopic preparation photo.</p> <p>This workshop will be based on the analysis of both digital photos of gonads and fresh gonads. Therefore facilities suitable to examine fresh biological material must be available during the workshop. It would be necessary to have a web server for storage and easy access to the photos collected by the participants</p>

	before the workshop.
<b>Participants:</b>	In view of its relevance to the DCF, the Workshop is expected to attract wide interest from ICES Member States that participate in biological sampling of sole, plaice, dab and flounder.
<b>Secretariat facilities:</b>	
<b>Financial:</b>	To obtain all biological data before the Workshop, funding is needed for buying fresh ungutted fish, to estimate age and to process gonads histology. To ensure wide attendance of relevant experts, additional funding will be required, preferably through the EU, e.g. by making attendance to the Workshop eligible under the DCF.
<b>Linkages to advisory committees:</b>	ACOM
<b>Linkages to other committees or groups:</b>	This workshop is proposed by PGCCDBS. Outcomes from this Workshop will be of interest to all Working and Study Groups related to sole, plaice, dab and flounder, namely WGNSSK, WGBFAS, WGSSDS and WGNSDS, as well as to survey groups like the IBTSWG and WGBEAM.
<b>Linkages to other organizations:</b>	There is a direct link with the EU DCF.

**Workshop on Sexual Maturity Staging of Turbot and Brill [WKMSTB]**

A Workshop on Sexual Maturity Staging of Turbot and Brill [WKMSTB] (Chairs: Ingeborg de Boois and Cindy van Damme, The Netherlands) will be established and take place in IJmuiden, The Netherlands, 5-9 March 2012 to:

- a) agree on a common maturity scale for turbot (*Psetta maxima*) and brill (*Scophthalmus rhombus*) across laboratories comprising a comparison of existing scales and standardization of maturity determination criteria
- b) reduce sources of error on maturity determination validating macroscopic staging,
- c) establish correspondence between old and new scales to convert time series
- d) propose optimal sampling strategy to estimate accurate maturity ogives.
- e) address the generic ToRs adopted for maturity staging workshops (see ['PGCCDBS Guidelines for Workshops on Maturity Staging'](#))

WKMSTB will report by XX 2012 for the attention of ACOM.

**Supporting Information:**

<p><b>Priority:</b></p>	<p>Both turbot and brill have wide distribution areas (see below) and high commercial values. At this point, the EU requests advice on these species (both are MoU species that are subject of research in WGNEW and for which available data have also been assembled and analysed in the EU project NESPMAN), but current quota and management are based on historical trends in landing series only. Additionally, there are no species-specific quota for these species, but combined ones for both of them together.</p> <p>The maturity stage is an important biological parameter to be used in the calculation of maturity ogives (and therefore of Spawning Stock Biomass), for the definition of the spawning season of a species, for the monitoring of long-term changes in the spawning cycle, and for many other research needs regarding the biology of fish.</p> <p>These two species have a wide distribution:</p> <p>Turbot: Baltic Sea, from the Northeast Atlantic (European coasts from Arctic Circle to Morocco + south of Iceland) and throughout the Mediterranean. The population in the Black Sea is mostly regarded as a separate subspecies (<i>P. m. meioticus</i>).</p> <p>Brill: Basically the same as turbot, but not as far north along the Norwegian coast and far less numerous in the Mediterranean and Black Seas.</p>
<p><b>Scientific justification:</b></p>	<p>Laboratories involved in the collection of maturity data for the various assessment WG's use different macroscopic maturity scales for the same species. Even when a common scale is used, slightly different criteria to classify the maturity stages allows for a subjective interpretation. This may lead to a bias in the data that may be used in stock assessment models, or in other types of analyses. Therefore, this workshop aims at reaching an agreement on a common maturity scale to be used, but also to define objective criteria to classify the separate stages of that scale. Therefore, a common scale for maturity staging, with a common set of criteria to classify each stage, is to be developed for implementation in all labs.</p> <p>Addressing ToR b) should lead to a validation of the macroscopic maturity stage with histological analysis, mainly for stages that are normally incorrectly classified (as the 'resting' stage). ToR c) should be addressed to assess, and if possible to correct, the impact on historical maturity series of the new agreed maturity scale. ToR d) should consider the ecology of the species, existing surveys, commercial sampling capacity and other considerations to define and</p>

	recommend the optimal sampling strategy to estimate accurate maturity ogives.
<b>Resource requirements:</b>	Before the Workshop, the organising institute will set up a sampling plan for assembling (and collecting, if needed) samples for to be used during the workshop. The Additional sampling will be carried out during 2011. Guidelines on how to prepare the Workshop, as well for collecting maturity data and histological analysis for the Workshop have been updated and are available in the PGCCDBS 2010 report (Annexes 12 and 13).
<b>Participants:</b>	In view of its relevance to the DCF, the Workshop is expected to attract wide interest from ICES Member States that participate in biological sampling of turbot and brill.
<b>Secretariat facilities:</b>	
<b>Financial:</b>	None
<b>Linkages to advisory committee:</b>	ACOM
<b>Linkages to other committees or groups:</b>	This workshop is proposed by PGCCDBS. Outcomes from this Workshop will be of interest to all Working and Study Groups related to turbot and brill, namely WGNEW.
<b>Linkages to other organizations:</b>	There is a direct link with the EU DCF.

## Annex 16: Recommendations

Report section	Recommendation	For follow up by	Timeframe
2	PGCCDBS recommends that those involved in future age calibration exchanges and workshops should adhere to the guidelines for both exchanges and workshops as outlined by the PG in its 2008 report.	Chairs of age reading WKS and co-ordinators of otolith exchanges.	From now on.
3.1	PGCCDBS recommends that RCMs provide an overview of data collection and availability for protected species.	RCMs	April/May 2010
3.1	PGCCDBS recommends that ICES Secretariat provides a list of stocks to WGDEEP and relevant RCMs so that RCMs can provide an overview of deep-sea fisheries data available.	ICES Secretariat, RCMs	April/May 2010
3.1	PGCCDBS recommends that data on discards, length distributions of landings and ALKs for megrim in Div. VIIIc/IXa, with indicators of quality, should be provided by Portugal to WGHMM.	RCM North Atlantic	April 2010
3.1	PGCCDBS recommends that an internationally coordinated project to obtain basic biological data for <i>Nephrops</i> from the various FUs should be instigated. Data to include growth, natural mortality, burrow occupancy and size of animal in relation to burrow size.	ICES SGNEPS	Nov. 2010
3.1	PGCCDBS recommends that WGSAM, in conjunction with IBTSWG and WGBIFS formulate a common proposal to address multispecies interactions in the North Sea and Baltic Sea. A new international coordinated stomach sampling program is recommended both in the North Sea and the Baltic Sea to track changes in the food web, to be used for estimation of predation mortalities and to facilitate an ecosystem approach to management.	WGSAM, IBTSWG, WGBIFS	Oct. 2010, March 2010/2011
3.1	PGCCDBS recommends that ICES further collaborates with the fishing industry to provide a stock-by-stock list of data requirements that can be incorporated into national data collection programmes, considering the the outcomes of WKUFS and WKSC.	MIRAC	January 2011
3.1	PGCCDBS recommends that the documentation of discarding of deep-waters sharks should be improved by developing or intensifying collaborative projects with the fishing industry, including self-sampling and collection of samples for lab analysis. Consideration should be given to the outcomes of	MIRAC	January 2011

Report section	Recommendation	For follow up by	Timeframe
	WKUFS and WKSC.		
3.1	PGCCDBS recommends that WGEF formulates a proposal for a small-scale study to: a) improve logbook recordings by species ID keys and by revision of legal requirements, and b) establish species ID methods by genetics etc., in order to improve species ID for the Centrophoridae family, particularly those occurring in the NE Atlantic (e.g. <i>C. granulosus</i> , <i>C. lusitanicus</i> ).	WGEF	June 2010
3.1	PGCCDBS recommends that WGEF formulates a proposal for a small-scale study on stock structure of deep-water sharks that should be considered in conjunction with the proposed workshop on age reading (WKARDS 2012, see Annex 15).	WGEF	June 2010
3.1	PGCCDBS recommends that the ICES Secretariat contacts the Chair of WKMSEL to ensure that the following issues are addressed in their ToRs: 1) address reproductive strategy of the deep-water squalid sharks <i>Centrophorus squamosus</i> and <i>Centroscymnus coelolepis</i> , 2) adopt standard maturity scale and calibrate the staging criteria between labs, 3) consequently, consider a workshop for standardization of criteria used to assign maturity stages between labs as well as on sampling protocols to guarantee adequate levels of precision.	ICES Secretariat, WKMSEL	until October 2010
3.1	PGCCDBS recommends that WGDEEP prepares illustrated definitions on length measurement procedures for roundnose grenadier and distribute these through RCMs.	WGDEEP, RCMs	April/May 2010/2011
4.2.2.8	PGCCDBS recommends the use of the Age Reader Forum (see section 4.2.4) in tandem with the WebGR tool (see section 4.4.3) for otolith exchanges and age reading workshops.	Co-ordinators of otolith exchanges, Age reading WK Chairs	From now on
4.2.3	PGCCDBS recommends stronger collaboration between stock-assessment statisticians and Chairs of age reading workshops. The approach of the WKAEH could serve as a good example in this respect.	Assessment WGs, Age reading WK Chairs	From now on
4.2.3	PGCCDBS recommends developing the 'Guus Eltink spreadsheet' for comparisons of age readings further and into a non-Excel based shape. The outcomes of calibration exercises should feed directly into assessment models, e.g. by producing a matrix stating the	PGCCDBS intersession work.	until PGCCDBS 2011



Report section	Recommendation	For follow up by	Timeframe
	variance or CV around the estimation of a given age and quantifying this into a variance parameter for the age distribution of the stock.		
4.2.3	PGCCDBS recommends that precision levels and acceptable 'widths' of confidence bands for age estimates should be evaluated by species, based on simulations with various degrees of disagreement by age.	PGCCDBS intersession work.	until PGCCDBS 2011
4.2.4	PGCCDBS recommends that each PG member speaks to their age-reading coordinators and encourage them to raise awareness of the 'Age Readers Forum' amongst their age readers.	PGCCDBS members	From now on.
4.2.4	PGCCDBS recommends establishing a 'SharePoint team' to take responsibility for updating the contents of the 'Age Readers Forum'. One person will be appointed to monitor the forum and update information, and this role should be rotated annually, amongst the various laboratories, ensuring the various laboratories become familiar with the forum.	PGCCDBS intersession work. Gráinne Ní Chonchúir (Ireland) will act as co-ordinator.	From now on.
4.3.2	PGCCDBS recommends that a sixth maturity stage, 'abnormal', is included in standard maturity scales for crustaceans, as this can be used as an ecosystem indicator.	National laboratories	From now on.
4.3.2	PGCCDBS recommends that the need for, and details of, a new workshop on maturity staging of crustaceans should be considered in PGMED & PGCCDBS 2011.	PGCCDBS, PGMED	PGCCDBS/PGMED 2011
4.3.2	PGCCDBS recommends that survey planning groups (WGBIFS, IBTSWG, WGBEAM) review the WKMSSPDF recommendation to 'put the content of a gonad under a microscope in case of disagreement or doubt on the maturity stage of a fish (if time allows during a survey)', and include it in sampling manuals if appropriate.	WGBIFS, IBTSWG, WGBEAM	March/June 2010/2011
4.3.5	PGCCDBS recommends that the FRESH-COST action reports information maturity staging of species following different reproductive strategies, such as viviparity and hermaphroditism in fishes, crustaceans and cephalopods.	FRESH-COST action	Until PGCCDBS 2011
4.3.6	PGCCDBS recommends that a workplan on the analysis of between-reader variation in maturity staging is being developed in close collaboration with the FRESH-COST action, considering general techniques to assess maturity and improve agreement between	PGCCDBS intersession work. Fran Saborido-Rey (Spain), Francesca Vitale	Until PGCCDBS 2011

Report section	Recommendation	For follow up by	Timeframe
	investigators.	(Sweden) and David Maxwell (UK-England) and Ernesto Jardim (Portugal) will act as co-ordinators.	
4.4.2	PGCCDBS recommends that the updated proposal for a project on 'Age Determination and Maturity Staging of species not previously subjected to biological sampling for analytical assessments' be considered by the DCF Liaison Meeting for inclusion in the EC Work Programme 2011 or 2012.	European Commission, DCF Liaison Meeting	2011 or 2012
5.1	PGCCDBS recommends on the basis of the WKPRECISE workshop that catch sampling programs should be based on statistically robust survey designs with clear definitions (and documentation) of the sampling frame, the primary sampling units (PSUs), the stratification schemes employed, and the methods used for selecting samples in each stratum.	National laboratories	From now on
5.1	PGCCDBS also recommends that the precision of estimates of key parameters is given in terms of standard errors or relative standard errors (often referred to as the coefficient of variation for a parameter estimate). In addition, the number of primary sampling units observed along with estimates of the effective sample size for the associated estimate should be given.	National laboratories	From now on
5.2	PGCCDBS recommends on the basis of the WKMERGE that primary data held in databases should be real observations and not imputations done manually or with automated routines. Imputation must be carried out external to the data base using transparent and robust methods.	National laboratories	From now on
5.2	PGCCDBS recommends the formation of a Study Group or EU contract to consider methods and tools for optimisation of sampling schemes between MS to achieve international precision targets and consistent collection of data to allow analysis by domains covering international strata within regions (e.g. metiers). Further development of data basis and COST tools should aim to cater for	RCMs, European Commission, National laboratories	2010/11

Report section	Recommendation	For follow up by	Timeframe
	different possible sampling designs and associated procedures described in WKMERGE		
5.3	PGCCDBS recommends that a series of workshops be set up, based on case studies allowing for a more thorough discussion on the details of design and implementation of catch sampling schemes. The case studies should from a methodological point of view be of general interest and should be well prepared prior to the workshop. Special attention should be given to design and implementation of regional sampling schemes. The PGCCDBS further consider it beneficial to collate the findings from the series of workshop into a reference book as this at present time is missing. This book should contain documentations and estimators for the basic statistics and how it is should be implemented in the assessment.	ICES Secretariat and PGCCDBS WKPICS	2010/11
5.4	PGCCDBS would like to maintain the recommendations from last year and hope that the Secretariate can allocate sufficient resources to complete the above worklist for 2010 before the PGCCDBS 2011 meeting.	ICES Secretariat	2010/11
6.2	PGCCDBS recommends that the outcome of the workshops, conferences or symposia on data collection from commercial fisheries should be reviewed as an intersessional work and reported to the 2011 PG meeting.	PGCCDBS intersession work.	Until PGCCDBS 2011
6.3	PGCCDBS recommends that all countries, before starting new self-sampling programmes, to look at the outcomes from these two Wks (WKUFS, WKSC) to get some valuable guidance.	National laboratories	From now on.
6.3.6	PGCCDBS recommends that countries analyse the data collected from the self-sampling programmes and observer programmes to be able to validate the effectiveness and quality of the data collected.	National laboratories	From now on.
6.3.6	PGCCDBS recommends that the importance of prioritizing the validation of data collected from self-sampling programmes could be discussed by EFARO in order to get support on such a focus. Furthermore, the PG recommends that the outcome of the analysis is published and reported to the PGCCDBS meeting in 2011.	EFARO, PGCCDBS intersession work.	Until PGCCDBS 2011
7.2.1	PGCCDBS recommends that all organisers of workshops and co-	Co-ordinators of	From now on.

Report section	Recommendation	For follow up by	Timeframe
	ordinators for otolith exchanges follow the planning procedures set out in section 7.2.1, including criteria for classifying ageing performance into 'good', 'medium' or 'bad'.	otolith exchanges, Age reading WK Chairs	
7.2.1	PGCCDBS recommends that the request to set target levels for the percentage of agreement and CV's for the different stocks, is included in the ToRs of the assessment working groups. During the AWG's, the data contact persons should stress this request and make sure the target levels list is completed and included in the WG's reports.	ICES Secretariat, Data contact persons	March-May 2010/2011
7.2.2	PGCCDBS recommends a small otolith exchange of brill ( <i>Scophthalmus rhombus</i> )	Co-ordinator: Annemie Zenner (Belgium)	2010
7.2.2	PGCCDBS recommends a small otolith exchange of black spot sea bream ( <i>Pagellus bogaraveo</i> )	Co-ordinator: Juan Gil Herrera (Spain)	2010-11
7.2.2	PGCCDBS recommends a small otolith exchange of red mullet ( <i>Mullus surmuletus</i> ) and striped red mullet ( <i>M. barbatus</i> )	Co-ordinator: Kélig Mahé (France)	2011
7.2.2	PGCCDBS recommends a small otolith exchange of North Sea sprat ( <i>Sprattus sprattus</i> )	Co-ordinator: Lotte Worsøe Clausen (Denmark)	2010-11
7.2.2	PGCCDBS recommends a small otolith exchange of Spanish mackerel ( <i>Scomber japonicus</i> )	Co-ordinator: Maria Manuel Martins (Portugal)	2012-13
7.2.2	PGCCDBS recommends a small otolith exchange of tusk ( <i>Brosme brosme</i> )	Co-ordinator: Gróa Pétursdóttir (Iceland)	2010-11
7.2.2	PGCCDBS recommends a small otolith exchange of megrim ( <i>Lepidorhombus whiffiagonis</i> )	Co-ordinator: Mark Etherton (UK-England)	2011
7.2.2	PGCCDBS recommends a small otolith exchange of sea bass ( <i>Dicentrarchus labrax</i> ) and Sparidae spp.	Co-ordinator: Kélig Mahé (France)	2010-11

Report section	Recommendation	For follow up by	Timeframe
7.2.2	PGCCDBS recommends a full otolith exchange of European eel ( <i>Anguilla anguilla</i> )	Co-ordinator: Françoise Daverat (France)	2010
7.2.2	PGCCDBS recommends a full otolith exchange of European Atlantic sardine ( <i>Sardina pilchardus</i> )	Co-ordinators: Eduardo Soares (Portugal) and Isabel Riveiro (Spain)	2010-11
7.2.2	PGCCDBS recommends a full exchange for angler ( <i>Lophius piscatorius</i> ) and black-bellied angler ( <i>L. budegassa</i> )	Co-ordinator: Jorge Landa (Spain)	2011
7.2.2	PGCCDBS recommends a full otolith exchange of Baltic, North Sea and Black Sea turbot ( <i>Psetta maxima</i> )	Co-ordinator: Annemie Zenner (Belgium)	2010-11
7.2.2	PGCCDBS recommends a full otolith exchange of roundnose grenadier ( <i>Coryphaenoides rupestris</i> )	Co-ordinator: France	2011
7.2.3	PGCCDBS recommends a Workshop on Age Reading of European and American Eel [WKAREA-2]	ICES Secretariat	2011
7.2.3	PGCCDBS recommends a Workshop of National Age Reader Coordinators [WKNARC]	ICES Secretariat	2011
7.2.3	PGCCDBS recommends a Workshop on Age Reading of European Atlantic Sardine [WKARAS]	ICES Secretariat	2011
7.3.1	PGCCDBS recommends a Workshop on Sexual Maturity Staging of Cod, Whiting, Haddock, Saithe and other gadoids [WKMSGAD]	ICES Secretariat	2011
7.3.1	PGCCDBS recommends a Workshop on sexual maturity staging of sole, plaice, dab and flounder [WKMSSPDF2]	ICES Secretariat	2012
7.3.1	PGCCDBS recommends a Workshop on Sexual Maturity Staging of Turbot and Brill [WKMSTB]	ICES Secretariat	2012
7.3.1	PGCCDBS recommends that the RCM-NS&EA and RCM-NA maintain and update the maturity sampling tables (Annex 10), and that RCM Baltic documents maturity sampling in the same way as the other RCMs.	RCMs North Sea & Eastern Arctic, RCM North Atlantic, RCM Baltic	April/May 2010
7.4	PGCCDBS recommends the creation of a HTML version of Annex 8 to facilitate the long-term planning of age reading	ICES Secretariat, PGCCDBS	Until PGCCDBS 2011

Report section	Recommendation	For follow up by	Timeframe
	workshops, the update and simplification of Annex 9, and the construction of a HTML version in which coloured cells will contain links to existing age calibration Exchange and Workshop reports. This tool should be constructed in collaboration with the ICES Secretariat, and hosted on the PGCCDBS documents repository, enabling open reader access and downloading for these reports.	intersession work. Willie McCurdy (Northern Ireland) will act as co-ordinator.	