ICES PGCCDBS Report 2007

ICES Advisory Committee on Fishery Management
ICES CM 2007/ACFM:09

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

5–9 March 2007

Valetta, Malta

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

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

H.C. Andersens Boulevard 44-46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

Recommended format for purposes of citation:

ICES. 2007. Report of the Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS), 5–9 March 2007, Valetta, Malta. ACFM:09. 115 pp.

Contents

Executive summary

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.

Since 2007 Mediterranean Scientists organize a Planning Group (PGMED) to deal with specific sampling issues of this area. Although organized 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 will be maintained through (i) the inclusion of each group's report as an annex of the other; (ii) the organization of parallel meetings; (iii) the organization of join plenary for generic issues and (iv) the organization of join workshops.

Workshops have become an important tool in dealing with tasks required by the PG. At the moment there are two types of workshops: (i) methodological workshops that deal with general methods of applications to all areas/species/fisheries; (ii) age reading and maturity staging workshops (WKAC&MS) that deal with promoting agreement among scientists classifying otoliths and gonads of specific species or groups of species. All workshops are now carried out as official ICES workshops and the reports stored on the PGCCDBS documents repository (http://www.ices.dk/reports/acfm/pgccdbs/PGCCDBSdocrepository.asp) and available to the public. It's the concern of this group that the work done in workshops should be promoted and the merit of the scientists involved recognised. In this line of thought PGCCDBS will promote the publication of WKAC&MS reports under the ICES Cooperative Research Report series (CRR). During 2007 a first attempt will be done to compile a set of WKAC and submit it to CRR.

With the aim of improving communication and introducing better linkages within the ICES system but also to other bodies, the following procedures were decided upon when dealing with the different recommendations coming out of PGCCDBS: (i) the chairs of WKAC&MS will make sure that the relevant WG chair is aware of the results and the report; (ii) PGCCDBS will have internal correspondents for each AWG that should take over the responsibility of communicating with AWG chairs; (iii) the ICES Secretariat will function as distribution point for any recommendation or information from PGCCDBS to stock coordinators and to other bodies outside ICES, like EU bodies.

A revision of last year's recommendations was done and several actions indicated to follow tasks not fulfilled. With regards to sampling protocols PGCCDBS decided to develop a "minimum protocol" during 2007 for length frequency sampling and promote the comparison with national protocols to identify their compliance.

Several WKAC were carried out and their summary with the most relevant recommendation to improve age readings were included. The Workshop on Maturity Sampling (WKMAT) and the Workshop on Discard Raising Procedures (WKDRP) were carried out in the beginning of 2007. The summary and main recommendations of these workshops are also included. Following the findings of WKMAT with regards to the estimation of maturity ogives PGCCDBS decided to propose a Workshop on Estimation of Maturity Ogives for Stock Assessment (WKMOG in Annex 5). Recommendations from Liaison Meeting were reviewed and actions proposed. The AWG reports were also reviewed with regard to information on data deficiencies and methodological problems and recommendations directly addressed to PGCCDBS (Table 3.4).

An overview of all stocks assessed by ICES is compiled in Table 4.1, and information of assessment type is given (age based analytical assessment, No assessment, etc). For some

stocks age and maturity data are collected but were not used in the assessment. It was not possible to identify the reasons why these data were not used. PGCCDBS is of the opinion that an update of the maturity ogives used for a number of stocks should be considered. PGCCDBS propose that the information presented in Table 4.1 should be available online and should be developed further in coming years. PGCCDBS recommends that the new ICES Quality Manager co-operates with PGCCDBS to develop online data tables containing basic data collection information, including age reading and maturity staging information and its use by AWGs.

In some auction markets automatic fish-grading machines are being used, creating the possibility of access to individual fish weights for entire hauls.

PGCCDBS recognises that data access can be a sensitive, political subject which is legally complex and that it will be dealt at a higher level by member states and the Commission. We draw attention to the possible levels of data access between full copyright and totally free access. For example, a Creative Commons licence (http://creativecommons.org/) is a new system, built within current copyright law, which allows data and product sharing with selected restrictions. We support the proposed delay between data collection and access as this will allow time for the data to be properly processed.

The implementation of the proposed shift in the EU data collection framework from species-based to métier-based sampling and, above all, the requirement on concurrent length sampling of the landings (Anon. 2007), are likely to cause significant problems for the institutes involved in length sampling. It is suggested that each national Laboratory which foresees problems with the implementation of concurrent métier-based market sampling carries out implementation studies. Protocols for such studies are presented together with a proposal for an ICES Workshop (WKISCON in Annex 5) to deal with the results. The workshop will be organized as an ICES expert group with participation and support from PGMED.

An important issue was identified related with discards sampling and it is recommended that both the retained and the discarded catch fractions are always sampled concurrently, i.e. from the same fishing operation.

PGCCDBS discussed the interpretation of ToR d) “Define the framework for standards and best practices for sampling commercial fisheries” in relation to the new item in the MoU regarding ICES responsibility of quality assurance of the aggregated data. An overview of a possible system was conceptualized where sets of quality indicators should be provided together with the data all the way from the national to the advice level, so that each responsible party can take the decisions regarding the usage of the information based on clear criteria and document the choice made. PGCCDBS agreed that in spite of the formal ICES area of influence this group has the expertise to develop a framework for QA of fisheries and stock information collected at the national level. The procedure we foresee relies on the establishment of protocols and the definition of a set of standards we want our data to be consistent with. Data must be collected in agreement with the protocols and analysed to compute statistics of interest for stock assessment. Before submitting data to the stock coordinator, the indicators must be computed by comparing the data collected with the standards defined. All information must then be provided to the stock coordinator, which should compile inputs to stock assessment and document its choices. The indicators may be: (i) compliance with protocols – qualitative indicator about deviations from protocols; (ii) coverage of the sampling achieved – quantitative indicator of the % of the fishing activity covered by the sampling programme; (iii) precision of the estimates – quantitative indicator of the precision achieved by the sampling programme. PGCCDBS agreed on the following prioritized workplan: (i) to develop a “minimum” international protocol to be used as a standard, and which should contain a minimum of procedures that the national protocols need to meet to fulfil the requirements set; (ii) to organize a workshop (WKACCU in Annex 5) with terms of reference to establish standardized/joint methods on how to evaluate and estimate the accuracy of submitted fisheries data; (iii) to organize a workshop (WKPRECISE) with terms of reference to establish standardized/joint methods and indicators for evaluating and estimating the precision of submitted fisheries data.

PGCCDBS discussed deeply the revision of WKAC&MS, in particular the ToRs and guidelines for organizing such workshops. Guidelines for Otoliths Exchange and WKAC are presented and generic ToR for WKAC proposed. It also developed guidelines for follow up actions and for reporting relevant information to AWGs. Generic ToRs for WKMS are also presented. PGCCDBS agreed that a general shift in attitude would be beneficial, moving from a reactive to a predictive perspective with the aim of enhancing performance and not criticising. PGCCDBS considers that cooperation and coordination in fish age determination should be arranged on a permanent and regular basis. Therefore it is recommended to hold regular otolith exchanges and workshops. Exchanges should be carried out at least once every two years and the possibility for a workshop should be offered at least once every four years. These frequencies should be revised by national age determination coordinators and by expert groups. The proposed frequency of exchanges and workshop by species (and area) is presented in Table 6.1. This table also lists the history of exchanges and workshops and the workshops planned for 2008 and 2009.

1 Introduction

1.1 Terms of Reference

The Planning Group on Commercial Catch, Discards and Biological Sampling [PGCCDBS] (Chair: Ernesto Jardim, Portugal) will meet in Valetta, Malta (dependent on the outcome of the discussion on establishing a Mediterranean equivalent group) for 4 days at the end of February 2007 to:

a) Review and follow up of last year's recommendations;

b) Review relevant recommendations from assessment Working Groups, Regional Coordination Meetings, SGRN and STECF Workshops dealing with DCR and where appropriate propose actions to taken within the ICES system;

c) Review changes in data collection procedures to check if these present problems for stock assessment data and where appropriate propose procedure changes for rectifying the problems. Such proposals shall be communicated to the DCR system (through DG Fish) for action;

d) Define the framework for standards and best practices for sampling commercial fisheries. The framework shall include methods to evaluate whether submitted data conforms to the standards. Agree a prioritized workplan for establishing such standards and best practices and initiate intersessional work.

e) Review and update protocols for age calibration and maturity staging workshops;

1.2 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 Regulation. The package presented below is the list of tasks that is agreed by PGCCDBS and the DCR programme for 2007. It is expected that DG Fish will provide funds for travel and subsistence for some participants to both PGCCDBS and the workshops.

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 national annual DCR workplans.

Some countries make their support for PGCCDBS and the workshops conditional on the availability of funding both for participation in meetings and preparatory work. Funding will be discussed within the DCR and between ICES and EC DG Fish during October-December.

This PG 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 Data Collection Regulation (DCR) and DG Fish will be member of PGCCDBS to ensure proper coordination with the DCR 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 practises within its remits and for fisheries in the ICES area. The implementation of these practises is discussed regionally and implemented nationally.

The PG coordinates initiatives for workshops and other activities to addresses specific problems.

There are five EU regional fisheries data collection coordination groups 1) Northwest Atlantic (NAFO), 2) Mediterranean, 3) Baltic Sea, 4) North Sea and 5) Western Approaches. These

RCMs are forums where EU member countries discuss how best to implement their national programmes.

1.3 General introductory remarks and workplan

There was a clear intention of moving PGCCDBS into a more action group that could plan and execute some tasks. With this is mind the PG accepted, as last year, to always go beyond recommending, providing actions, identifying responsibilities and defining schedules to fulfil the tasks proposed. PGCCDBS took onboard some tasks and defined intersessional work to be carried out during 2007. Tasks and responsible persons were agreed.

A great help towards this objectives was the stabilization of the ToRs which were kept very similar to last year's and hopefully will be kept on the same line of thought in the future. The work of an expert group like PGCCDBS, with around 40 participants from all European countries must be built along the year's finding; its role within ICES and having consistent ToRs is of extreme importance.

To overcome some of last year's drawbacks, in particular to avoid large subgroups that partially impaired the productivity in 2006, the meeting was organized in small subgroups with 3 to 5 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 organization was extended. Now there's a mailing list and a google group (pgccdbs@google.com) together with the web page based on a wiki system. These tools supported the development of our work and created conditions to continue our tasks' intersession.

The Chair invited the TACADAR project to be present at the meeting and present the work and achievements of the project with regards to the development of a QC/QA system for age readings. The presence of TACADAR at the meeting was very helpful and the experience described contributed to clarify what a QC/QA system can be and the rationale behind such systems applied to fisheries research.

1.4 Cooperation with PGMED (The Mediterranean Planning Group)

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

The link between the two planning groups will be maintained through (i) the inclusion of each group's report as an annex of the other; (ii) the organization of parallel meetings; (iii) the organization of joint plenaries for generic issues and (iv) the organization of joint workshops.

1.5 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 (WKAC&MS) and deal with promoting agreement among scientists classifying otoliths and gonads of specific species or groups of species.

All workshops are now 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/pgccdbs/PGCCDBSdocrepository.asp) maintained by the ICES Secretariat.

It's the concern of this group that the work done in workshops should be promoted, to call the attention of the scientific community to these exercises and to recognise the merit of the scientists involved. In this line of thought PGCCDBS will promote the publication of calibration WK reports under the ICES Cooperative Research Report series (CRR). CRR are peer reviewed and it's our view that this process will promote the quality of this work and will constitute an important recognition of the scientists involved.

1.6 Communication with other expert groups

In the PGCCDBS report from 2006, one of the recommendations was: "PGCCDBS considered that there was a need to develop a procedure for ensuring that Assessment Working Groups (AWGs) are more actively involved in both requesting information that they need and communicating back to the data collection system."

The problem with lack of communication between PGCCDBS and other expert groups have since been pointed out at various meetings, lately at the AMAWGC meeting in February 2007 without any solutions to lack of linkage between groups.

With the aim of improving communication and to introduce better linkages within the ICES system but also to other bodies, the following procedures were decided upon when dealing with the different recommendations coming out of PGCCDBS. The PGCCDBS report section on recommendations will clearly specify who needs to take action, to whom the recommendation is addressed and the time frame needed for the action taken.

1.6.1 Distribution of PGCCDBS report and reports from Workshops under PGCCDBS

The ICES Secretariat will make sure that the PGCCDBS report and reports from Workshops dealing with general and methodological issues, i.e. discards and maturity, will be distributed to all relevant groups under ICES.

It is recognised that the AWGs generally have a very high workload and often do not have time to read all reports that could be of possible relevance to them. It was therefore decided that sections, any results that need specific action from other groups or issues of general interest will be highlighted under the action column in the recommendation section.

The chairs of WKAC&MS for specific stocks will make sure that the relevant WG chair is aware of the results and the report.

Linkage between AWGs and PGCCDBS

It is considered important to continue interactions at meetings at the Annual Science Conference and at the AMAWGC meeting.

PGCCDBS decided to have an internal correspondent for each AWG to take over the responsibility of communicating all relevant subjects.

PGCCDBS will propose a template for a data section to be included in AWG reports and start discussion with AWG chairs.

Information to Stock coordinators

The ICES Secretariat keeps an updated list of stock coordinators which is reported back for each AWG chair; the Secretariat will function as distribution point for any recommendation or information from PGCCDBS to stock coordinators.

Information, reports and recommendations to other bodies, e.g. the Commission, RCMs, RACs

Recommendations and communications from PGCCDBS and its workshops to other bodies will go via the ICES Secretariat.

1.7 Organization of the report

The report is organized by ToR starting with Section 2 for ToR a) through Section 6 for ToR e). A set of annexes was added following the template provided by ICES (list of participants, agenda, ToR for 2008, recommendation table), adding a working document by Feijó, *et.al.*, the Wk proposals and the PGMED report.

2 Review and follow up of last year's recommendations

2.1 Compilation of national manuals and standard operating procedures

This task aimed to standardize sampling procedures around Europe and has been around for a long time. Last year a new attempt was made to compile national manuals using online facilities. However, this attempt was not successful.

PGCCDBS decided to follow a new course of action with relation to protocol standardization. During 2007 a "minimum protocol" will be developed for length frequency sampling and a comparison with national protocols will be done to identify their compliance. Based on such exercise it will be possible to identify the main drawbacks in national protocol and act upon it to fix or adjust the sampling procedures.

If this exercise succeeds, it can be expanded to other sampling protocols.

2.2 Develop a two – step procedure for the flow of information from data – providers to data users.

1) Provide a detailed description of the sampling scheme/raising procedures, etc.
2) Provide a yearly report with information about the achieved sampling by stock.

In reference to point 1), a form was designed to be completed by the individual institutes submitting data to stock coordinators. It is essentially a description of how the data was collected and raised. The purpose of the forms was to provide an overview of the operating processes that have taken place to provide the final estimates through only predefined agreed protocols. The certification of the quality of the data is to be seen as complete when all the operating procedures are fully described in ad hoc manuals. Thus, the form can be seen as the link between the statistical descriptions of the samples (intensity, precision) and the precise written manuals.

PGCCDS notes that no action was undertaken on the use or development of this form and recognises that it should have been more specific about who in ICES was required to take the recommendation further.

In reference to point 2), a yearly sampling form was proposed as a means of obtaining information on the level of sampling on a stock by stock basis.

As in point 1), no follow up action was initiated.

PGCCDBS notes that ICES is in the processes of reviewing what information is required from the working groups, and the PGCCDBS will await the outcome of this review.

2.3 Guidelines on how to incorporate experimental design into age reading workshops

Guidelines on this have been provided, in the PGCCDBS report 2006, and added to the general guidelines (Section 6.2.4).

2.4 To develop a procedure for ensuring that AWGs are more actively involved in requesting data and providing feedback to data providers

PGCCDBS notes that this is a key issue, which still needs to be resolved.

The enquiry forms detailing the data requested and received by the AWGs were developed, but were not deemed to be very effective, and will not be used in the future. An alternative is being investigated by the ICES secretariat. The communication flow will also be addressed by other PGCCDBS subgroups.

In order for the AWGs to identify key data problems, there is a need for an efficient way of screening the sampling data once it has been compiled by the Stock Coordinator, and this would be most efficiently done through COST in conjunction with databases such as FISHFRAME.

2.5 Improve age readings and maturity staging for several species

All proposed workshops/exchanges are in progress or have been held with the exception of red mullet, which has been postponed until 2007.

The extended abstracts were included in Sections 3.1-3.3 and all reports are available on the PGCCDBS repository (Section 2.6). These include the following: Sandeel, Anchovy, Flounder, Saithe, Redfish, Horse Mackerel and Greenland Halibut, Turbot, Brill and Sole.

A workshop on sexual maturity sampling (WKMAT, Section 3.3.1) was held in 2007, and the report is available on the PGCCDBS repository. Three workshops dealing with maturity staging of mackerel/horse mackerel, hake/monk, and cod/haddock/whiting and saithe will be held in 2007.

2.6 Publish reports of age readings and maturity staging workshops online

During 2006 a document repository for PGCCDBS was set by the ICES Secretariat to keep online all relevant workshop reports. The repository is fully searchable and is maintained by the ICES Secretariat.

2.7 Each workshop to prepare a digitised set of agreed age otoliths, with and without annotations

Most ageing exchanges and workshops have used sets of digitised otolith images, which have been annotated either individually by readers or in discussion by the workshop participants. These "confirmed" aged datasets have not necessarily been compiled into reference sets which are readily available to other age readers.

There is an increasing need for secure web services to manage the output from meetings, exchanges and workshops. PGCCDBS has previously recommended that a website is needed to archive reports and hold digital images such as reference collections from ageing and maturity workshops. The most effective means of achieving this would be through a centrally supported website under JRC. PGCCDBS considers that the absence of such a facility is preventing efficient communication.

For future age exchanges and workshops, PGCCDBS is proposing a set of guidelines to ensure that reference sets of digitised images are compiled and made more widely available

(Section 6.2). In addition, a large number of workshops have already been completed in the past 4 years and if the digitised material could be brought together it would provide a valuable reference and training source.

2.8 Each workshop to prepare a digitised set of agreed maturity stages, with and without annotations

For future maturity workshops, PGCCDBS is proposing a set of guidelines to ensure that reference sets of digitised images are compiled and made more widely available (see Section 6.3).

2.9 Considers that the continuing review and assessment of task sharing and cooperation with the discard sampling is best served at RCM level

No action required

2.10 Supports the development of the project proposal "Discard Atlas" and are of the firm opinion that this would serve as a suitable tool to review discards sampling programmes and develop methodologies to deal with discard rate estimates

PGCCDBS notes that no funding has been made available for this project.

2.11 14 Proposals for workshops (other than WKAC&MS) recommended by PGCCDBS 2006

All workshops proposed were accepted and will be held during 2007.

2.12 Review of web tools

As a first approach to the use of the Internet for the DCR work, wiki sites, mailing lists and Google sheets have been proven helpful.

Nevertheless, there is an increasing need for secure web services to manage the output from meetings, exchanges and workshops both as text and as pictures.

PGCCDBS 2006 has recommended that web space should be made available to archive reports, hold other text (e.g. standardized procedures) and digital images such as reference collections from ageing and maturity workshops.

This recommendation was also supported by the 2006 NEA and the Baltic RCMs through the proposal of a project named "WebGR – Web services for growth and reproductions studies". This project should be developed in cooperation with JRC that would provide development expertise and maintenance facilities.

The best organisation of such a website for many purposes is a web database allowing precise access to large amounts of data as would be expected from the above mentioned workshops.

3 Review relevant recommendations from assessment Working Groups, Regional Coordination Meetings, SGRN and STECF Workshops dealing with DCR and where appropriate propose actions to taken within the ICES system

In general, the recommendations addressed to the Group should be compiled prior to the meeting by assigned members of the Group. In this way, the Group could focus on identifying general problems during the meeting and propose actions.

The Term of Reference b) should be reworded to: *Review recommendations addressed to the PGCCDBS by Assessment WGs, the Liaison Meeting and relevant STECF Sub-groups*.

3.1 2006 Age Reading Workshops

3.1.1 Sand eel

A sand eel otolith age reading workshop was hosted by DIFRES in Charlottenlund, Denmark in September 2006. The objectives of the workshop were manifold; apart from the overall goal of securing consistency in age estimation of sand eel; updating and assembling age readers from all national laboratories handling sand eel from the North Sea to exchanged views on methods and experiences was among the objectives. This had not been done for more than a decade among the participating laboratories.

Prior to the workshop an otolith exchange was undertaken and the results were discussed during the workshop.

The otolith exchange set consisted of 920 otoliths selected from commercial catches taken from the major Danish fishing areas in the North Sea during 2004. Sampling dates were evenly distributed over the months April through June. The overall agreement was 83.5% with a precision of 19.7% CV and in 53% of the otoliths the agreement was larger then 90%. The relative bias were not skewed for any ages (figure 1), although there were a slight, but not significant, tendency to overestimate the younger ages and overestimate the older compared to modal age. The two most experienced readers in the exchange had a consequent pattern of disagreement, where one reader (R1) were interpreting the age 1 year younger than the other in 42% of the individuals compared to the other reader (R2).

These discrepancies in interpretation of age structures in the otolith were further explored in an image analysis calibration during the workshop. The calibration exercise was a combination of a traditional age calibration exercise and an image analysis system approach.

The calibration otolith set consisted of 102 otoliths selected from Danish commercial samples from the Dogger Bank and Jyske Rev areas in the North Sea in April, May and June 2004. The analysis of the results was performed using an Excel ad-hoc Workbook AGE COMPARATIONS.XLS from A.T.G.W. Eltink from RIVO following the recommendations of EFAN (Eltink *et al*., 2000). Modal age was reached for all otoliths in the calibration set.

The image analysis age calibration was performed using both live otoliths under the stereomicroscope and digitized images of the corresponding otoliths. The readers had the otolith exposed under the stereomicroscope, while pointing at the age structures on the picture using the image analysis system tool, and could consult the live otolith if the pictures did not reveal all the desired otolith structures clearly. The image analysis system tool makes use of XY-coordinates corresponding to the points, the reader marks as age structures on the digitised image of the otoliths. Prior to the exercise the readers agreed on one axis from the centre and towards the edge along the rostrum along which all points should be placed.

The overall agreement in the calibration exercise was somewhat lower than in the exchange (72.5% with a CV of 21.2%). This however should be taken with some caution as the participants in the exercise counted two new readers who did not participate in the exchange and then the two experienced readers, who did participate in the exchange. Thus an additional comparison of the results between the exchange and the calibration exercise only including the two experienced readers was performed, and that showed an increase in percent agreement from 52% to 67% just between the two readers. The pattern in disagreement was persistent as R1 was identifying fewer age structures in the otoliths compared to R2.

The omission of age structures by the individual readers did have a pattern, thus it was possible to direct the discussion of which age structures to count towards the conception of false rings. Some otoliths showed to be very difficult to reach a common interpretation of the age and the points counted as age structures were scattered along the otolith, however some trends were obvious and figures 2 A and B show the most typical patterns of the selective interpretation of age structures. The false ring most frequently appeared when a second opaque zone had been formed during the first summer by some individuals, thus the definition of the first annual structure showed to be of great importance in reaching agreement on the age of the individual fish. However, also between the first and second year of growth, the appearance of a split-ring structure was the cause of discrepancy between readers. The most frequent argument for omitting a ring as false was the width of the structure, if it appeared less wide than the remaining transparent structures it was considered false by some readers.

The image analysis exercise clarified that the lack of agreement can be due to two reasons, the first being the position of the first ring where a secondary period of growth has been taken place during summer. This is often seen in the younger individuals as the otolith is thinner and thus the structures more clear. The second reason for disagreement arose where some readers choose to leave out specific rings identified by other readers as true annual rings where the rings successive to the 2nd ring were split rings.

Validation of annual structures by otolith microstructure appearance showed to be very useful for reaching agreement in the majority of the otoliths, where the readers did disagree. Inclusion of this method in the routine work with sand eel otoliths when a reader is in doubt of the character of the age structures would be desirable. It will be a part of the standard set up in one of the ageing labs that participated in the workshop.

The two most experienced readers (R1 and R2) reached a high level of agreement through the course of the workshop and the training of the new readers would be done following the agreements from the workshop thus facilitating a continued high agreement between ageing labs despite the change of personnel.

The workshop achieved quite a lot in terms of ironing out, through discussion and calibration, some of the major problems in ageing otoliths of sand eel. The group reached agreement on an outline of ageing protocol/guidelines as described in section 5 of the present report and the aim is to produce a DVD training package, including extensive photo-documentation of otoliths with agreed and validated age structures by area and sampling month. This would be part of a reference collection for each area where actual otoliths and digitized images are available for training and future workshops.

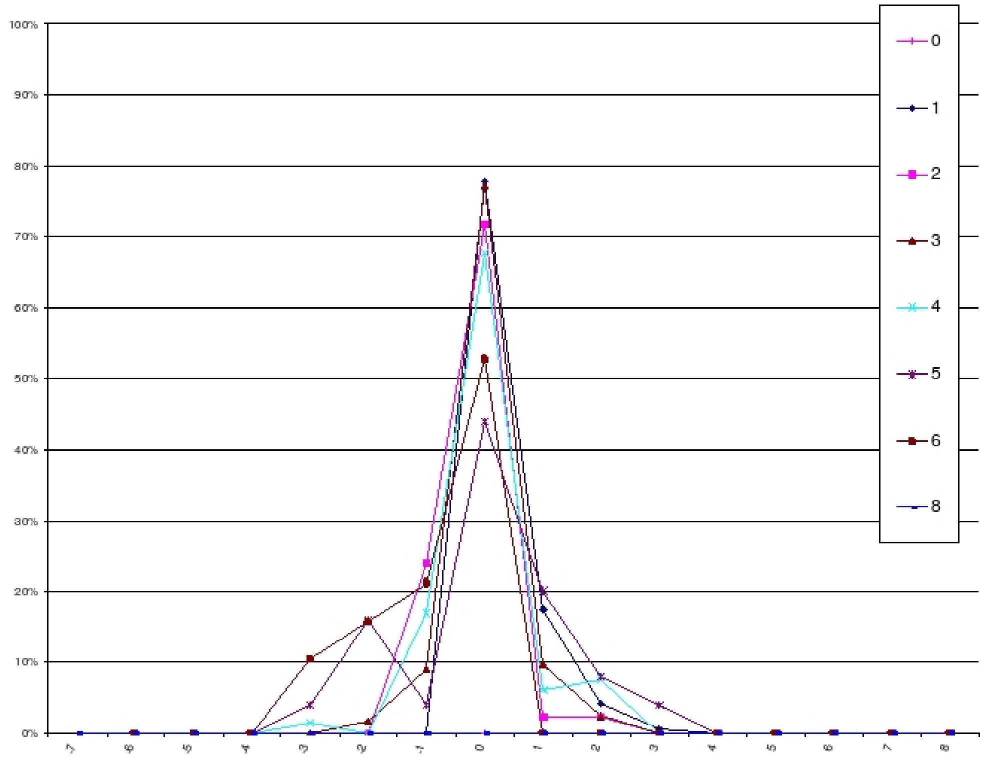


Figure 3.1 - The distribution of the age reading errors in percentage by modal age as observed from the whole group of age readers in an age reading comparison to modal age. The achieved precision in age reading by modal age group is relatively high as the spread of the age readings errors is narrow. There appears to be no relative bias, as the age reading errors are normally distributed.

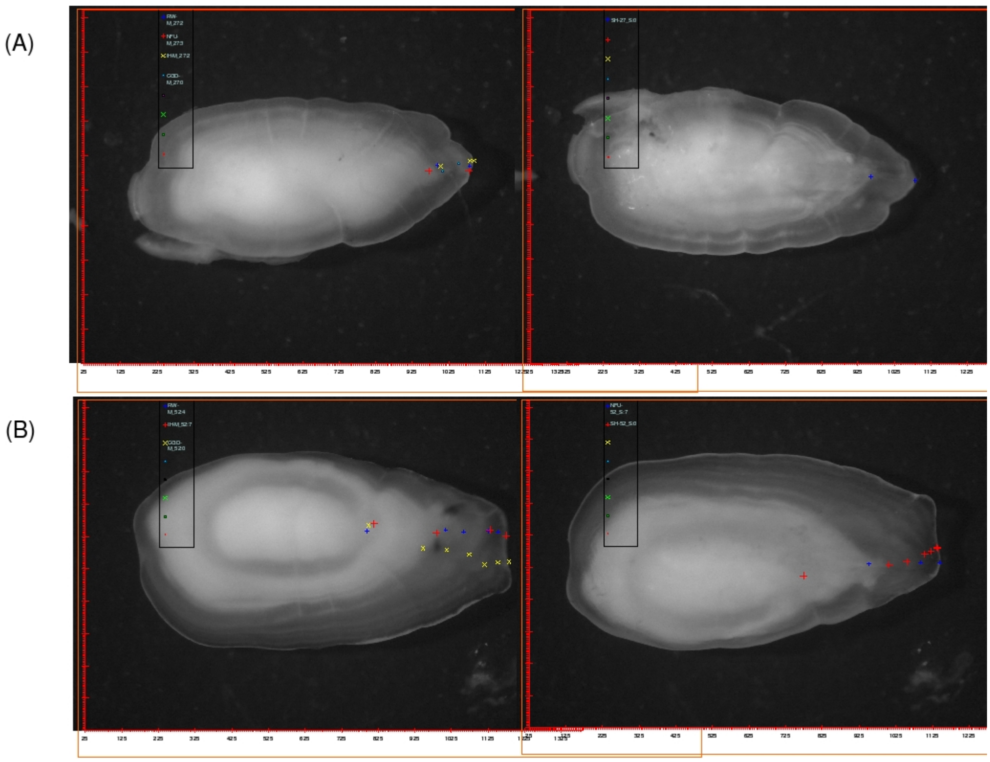


Figure 3.2 - (A) Individual nr. 27. From June, location 39F7; ages set as either 1 or 2- (B) Individual nr. 52: From May, location 36F6; ages set as 2, 3, 5, 6 or 7.

3.1.2 Anchovy

Following the recommendation of PGCCDBS (ICES CM 2005/ACFM: 15), a workshop was carried out in AZTI-Tecnalia (Pasaia) from 14 to 15 November, 2006 to analyse the results of the exchange exercise on anchovy otoliths performed in 2005, and to solve the problems detected in anchovy age determination based on the examination of otoliths.

Six attendees participated in the meeting, two per institute dealing with anchovy in the Bay of Biscay (AZTI, IEO and IFREMER). The results of the 2005 exchange programme were discussed and served as a starting point for the development of this workshop on anchovy age determination in 2006. A review of the criteria for age determination of anchovy otoliths in the Bay of Biscay was presented, following past practices (Uriarte *et al*. 2002). In addition a new quick exercise of age reading on the otoliths of the 2005, and part from the 2001 exchange programmes was made in order to evaluate the improvements in ageing precision among institutes by the end of the meeting.

Results show that the overall level of agreement and precision in anchovy age determinations are satisfactory: Most of the anchovy otoliths were well classified by most of the readers during the 2006 workshop (with an average agreement of 92.7% and a CV of 9.2%). CVs were on average smaller than 15% for any age, although individual CVs for ages or readers might be as high as 30-35% in particular ages. However, the percentage of agreement of the new readings and the coefficient of determination are similar to those achieved during the 2005 otolith exchange programme: no neat improvement was achieved.

This may well be due to the fact that the agreement during the exchange otolith programme was already high and hence the expectation of improving was a matter of solving the most difficult otoliths. In addition, current year's readers have nowadays acquired quite a long experience in age reading in comparison with the workshop carried out in 2002 and some of their criteria are quite well established, hence polishing discrepancies in the most difficult otoliths is certainly a hard issue.

In the 2006 otolith workshop, as in the 2005 exchange programme, the difficulties become more relevant for the otoliths from the second half of the year (Percentage of agreement of 90.7% and CV of 14.1%). It is unclear by how much errors of individual readers can propagate to the age determinations of catches or suveys. Maximum errors detected in the workshop of about 50% in the percentage of age 2 during the second half of the year are probably an overestimate of the error induced in the catches for that period of the year.

The workshop served to make explicit that major difficulties encountered refer to the discrimination between true winter rings from summer and autumn checks: There are marks after the first winter ring which could be interpreted as checks formed during summer or autumn time, C15 or C18, or as additional winter rings. This is hard to be elucidated for fishes caught in summer and autumn time when the expected total annual growth is not yet achieved and it is difficult to assess. This makes confounding ages one with older. In these circumstances the criteria of complete annual growth to judge different potential interpretations of the otoliths become of a lesser support than in Spring, and some subjective judgement of the strength of the marks observed and their distance to the first winter ring become the sole criteria which can be applied. Spring otoliths, prior to the start of the annual white growth band, are easier to be aged.

The problems encountered for the second half of the year are confirmed with the results of the subset of otoliths for the same half of the year from the 2001 anchovy exchange programme. Several photos of otoliths of simple and straightforward age determination and others of major difficulties are presented and discussed in the report.

Further research for solving some difficulties in discriminating between 0 and 1 year old otoliths are suggested by the examination of daily micro increments.

Next workshop is suggested to be carried out in 4 years.

3.1.3 Redfishes

Since the previous workshop in 1995, more than 300,000 otoliths from redfish (mainly *Sebastes marinus* and *S.mentella*) were collected from three major areas: Northeast Arctic, Iceland-Greenland-Irminger Sea, and Newfoundland-Flemish Cap. This sampling effort reflects the fisheries and scientific interest in the species. However, in total only 22% of the otoliths collected have been read, reflecting the low capacity available to participate in age determination, especially for some stocks. This is partially due to the lack of trained technicians and the lack of standardized application of existing accepted and recommended ageing criteria. Currently, six laboratories from five different countries determine the age of redfish on a routine basis, although with varying intensity, with two countries only reading them occasionally. There is a certain degree of heterogeneity among laboratories regarding the methodology used. Otoliths are read across laboratories using three different cross-section methods: broken and burnt, thin sections and broken and baked. Although there are some optical differences in how the annual growth patterns are revealed, the patterns themselves are predetermined and the same basic criteria are used to differentiate annuli from checks for all three methods. The technical pros and cons of each were discussed during the workshop, and comparative age readings were performed to estimate bias and precision between readers and methods.

Clearly, species and/or stocks yielded different biases and variation among readers. The bias varied considerably for Icelandic S. marinus between readers and relatively high variation in age estimates was observed for all readers. On average, the broken-and-burnt otoliths were aged 3–4 years older than the broken-and-baked otoliths. This was similar for Irminger Sea S. mentella where between-reader bias and high variation in age estimates was evident (Figure 3.3). Only slight differences between methods were detected, even when readings from the same reader using different otolith preparation techniques were analysed (Figure 3.4). The overall bias was comparably low for the northeast Arctic S. mentella stock and although a relatively high variation in age estimates was observed for some readers, in general, the readers produced similar ages.

As random differences with respect to interpretations and age estimate errors will always exist, the occurrence of such differences may only be reduced through frequent otolith exchanges and comparative readings. The most serious systematic error or bias discovered during the workshop was that some participants were not taking the thickness growth (proximal axes) of the otolith cross-section into consideration when ageing, resulting in underestimation of age. It was also discovered that some readers who counted only along the distal dorsal axis, tended to misinterpret checks as annuli (over-ageing) and thus by chance got the same age as if they had counted on a proximal axis. Recommended and documented criteria indicate that a growth zone should not be identified as an annulus unless it can be traced over a certain distance. An often difficult task is the correct identification of the first few “juvenile” annuli that frequently form in association with prominent checks. Some of the age differences originated from this problem. Measurements of the location of the first few annuli on otoliths from known-age fish or on very clear otoliths have the potential to minimize over-ageing due to counting checks formed in the during the first years. The measurements could serve as a guideline in all routine readings for the same stock.

During the workshop, it was pointed out that only few studies on age determination and validation of redfish ageing have been published. Validation by following strong cohorts, as those conducted for Flemish Cap redfish, can be a great help confirming interpretation of the juvenile portion of the otolith growth pattern where many checks are observed. Published radiometric research inferred a slight tendency towards underestimation of age by traditional annulus counts.

Apart from the Fish Ageing Lab at the Pacific Biological Station, Canada, only Norway has implemented a full Quality Assurance system for production redfish age determination. It was agreed that each laboratory should implement a confidence index (readability) for assigning a quality level to each age reading. For circulated otolith material, the different labs are requested to include their quality assignment as a parameter. In addition, it is recommended that reference material of previously-read otoliths should always be at the readers' side when reading new otoliths. This will help to avoid drifting away from the standards of criteria application when reading.

During the workshop, the information available on redfish growth studies was presented. The calculated growth parameters varied considerably between readers and only slightly between ageing methods. The growth curves produced by the thin-sectioning and break-and-burn methods, however, did not differ significantly. The group noted that, only in three cases, the data was divided into sexes. Since it is known that males and females show different growth trajectories in redfish, combining sexes prevented conducting correct analyses of the growth. Thus, it was agreed that from 2007 onwards, age information will be separated by sex. It was acknowledged that, based on the different life history and biological experiences, differences in growth patterns and hence in its interpretation among species and stocks may exist. In general, there was the perception that readers should know about the biology of the species to interpret the otolith growth pattern properly. It was agreed that considerably more effort and research is needed in this direction in particular for measuring growth increment patterns in the otolith. This technique has been applied for Pacific Sebastes species to assist in identifying growth patterns related to the biology of the species/stock, as well with environmental features.

Only a few of the redfish stocks defined in the North Atlantic are assessed analytically. The high bias and low precision observed in age determination of redfish have prevented the use of age data for other redfish stocks. The effects of age reading error on the assessment have not been tested thoroughly yet. The workshop recommends that all labs providing age data for assessments for a certain stock should investigate uncertainties in assessments due to age readings in redfish. Within the next two years, these analyses should be performed on those stocks that are currently assessed analytically (Icelandic S. marinus, Northeast Arctic S. marinus).

The studies conducted since 1995 to combine age readings based on scales and otoliths showed that it is virtually impossible to derive appropriate conversion factors. In spite of the 1995 workshop recommendations, Russia has continued to read scales of S. mentella in the Irminger Sea, but has also collected several thousand scales and otoliths from the same fish in the period 1999–2005. This collection is a great opportunity for further research supporting standardizing redfish ageing methodology. Calibration exchanges will be carried out where sub-sets of these otoliths are sent to other age reading labs for comparative reading.

The workshop agreed on several otolith exchange sets for inter-calibration between ageing labs within the next two years. The results of this exchange should be analyzed during a workshop to be held in 2008.

Recommendations

Regarding otolith reading and growth estimation:

- Otolith annuli along the proximal growth axes have to be taken into account during reading.

- Each reading lab should develop, implement and document a confidence (readability) index.
- The first few annuli on known-age fish and on very clear patterned otoliths from each species/stock should be measured to facilitate the identification of the likely position of these annuli.
- Reference material from past read otoliths should always be at the readers' side when reading new otoliths.
- Comparisons of otolith preparation methods (break-and-burn, break-and-bake, thin-sectioning) and the analysis of related differences should be continued.
- The preparation efficiencies per otolith of the three methods currently used for redfish age determination need to be properly assessed (i.e. time for all steps from pulling otolith out of storage unit to ready-for-ageing).
- As agreed in 1995, it is strongly recommended to use only otoliths for age determination of redfish.
- For sex-specific estimation of growth, age determinations should be reported by sex.
- Otoliths from the Russian collection of scales and otoliths from the same fish should be read again by Russian experts, considering the proximal growth zones, and also read by other countries' experts for comparisons.

Regarding quality in age data:

- The workshop agreed on several sets of exchange samples for the purpose of inter-calibration between ageing labs within the next two years.
- All labs providing age data for assessments for a certain stock should investigate uncertainties in assessments due to age readings in redfish, especially for those stocks that are currently assessed analytically (Icelandic S. marinus, NE Arctic S. marinus, Flemish Cap beaked redfish).
- Quality Control/Quality Assurance (QC/QA) should be implemented in all labs performing redfish age readings. As a first step, the reading confidence index (see above) should be tested within otolith exchanges, agreed in the near future and implemented. Specific procedures such as documentation, routine exchanges, reference collections, precision testing systems, etc. should be discussed by correspondence, agreed and implemented within the next two years.
- The next workshop should be held in 2008 to analyse the results of the exchanges, to further standardise ageing methodologies and practices and to monitor the progress in QC/QA implementation.

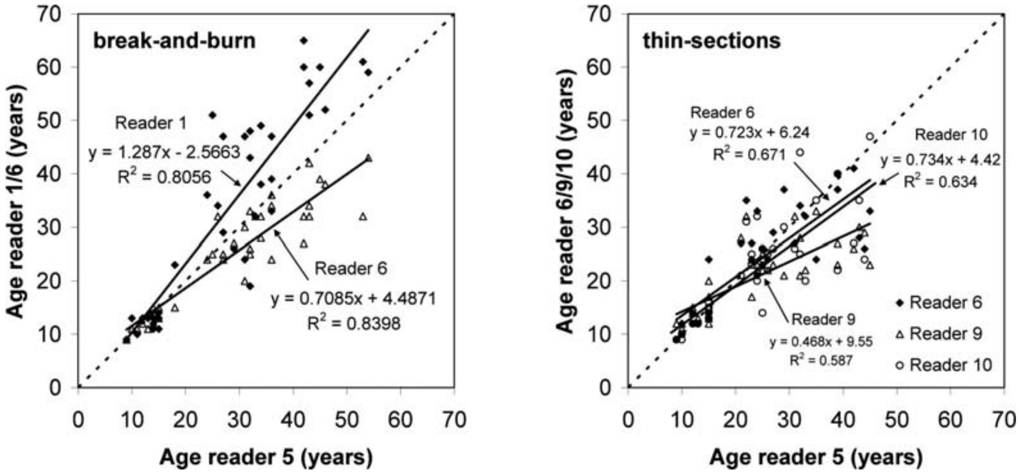


Figure 3.3: S. mentella Irminger Sea (ICES Div. XIVb, deep). Comparison of ages read by readers 1 and 6 with ages read by reader 5, using the break-and-burn technique (left panel), and comparison of ageing results of readers 6, 9 and 10 with reader 5, using thin-sections (right panel). The 1:1 equivalence is indicated by dashed lines, and the linear regressions are shown as solid lines, with the corresponding regression formulae and coefficients (R2).

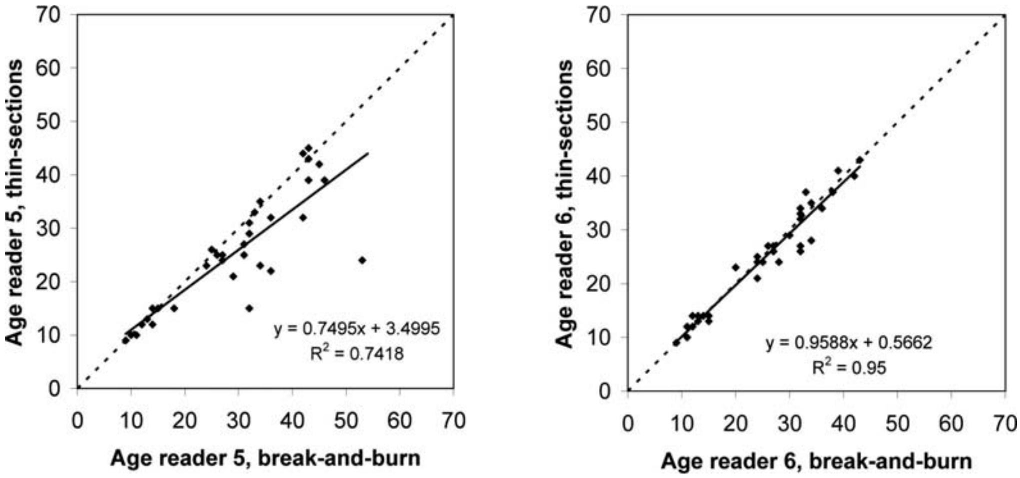


Figure 3.4: S. mentella Irminger Sea (Div. XIVb, deep). Comparison of ages (in years) read by reader 5 (left panel) and reader 6 (right panel), using different otolith preparation methods. The 1:1 equivalence is indicated by a dashed line, and the linear regression is shown as solid line, with the corresponding regression formula and coefficient (R2).

3.1.4 Greenland Halibut

The workshop was held in St. John's, Newfoundland and Labrador, February 21-24, 2006. Prior to the workshop there was an exchange of otoliths and scales collected during the 2005 EU survey in SA3. During the workshop each lab presented information on ageing methods using scales, otolith whole and otolith section, no two labs were using the same method. Research related to methods and age validation was also presented. Observations have been made in recent years that suggest Greenland halibut are longer lived and slower growing than previously thought. The otolith cross-section methods presented during the workshop indicated older ages at a given length compared to surface ages. For the Alaskan stock it was suggested the methods deviate beginning at approx. 60 cm or age 7 yr. For the stock in NAFO SA0 deviations in the bias plot of whole versus section ages began at about age 15 (approx. 50 cm). For the Northeast Atlantic stock off the Norwegian coast ages derived from a revised whole otolith method began to deviate beginning at ages 4–5 (approx. 40 cm). Dark "eatureless" translucent margins on large otoliths indicate an accumulation of compacted small annual zones. Greenland halibut have a larger size at maturity (40 cm for males and 60 cm for females) which is typical of many long-lived species. It became clear during the workshop that bias between age readers could not be solved by simply agreeing to common interpretation practices. Workshop participants provided several conclusions and recommendations.

3.1.5 Horse Mackerel

Following a recommendation from PGCCDBS (ICES, 2006) a workshop on age calibration of horse mackerel was carried out. The last workshop had been held in 1999. Furthermore, the age compositions provided to WGMHSA (Working Group on the Assessment of Mackerel, Horse Mackerel Sardine and Anchovy) and the results of an informal small-scale otolith exchange indicated that ageing problems may exist.

The objectives of the exchange and workshop were:

a) In general, improve the quality of horse mackerel readings by international calibration.

b) In particular, attempt to resolve the observed differences between countries.

c) Estimate the accuracy and precision of the age readings before and after the inter-calibration.

d) Take into account differences between areas and methods.

e) Training of new horse mackerel readers.

The exchange and the workshop were carried out in 2006. Eight experienced readers participated in the exchange, seven of which also participated in the workshop. Five trainees participated in the workshop, only one of these trainees also participated in the exchange. All countries providing age reading data to the WGMHSA were represented in both the exchange and the workshop by an experienced reader.

Portugal, Germany and The Netherlands provided otolith sets for the exchange. The sets represented different otolith preparation methods and stocks (Table 3.1). Sets G & K consisted of otoliths from the extremely strong 1982 year-class and hence the age is considered to be known (with a certainty of approximately 95%). Set NL-VIIe-2003 focused on the younger fish which were expected to present problems based on the informal small-scale otolith exchange.

The experienced readers were accustomed to different otolith preparation methods and different growth patterns associated with the different stocks. Generally, the readers had more difficulty if they were reading material they were not accustomed to.

Horse mackerel is regarded to be a difficult species to age and this is reflected by the results of the exchange. The agreement between the experienced readers was low, especially for otoliths from the Southern stock. For sets G and K the agreement with the modal age was higher than with "true" age. Comparison with the "true" ages showed an overall tendency to underestimate the age.

Table 3.1. - Description of the otolith sets included in exchange and percentage agreement for the 7 experienced readers participating in both the exchange and the workshop.

Otolith set (preparation method)	Stock	Months	Size range	Age range	Number of otoliths		% agreement	
					total	exchange	"true" age	modal age
Set PT-IXa-2005 (broken-burnt & w hole)	Southern	1-3	21-42 cm	2-21	51	49	n.a.	38%
Set PT-IXa-2005 (sections)	"	"	"	2-24	51	50	n.a.	37%
Set DE-IV-2005 (sections)	North Sea	7-8	19-33 cm	1-13	175	48	n.a.	62%
Set DE-VIId-2005 (sections)	Western	10	18-37 cm	1-21	233	51	n.a.	58%
Set NL-VIIe-2003 (sections)	Western	8	16-20 cm	1-4	100	23	n.a.	68%
Set G (broken-burnt)	Western	1-5	24-35 cm	4-13	170	48	39%	54%
Set G (sections)	"	"	"	3-15	170	48	43%	53%
Set K (sections)	Western	9-11	14-30 cm	1-12	153	38	36%	56%

For the Dutch sets (set G, set K and set NL-VIIe-2003), the images of the sectioned otoliths were digitised and annotated by the readers participating in the exchange. During the workshop these annotated images were used to discuss differences in interpretation. A great deal of attention was paid to the interpretation of the first annuli, both in young fish as well as in older fish. This point appeared to be the mayor cause of differences in interpretation. In some otoliths split rings or the interpretation of the edge of the otoliths caused problems. All these features were discussed and eventually consensus was reached for all otoliths put up on the screen.

For a small set of the Southern stock otoliths provided by Portugal, images of sectioned otoliths were digitised during the meeting. These images were discussed in the group. In some cases consensus could be reached on how to interpret the otolith, however in other cases it seemed to be impossible to age the otolith. Ageing of the Southern stock otoliths appeared to be less difficult when using broken-burnt material in stead of (images of) sectioned otoliths.

A subset was extracted from set G (subset G1) and included in the exchange. A second subset (G2) was extracted from set G and presented to the readers during the workshop. Both subsets consisted of 4–5 fish per age group in the age range of 4 to 13 ("true" ages), and both subsets were comparable in size distribution (24–35 cm) and catch months (mainly January-March, some from April-May). At the end of the workshop all readers re-read subset G1. The results of the 7 experienced readers clearly showed an improvement from subset G1 to subset G2, and from subset G2 to the reread of subset G1 (Figure 3.5). Although it can be argued that the readers may have remembered their first age readings of subset G1, this seems unlikely because the second reading was carried out 2–7 months later and the readers were not informed that they were reading the same set.

A similar select, re-select, and reread of first selection was carried out for 2 small subsets from the set containing only very young fish (NL-VIIe-2003). The percentage agreement increased to almost 100%. However, this exercise served more as a repetition on how to interpret the first annuli than a reliable measurement of accuracy and precision because the readers were aware that the subsets contained "more of the same".

Most of the trainees only participated in the workshop, so subset G2 was the first set for them to read. Comparison of their results for subset G2 and the results of the consecutive age reading for subset G1 showed a tremendous improvement in both accuracy as well as precision.

Recommendations

On horse mackerel ageing methods

- Innovative research should be carried out to develop better methods to enhance the contrast between opaque and translucent in sectioned otoliths (especially for Southern stock).
- Although reflected light is the preferred method for reading sections, alternating with transmitted light can sometimes help to interpret the structures.

On workshops

- Frequent workshops should be held for difficult species such as horse mackerel (once every 3–5 years).
- An exchange (shortly) before workshop increases the effectiveness of the workshop.
- Readers attending the workshop should also participate in the exchange.
- Be aware and make clear decisions on how workshop time is allocated over reading vs. discussing images, different areas, different methods, etc.

On training

- Taking trainees to workshops offers an opportunity for a quick start of the learning process.
- The best way to learn is by putting up images on the screen and jointly discussing the interpretation.

On reference collections

- Collate an image collection from the “known” age set G, in which the agreed interpretation is annotated in a separate layer (planned by The Netherlands for 2007).

On validation

- In general, calibration alone is not sufficient, validation is also required.
- For horse mackerel, validation of the growth patterns in the first years of life by day-ring analyses. This is not covered (sufficiently) by the “known” age collections based on an extremely strong year-class.

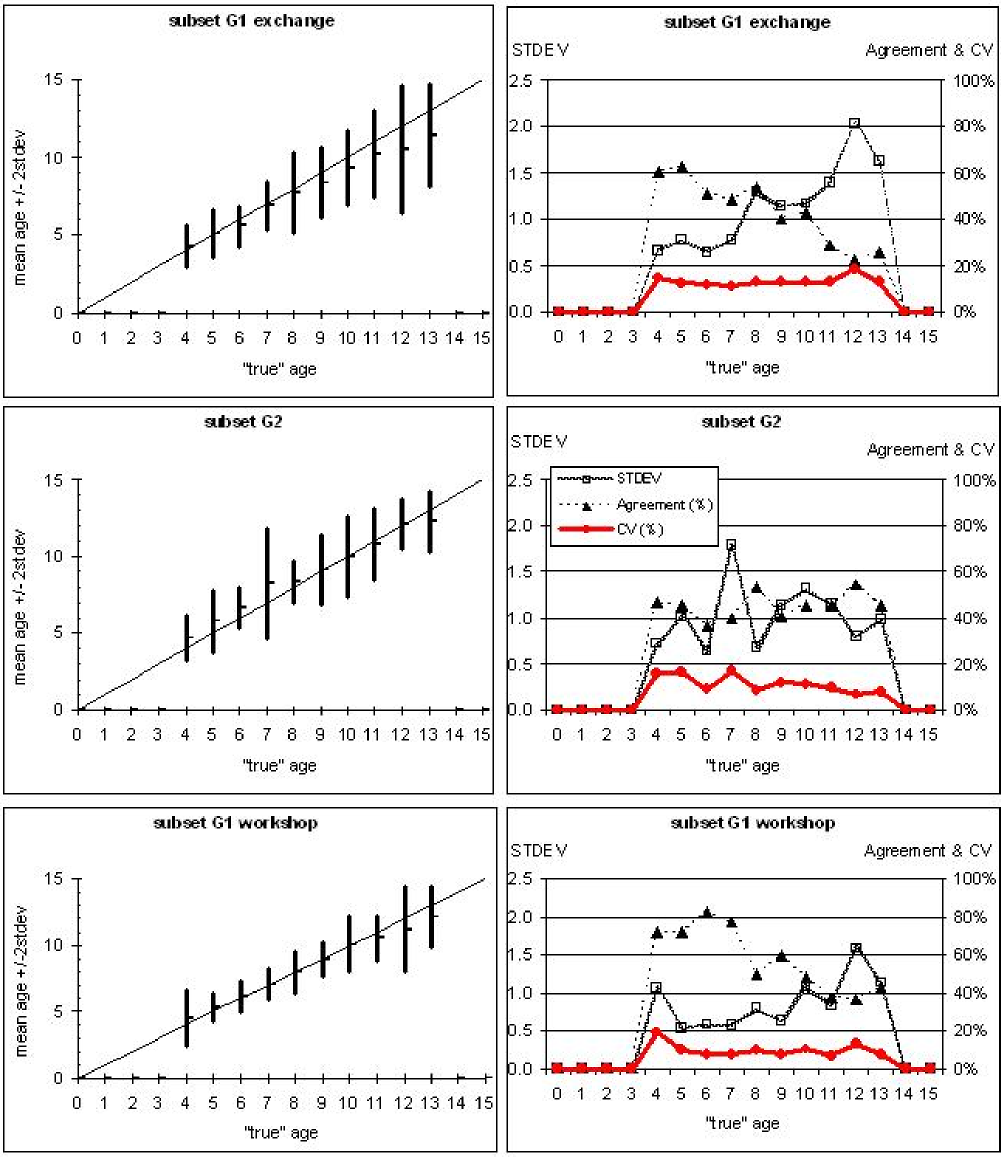


Figure 3.5 - Results of the 7 experienced readers who participated in both the workshop and the exchange. Top panels show the exchange results for subset G1, middle panels show the workshop results for subset G2 (which was designed to be identical to set G1), and bottom panels show the results of the reread of subset G1 during the workshop.

3.2 2006 Otholits Exchange Programmes

3.2.1 Flounder

The otolith exchange was started in spring 2006. In total 6 samples were prepared for the exchange containing 275 otoliths. Two of them consisted only of flounder otoliths. 4 flounder otolith samples were sent to the Institute of Coastal. Research in Oregrund, Sweden, where one of the otoliths was sliced and stained thus each of these samples consisted of two sub-samples - whole otoliths and otolith slices. The samples were sent around the Baltic Sea and in the age determination 10 age readers from 7 countries participated. At the end of the exchange two samples were treated also by age readers from CEFAS UK, who also participated in the workshop. The results of the exchange have been analysed and presented at the Workshop.

3.2.2 Saithe

The countries involved are France, Sweden, Denmark, Germany, Faroe Islands, UK-England, UK-Scotland, Ireland, Norway and Iceland. Two sets of otoliths have been prepared from ICES sub-area IV and sub-area VI. The exchange is about to start (March 2007) and is expected to end up by the end of 2007. The analysis of the result will show if a workshop is necessary or not.

3.2.3 Sole

The Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS) meeting in March 2005, identified Dover sole as one of the species requiring confirmation of the ages being assigned by Fisheries Institutes. The last exchange on sole age determination was organised by Cefas (Lowestoft, England) and a workshop held in 2002 in Ostend, Belgium.

The planning group indicated that Cefas (Lowestoft, England) should be responsible for organising an otolith exchange in 2005 and a subsequent workshop if this was thought necessary. All the relevant European institutes were contacted and the following countries all expressed an interest in participating in the exchange:

England, Netherlands, Belgium, France, Ireland, Denmark, Germany and Sweden. Sweden does not age soles but expressed an interest in taking part in the exchange to gain experience of other species.

The objectives of the exchange were:

a) To investigate the levels of agreement on age readings.
b) To analyse the agreement between areas.

Methods

A collection of 354 otoliths were prepared from the following six ICES areas: IVc, VIId, VIIa, VIIe, VIIfg and VIII. All the otoliths came from market or research samples. All the samples were sectioned and stained with neutral red dye and acetic acid, then mounted between two glass slides to protect the surface of the sections. The VIIfg sample was from February but the rest covered the period from April – August during which time the protein band is formed and is considered to be the most difficult time for interpreting the ring structure and where most mistakes/differences would occur.

Digitised images of all the otoliths were prepared and sent out with the samples. All the otoliths were digitised using the same settings on the microscope so that the images could be compared by size to each other if required.

Results

The data was analysed for each area separately. There was some uncertainty with the results for one of the French participants possibly caused by clerical errors in recording the ages rather than poor reading. This has not been resolved yet and the analysis includes these uncertain readings.

Table 3.2 - summarises the results for each ICES division or sub-area. In each case the results are for 19 readers and exclude the Swedish participants.

AREA	% AGREEMENT	RANGE	NUMBER ICES READERS WITH <90% AGREEMENT
IVc	90.4	70.6 – 100	4 of 9
VIIa	94.7	81.3 – 100	0 of 4
VIId	90.4	46.6 – 98.9	4 of 6
VIIe	88.9	64.0 – 98.0	2 of 3
VIIfg	89.5	66.1 – 96.6	2 of 3
VIII	79.5	23.1 – 92.3	3 of 3 <85%

Conclusions and Recommendations

- Sole from most areas are considered to be relatively easy to age as long as the sections are prepared accurately and care taken when ageing. As expected the area VIII samples which are generally regarded as more difficult to read gave the lowest agreement.
- An agreement of 90% with the modal age should be considered as normal for all areas except VIIh and VIII. Readers with a relatively small amount of experience should be able to achieve this and any lower figure is a cause for concern especially for those supplying ages to an ICES working group.
- Only in one area, VIIa, did all readers providing data to ICES AWGs exceed the 90% agreement expected from experienced readers.

It is recommended that:

- countries obtaining agreements less than 90% for readers supplying data to ICES working groups should review their procedures and training protocols
- a workshop for sole is not necessary in view of the generally high agreement but there should be further, small, within region exchange early in 2007 between these countries and experienced readers in other countries to ensure that there has been an improvement in ageing
- Any future exchanges should consist of samples supplied by each Institute, as the accuracy and quality of the sectioning may be just as important as the reading; this aspect should also be subject to appropriate quality control
- the final analysis should only include a separate analysis for readers providing ages to ICES working groups

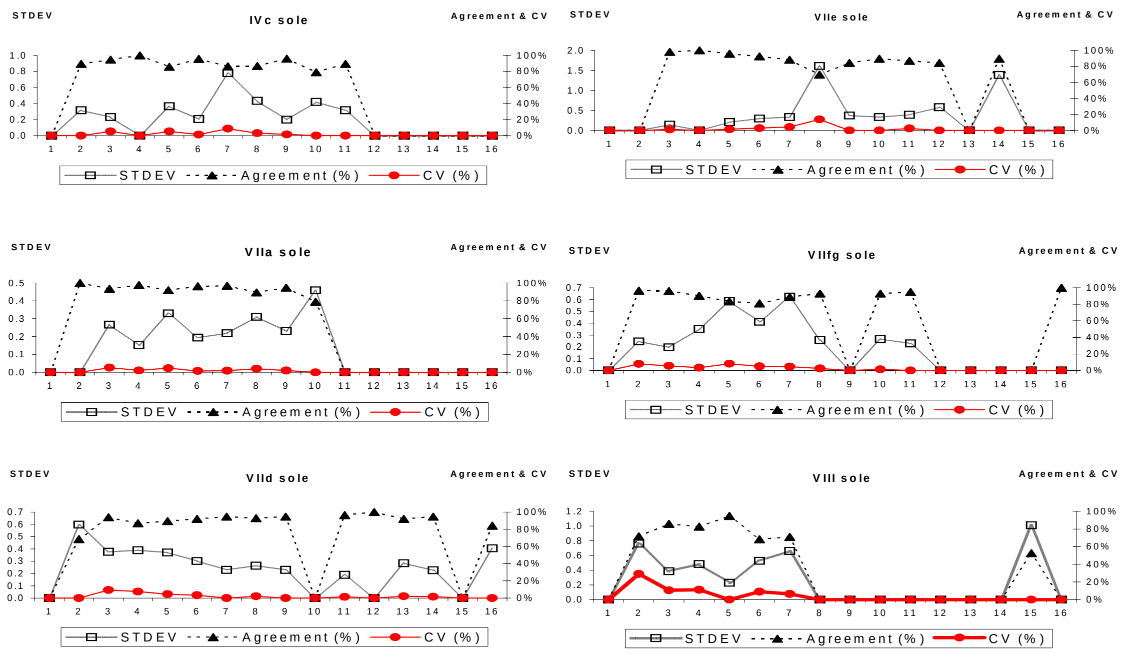


Figure 3.6 - Results of the sole exchange in 2005. The figures give the % agreement, CV(%) and Standard deviation from the modal age for each ICES area based on all readers except Sweden.

3.2.4 Turbot & Brill

PGCCDBS identified turbot and brill as two species which required an international otolith exchange. No ageing workshop has ever been carried out for these two species within the ICES community, probably because they are not (yet) included in the annual VPA assessments carried out by the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) and the Baltic Fisheries Assessment Working Group (WGBFAS). Nevertheless, several countries collect market (age) samples for turbot and brill, partly under obligation by the EU Data Collection Regulation.

The objectives of the exchange were:

a) Detect any potential age reading problems.

b) Estimate the accuracy and precision of the age readings.

Three otolith sets were included in the exchange: a North Sea brill set (N=99), a North Sea turbot set (N=110), and a Baltic turbot set (N=96). Nine readers (from UK, Belgium and the Netherlands) participated in all three exchanges, four additional readers (from Sweden, Estonia and Poland) participated in both turbot exchanges, and one additional reader from (Latvia) participated in the Baltic turbot exchange.

The agreement between the nine readers for the North Sea brill set was very high and no bias between the readers is evident (Figure 3.7).

The agreement between the 13 readers for the North Sea turbot set was lower and there is small relative bias in the youngest and older age groups (Figure 3.7).

The agreement between all 14 readers for the Baltic turbot set was much lower, the CV much higher, and there is a strong relative bias in the younger and older age groups. The relative bias and high CV are mainly caused by three readers (from Poland and Latvia) who appear to have a completely different interpretation of the Baltic turbot otoliths. If these three readers are left out of the analyses, then the results of the Baltic and North Sea turbot sets are more or less comparable (Figure 3.7).

Although brill and turbot are closely related and their ecology is similar (e.g. time of spawning and settlement, location of nursery areas), differences in growth patterns occur. A very small first ring often occurs in turbot otoliths, causing uncertainty on whether or not this is a true annulus. This feature does not occur (frequently) in brill otoliths.

Recommendations

- For turbot, a workshop including both North Sea as well as Baltic otoliths.
- For turbot, validation of the growth patterns in the first year of life using day-ring analyses.

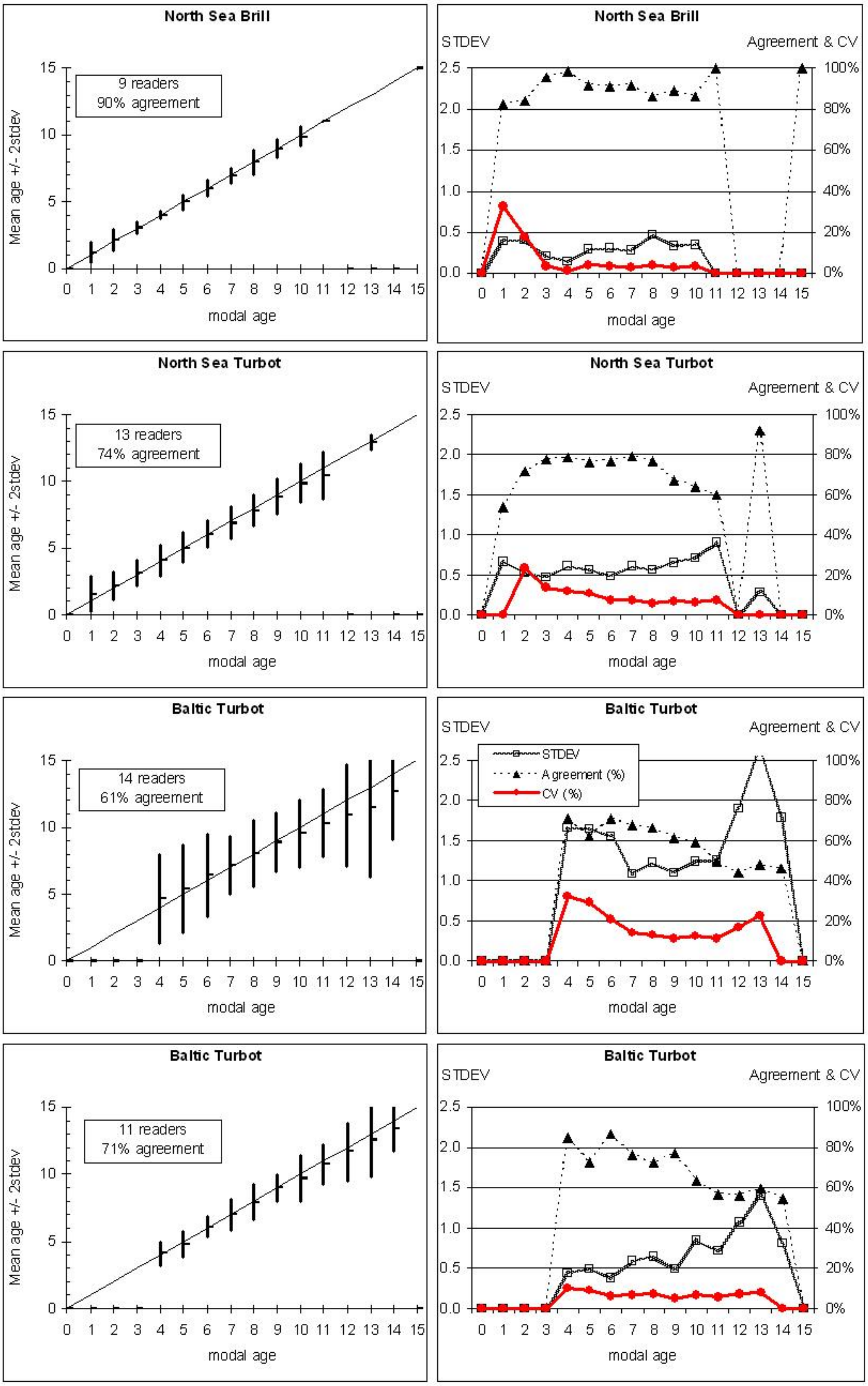


Figure 3.7 - Results of the North Sea brill exchange (top row), the North Sea turbot exchange (2nd row), the Baltic turbot exchange including all readers (3rd row), and the Baltic turbot exchange excluding 3 of the 14 readers (bottom row).

3.2.5 Grenadier

The countries involved are France, Spain, Faroe Islands and UK-Scotland. The otoliths exchange will end up mid-March and the first analysis shows that the agreement is poor between the readers. Each country will interpret a set of reference digitised pictures before the workshop. The workshop (WKARRG) will be held in Boulogne-sur-Mer (France) from 4 to 6 September, 2007.

3.2.6 Red mullet

The counties involved are France, Italy, Greece, Spain, Cyprus and UK-England. The otoliths exchange will end up by the end of April, and comprises sets of otoliths and digitised pictures prepared from the Mediterranean (*Mullus barbatus*) and the Eastern channel (*Mullus surmuletus*). If the agreement between readers is poor, a workshop should be held in 2008.

3.3 Methodological Workshops

3.3.1 [WKMAT] - Workshop on Sexual Maturity Sampling

Following the recommendation of PGCCDBS (ICES, 2006a) a Workshop on Sexual Maturity Sampling (ICES, 2007b) was held in Lisbon (Portugal), 15–9 January, 2007.

The Data Collection Regulation (DCR, EC Reg. 1543/2000) programme covers extensive sampling of maturity stages, but up-to-date results are rarely used in the assessment of Spawning Stock Biomass (SSB). In several cases, calculation of the proportion of mature fish is based on information collected far outside the spawning season, or on incomplete coverage of the stock distribution area. Market sampling, fishery independent stock surveys and observer programmes provide information on the timing of the spawning season. Samples shortly preceding, or in the early phase of the spawning season may achieve adequate spatial coverage. Improved sampling programmes, further analyses and consideration of the consequences of inter-annual variation in maturity on stock assessments, will further eliminate the current problems in the maturity sampling programmes.

The DCR programme covers extensive sampling of maturity stages for stocks within Community waters, mostly on a tri-annual basis. Currently it prescribes a predefined precision level (level 3, the highest), but sampling strategy and the actually achieved precision have hardly been addressed yet. ICES stock assessments are often based on time invariant maturity ogives, derived from information collected outside the spawning season and/or covered the spatial distribution of the stocks incompletely. This Workshop was set up to develop sound approaches to maturity sampling for the wide range of species included in the DCR. Appendix XVI of the DCR lists all stocks for which maturity data need to be collected. This includes over 150 stocks, each of which has its details and peculiarities. Rather than specifying maturity sampling protocols for each and every species/stock, the Workshop addressed species groups with similar life history traits and sampling requirements.

Implementation of improved maturity sampling protocols necessarily requires detailed planning at the species/stock level, in the relevant Regional Coordination Meeting. For individual stocks, maturity information is usually collected by several Member States and institutes. The proper identification of maturity stages for a small number of species/stocks will be the subject of a series of workshops organised later this year (WKMSHM, WKMSMAC, WKMSCWHS). In the current workshop, it was realised that the coding schemes in use (varying from a 4grade scale to a 10grade scale), and the interpretation of particular stages (in particular immature versus post spawning or skipped spawning), might give rise to misinterpretations, both with respect to the actual biological maturity stage, as to the assessment of the spawning stock biomass. An improved five stage maturity scale is proposed, which accommodates for these problems, while allowing consistent mapping of the more detailed scales. It is recommended that this proposal is further considered by the species specific workshops later this year.

Table 3.3 - 5 stage maturity scale proposed

FEMALES	STAGE	MALES	MATURES/IMMATURES
Ovaries translucent without visible oocytes.	IM Virgin	Stringlike and translucent testes.	Immature
Larger, opaque ovaries, individual opaque/yolk oocytes often visible.	MI Maturing	Larger and grey-whitish testes.	Mature
Even larger ovaries and with translucent/hydrated oocytes (running).	MA Spawning	Larger white testes with sperm that can be extruded under pressure or visible in the ducts.	Mature
Ovaries slack with residual eggs or already in a recovering stage (lighter colours, smaller and with no occytes visible).	SP/RE Spent/Recovery	Slack testes and blood stained or already in a recovering stage (no longer blooded, presents ribbon lying aspect).	Mature
Contracted and greyer ovaries.	OS Omitted spawning	Contracted and greyer testes.	Sexually mature individuals not contributing to the SSB in the current year.

The majority of species/stocks covered by the DCR spawn during a limited time interval of the year, nearly always in restricted spawning areas. Sampling protocols, therefore, should accommodate for temporal and spatial variation in maturity composition. Additionally, length selectivity of gears might influence the sampling. Market sampling, stock surveys and observer programmes constitute sources of information on the maturity status of stocks. Market sampling most easily provides full temporal coverage, but catches might be stripped before landing, or the fishery may target the spawning component of the stock disproportionably. Stock surveys, primarily set up for year class abundance estimation, will not necessarily match the spawning season. Manpower on observer trips often does not allow for additional sampling for maturity.

Sampling protocols on board research surveys, as well as market sampling procedures, differ between countries, between stocks, and even between different surveys for the same stock. Evidently, problems occur with respect to the sampling protocols, as well as the raising of the data for usage in stock assessments. However, it is also apparent from this overview, that up-to-date information on maturity is often not used by assessment working groups.

PGCCDBS believes that the raising procedures applied to estimate maturity ogives is essential and following the findings of WKMAT, that clearly stated that, at current, few raising procedures are proven to be appropriate, proposes a Workshop on Estimation of Maturity Ogives for Stock Assessment (see Annex 5).

3.3.2 [WKDRP] - Workshop on Discards Raising Procedures

Following PGCCDBS 2006 recommendations (ICES, 2006a) a Workshop on Discards Raising Procedures (ICES, 2007a) was held in San Sebastian (Spain) from 6 to 9 February, 2007. The objectives were to perform different raising procedures on a set of discards data coming from different countries and different métiers, and identify the advantages and limitations of each procedure. In addition, the workshop had to review the data structures commonly used at a national and international level and agree on a common format for analysis purpose.

The main outcome of the workshop was to propose a raising procedure key in order to choose the best raising method to use. The general idea is to use more than one raising method, compare them and choose the least biased and more precise. The discard raising procedure is described in the following raising procedure key:

3) Is the sampling representative (mean length of vessels and mean auxiliary variable sampled compared to the population, see section 4)?

    3.1) Yes — Raise by trips AND go to 2

    3.2) No — DON'T raise by trips and go to 2

4) Has the quality of the data used for raising been established (no misreporting and availability, see section 4)?

    4.1) Yes — Go to 3

    4.2) No — Go to 6

5) Are the discard and auxiliary variable linearly related (significant relationship and positive slope)?

    5.1) Yes — Raise by all variables and Go to 4

    5.2) No — Go to 6

6) Compare the results of the different raising procedures:

    6.1) Similar (<10-20% difference) — Go to 5

    6.2) Dissimilar (>10-20% difference) — Go to 1 and find the cause of the difference!

7) Choose a method that is the least biased (trips if applicable, ratio if regression passes through origin or variable with less concerns) and most precise (compare CV's).

8) When there is no suitable raising procedure then identify the problem, identify the population sampled (different stratification/sampling?) and start again!

    8.1) — Go to 1

PGCCDBS appreciated this initiative and was of the opinion that the raising procedure key will help scientists dealing with discard data to provide better and more comprehensive estimates at an international level. The exchange format proposed by the workshop was discussed and the PG argued for some changes in the content of the forms. These changes concern (i) the description of the fishing activity where the regional level becomes the reference for exchanging information and (ii) the addition of the fleet segment as recommended by the Nantes workshops (Anon., 2006a) and SGRN-06-03 (Anon., 2007). The WKDRP report has been modified accordingly after approval by all workshop participants. The PG recommends the use of the three tables described in the report of WKDRP, for any international exchange of discard data.

Recommendations from the workshop

1) Do exploratory analysis of the sampled data before the start of the analysis, to check for mistakes and extreme discard behaviours.

2) Check if the fishing trips sampled are representative of the fishing fleet, by comparing the mean length of the vessels sampled and the average of the auxiliary variable per trip against the same parameters at population level.

3) Follow the Raising Procedure Key to choose a raising procedure specific to your data.

4) Try different procedures (simple, ratio or models) when raising discards.

5) Compare the results between procedures.

6) When pooling discard data from different raising procedures, take into account that different procedures give different results, and specifically that fishing hours will probably overestimate discards compared to total landings.

7) Do not apply the wrong method to raise discards!

8) Unbiased result/procedure is preferable than a precise one.

9) In the future if information regarding hauls is available at population level, then a second-stage estimator should be used.

3.4 Liaison Meeting

The RCM recommendations were already reviewed by the 3rd Liaison Meeting (LM) held in Brussels, 14–15 Nov 2006. PGCCDBS therefore chose to comment only upon the recommendations from RCMs addressed to the PGCCDBS by the LM. Extraction of information from the LM report was, however, not straightforward due to some inconsistencies between chapters in the report.

Recommendations for consideration by ICES PGCCDBS:

- The RCM North Sea and East Arctic recommends that harmonisation of sampling and compilation of fishery dependent data should be made.
- The RCM North Sea and East Arctic recommends that if an area is covered by one dedicated trip per year only, the effort put into this single trip could better be allocated to other fleet segments ensuring better coverage of these segments.
- The RCM North Sea and East Arctic recommends that to start the harmonisation process otoliths should be sampled in homogenous strata as this would give the opportunity to combine ALKs within an area.

The PGCCDBS supports all initiatives that increase quality, transparency and harmonisation of fishery-dependent data. It is, however, the view of the Group that all the detailed aspects of regional cooperation in sampling of fishery-dependent data should be handled by the relevant RCM.

- The RCM North Sea and East Arctic recommends that SGRN should set up a template for a common manual. All MS are then recommended to use this template when writing manuals.

The PGCCDBS assumes that this recommendation will be handled by SGRN.

- In order to keep the general work in the different RCMs in compliance, the RCM Baltic recommends that the ICES PGCCDBS need to establish general principles and guidelines for all RCM work.

PGCCDBS agrees with the LM comments, underlining that this task is not within the scope of PGCCDBS.

The Group further takes on the recommendation from the LM to set up a workshop on ageing of Greenland halibut in 2008 (Annex 5).

3.5 ICES Assessment Working Groups

The Group reviewed most of the AWG reports with regard to information on data deficiencies and methodological problems and Recommendations directly addressed to PGCCDBS (Table 3.4).

Most of the actions to be taken should be followed up by the relevant Regional Coordination Meetings (RCMs). These relate to bilateral agreements between Member States on sampling of foreign flag landings, regional co-ordination and coverage of sampling (discards, age and length, sex and maturity) and the implementation of fleet-based sampling. The Group considers that the RCMs take up these tasks consequently to ensure full availability of the required input data for the stock assessments carried out by the respective AWGs. The communication with the RCMs regarding these tasks should be carried out by the ICES Secretariat.

In addition, some AWGs expressed the need for a harmonized and transparent use of appropriate discard raising methods. The Group recommends that the national labs and/or WG stock coordinators use the discard raising methodology proposed by WKDRP (ICES, 2007a).

The need for further otolith exchanges and age reading workshops was reported by some AWGs, in order to resolve observed discrepancies in ageing data. PGCCDBS recommends the establishment and/or extension of several otolith exchanges and age reading workshops (Table 6.1).

The Group suggests contact persons for the proposed actions (see rightmost column in Table 3.4) to ensure that these actions are actually followed.

Table 3.4 – Assessment Working Group Recommendations and relevant information on data deficiencies and needs for improvement of data collection.

WORKING GROUP NAME	ACRONYM	DATA SECTIONS (YES/NO)	INFORMATION ON DATA DEFICIENCIES AND METHODOLOGICAL PROBLEMS AND RECOMMENDATIONS DIRECTLY ADDRESSED TO PGCCDBS	PGCCDBS COMMENTS	CONTACT PERSON(S) FOR FOLLOW-UP
Herring Assessment WG for the Area South of 62°N	HAWG	**Yes**	**Late data delivery** by some countries was a general problem. Similar **arrangements**, as the obligation implemented by the EU Member States on sampling of landings outside the flag country, to be implemented **between all countries**. Furthermore, agreements on when and how the sampling country provides sampled data to the flag country should be made in order to make data available for the HAWG -> ***National labs*** The development of methods for **estimating discards should be based on a fleet-based method**, rather than on a national basis. The inclusion of discarded catch is considered to give more realistic values of fishing mortality and biomass. -> ***PGCCDBS*** (2006 Report, sec 1.5.2.): HAWG reviewed the quality of the overall sampling of herring and sprat for the whole area. There is concern that the present sampling regime may lead to a deterioration of sampling quality, because it does not ensure an appropriate sampling of different metiers (each combination of fleet/nation/area and quarter). Given the diversity of the fleets harvesting most stocks assessed by HAWG, an appropriate spread of sampling effort over the different mètiers is more important to the quality of catch at age data than a sufficient overall sampling level. The EU data directive appears to not assure this. The WG therefore recommends that **all metiers with substantial catch should be sampled** (including by-catches in the industrial fisheries), that **catches landed abroad should be sampled, and information on these samples should be made available to the national laboratories**. Most of the issues raised here have also been addressed by the Planning Group on Commercial Catch, Discard and Biological Sampling.	**Action**: National labs **Action:** RCMs NS&EA and NEA should promote and assist in bi- and multilateral agreements on sampling foreign landings. **Action**: RCMs NS&EA and NEA (and EU COM) should implement fleet-based discard sampling under the revised DCR and ensure complete sampling coverage.	
North-Western Working Group	NWWG	No			

Table 3.4.cont. – Assessment Working Group Recommendations and relevant information on data deficiencies and needs for improvement of data collection.

Working Group name	Acronym	Data sections (yes/no)	Information on data deficiencies and methodological problems and Recommendations directly addressed to PGCCDBS	PGCCDBS comments	Contact person(s) for follow-up
Working Group on the Assessment of Southern Shelf Demersal Stocks	WGSSDS	**Yes**	Discarding was identified to be a problem for some of the stocks assessed, but for most of those, **discard data were not collected, were incomplete or had "raising or data deficiency issues".** As part of the Data Regulation, all EU Member States have been called upon to implement a discard sampling program. Some of the Member States were already sampling discards in a more or less extensive way, some others have begun with pilot studies. It is therefore expected that a **representative sampling protocol** is, or will soon be, determined for future years. There is an **essential need for co-ordination between Member States to enable sampling to describe the discard behaviour with a minimum of bias and a maximum of precision**. As long as a **raising protocol** to estimate the total volume of discards in a given stock is not **harmonised and well established**, the landed/discard length structure should only be provided to working groups raised at the sampled trips level.	**Action**: RCM NEA should ensure complete coverage of discard sampling and use of appropriate raising procedures according to WKDRP. **Action:** RCM NEA should promote and assist in multilateral agreements on discard sampling.	
Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk and Megrim	WGHMM	**Yes**	**Discards**: The analysis and development of methods for discard data estimation and reconstruction of discard data series for inclusion in the assessment is needed. **Stock-specific issues:** **Northern hake:** Further work is to be carried out to **obtain information** (on e.g. **discarding** and **growth rates**) in these areas (under recovery plan), and more in-depth analyses are to be carried out to evaluate the potential effects on assessment and management. **Anglerfish *(L. piscatorius* and *L. budegassa)* in Divisions VIIb-k and VIIIa,b,d:** The sampling coverage of catches of smaller anglerfish has to be increased, as well as the number of age readings of younger fish.	**Action**: WG stock coordinators should use appropriate discard raising procedures according to WKDRP. **Action**: RCM NEA should check and improve sampling and age reading coverage.	

Table 3.4.cont. – Assessment Working Group Recommendations and relevant information on data deficiencies and needs for improvement of data collection.

Working Group name	Acronym	Data sections (yes/no)	Information on data deficiencies and methodological problems and Recommendations directly addressed to PGCCDBS	PGCCDBS comments	Contact person(s) for follow-up
Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy	WGMHSA	**Yes**	**Sampling coverage**: Mackerel: In 2005, 83% of the total catch was covered by the sampling programmes. Horse mackerel: 78% in 2005; Sardine: 84-100%; Anchovy: 100%. The **lack of sampling data for relatively large portions of the horse mackerel catch** continues to have a serious effect on the accuracy and reliability of the assessment, and the Working Group remain **concerned about the low number of fish that are aged**. **Catches of sardine in Area VII are not sampled**. This is considered to be relevant, given that catches in this area can be important in some years. **Discard estimates** for some countries for mackerel, horse mackerel, anchovy and sardine were provided to the working group. These data included sampling levels and raised discard estimates. **The raising methods used, namely the estimators used as a proxy of fishing activity, are not clear**. In addition, the associated **sampling levels are low**, and therefore the data should be treated with caution. **The necessary steps involved in providing discard data to stock assessments require further research**. Because of the potential importance of significant discard levels on pelagic species assessments, the Working Group again **recommends that observers should be placed on board vessels in those areas in which discarding may be a problem**. Existing observer programmes should be continued. **Mackerel**: There is **inadequate sampling for stock weights during the spawning season**. This applies particularly to the North Sea, where insufficient fish were sampled for the 9+ group. **Some nations have still not or inadequately aged samples, others have not even submitted any data**. For **sardine in the northern areas**, more nations have provided catch data than last year, but the **sampling in this area is still poor**.	**Action**: RCMs NS&EA and NEA should check and improve sampling and age reading coverage. **Action**: WG stock coordinators should use appropriate discard raising procedures according to WKDRP. **Action**: RCMs NS&EA and NEA should ensure complete coverage of discard sampling and age readings.	

Table 3.4.cont. – Assessment Working Group Recommendations and relevant information on data deficiencies and needs for improvement of data collection.

WORKING GROUP NAME	ACRONYM	DATA SECTIONS (YES/NO)	INFORMATION ON DATA DEFICIENCIES AND METHODOLOGICAL PROBLEMS AND RECOMMENDATIONS DIRECTLY ADDRESSED TO PGCCDBS	PGCCDBS COMMENTS	CONTACT PERSON(S) FOR FOLLOW-UP
Pandalus Assessment Working Group	NIPAG	(Yes)	Data issues are discussed throughout the report. Recommendations from the previous year are followed up (in general no actions have been taken, however). There seems to be a general problem with **late data submission** to the WG. For several stocks it is recommended that **sampling of catches by observers** – essential for assessing age, size, sex composition, fecundity and frequency of spawning of the stock – **should be re-established in the area**. For **Northern shrimp in the Barents Sea:** - the existing ecosystem survey should be calibrated to the discontinued shrimp surveys - improve estimates of shrimp consumption, by cod and other predators, for inclusion in the model	**Action**: RCMs NAFO, NS&EA and NEA should ensure complete sampling coverage.	

Working Group name	Acronym	Data sections (yes/no)	Information on data deficiencies and methodological problems and Recommendations directly addressed to PGCCDBS	PGCCDBS comments	Contact person(s) for follow-up
Working Group on Elasmobranch Fishes	WGEF	(Yes)	All countries having bycatch of elasmobranch species in tuna and swordfish fisheries should provide ICES with reliable time series of bycatch and discards. **Basking shark** WGEF recommends that bycatch be recorded. WGEF further recommends that accidental collisions be recorded and the data reported to ICES. Biological sampling of dead bycatch and stranded basking sharks should be initiated. **Spurdog** WGEF recommends that all countries supply time series of species-specific data for spurdog. It is recommended that all parties report spurdog landings using the code DGS. For landings of mixed dogfishes, the code DGH should be used. The DGH code should not be used for single species landings or for deepwater sharks. The code DGX should not be used for spurdog landings. WGEF recommends that length frequency data be collected for this species, especially from directed and mixed trawl fisheries. **Provision of data before working group** WGEF recommends that MS provide explanations of how national data are raised to species composition and length and to the total catch. **General Recommendations** WGEF recommends that ICES implements the exchange format for CPUE data in all relevant working groups, but especially WGDEEP and WGEF. These data should be stored in a secure database in ICES that will facilitate further analysis.	**Action**: RCMs should ensure complete sampling coverage. **Action**: ICES Secretariat	
Northern Pelagic and Blue Whiting Working Group	WGNPBW	**Yes**	**Norwegian Spring Spawning Herring** Given the large changes observed in the **maturity at age data** in recent years and the large effect it has on the estimation of the spawning stock, these data (at least for the last 10 years) **should be re-evaluated**. **Blue Whiting** The Working Group recommends **continual exchange of age reading expertise** between different countries in order to ensure coherence in aging of blue whiting. The Working Group recommends investigating whether current maturity ogives should and could be revised.	**Action:** WG should perform the re-evaluation of maturity-at-age data, considering the WKMAT recommendations. PGCCDBS also recommends a workshop on maturity ogives (WKMOG). **Action**: PGCCDBS recommends regular exchanges and workshops (see workshop proposals under ToR e, Annex 5).	

WORKING GROUP NAME	ACRONYM	DATA SECTIONS (YES/NO)	INFORMATION ON DATA DEFICIENCIES AND METHODOLOGICAL PROBLEMS AND RECOMMENDATIONS DIRECTLY ADDRESSED TO PGCCDBS	PGCCDBS COMMENTS	CONTACT PERSON(S) FOR FOLLOW-UP
Deep Sea Working Group	WGDEEP			(not considered)	
Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak	WGNSSK	**Yes**	No information on data deficiencies		
Working Group on the Assessment of Northern Shelf Demersal Stocks	WGNSDS	**Yes**	WGNSDS recommends that a **TV survey workshop** be held in 2006/7 to further investigate the application of this approach to *Nephrops* stocks and also the potential for applying the method to other demersal species.	**Action:** WKNEPHTV will be held 17-21 April 2007	

WORKING GROUP NAME	ACRONYM	DATA SECTIONS (YES/NO)	INFORMATION ON DATA DEFICIENCIES AND METHODOLOGICAL PROBLEMS AND RECOMMENDATIONS DIRECTLY ADDRESSED TO PGCCDBS	PGCCDBS COMMENTS	CONTACT PERSON(S) FOR FOLLOW-UP
Baltic Fisheries Assessment Working Group	WGBFAS	**Yes**	**All 2006 data** (landing statistics and sea-, harbour- and market samplings, effort) for all species **should be uploaded into FishFrame**. A regular **quality control of age reading consistency for Baltic Herring, sprat, cod and flounder should be organized**. a) **regular exchange of an agreed number of otolith samples** which are circulated among the national fisheries institutes. The results are sent to persons who coordinate the sample exchange for the certain species and who conduct the analysis of age determination results and distribute them between the participants; b) **organization of regular Age Reading Workshops on triannual basis**. The differences in age determination of sprat and flounder revealed by Age Reading Workshops in 2006 identified the need of further work between national experts that will manifest in exchange of otolith samples starting in spring 2006. It would be essential that the results of these exchanges are discussed in Age Reading Workshops held in 2007. Besides bilateral or trilateral meetings on regional basis of the Baltic Sea could also be useful and should be supported. c) National institutes should pay attention to recommendations of the Age Reading Workshops concerning collection of otolith samples for age reading, necessary age reading technique and the general results of age determination in otolith sample exchanges and at the Workshops. → ICES <u>Data section in quality handbook:</u> **Kattegat Cod:** The WG suggests a careful **analysis of the available discard data**. This should be done **by segments of the fishery** (not only by active and passive gear as done so far) and considering the impact of regulations on discarding practice. Moreover, averages should be applied to stabilize the estimates for periods with insufficient data, but characterized by coherent fishing practice, and finally **common well-documented substitution and raising procedures should be applied**. **Eastern Baltic Cod in Subdiv. 25-32:** Otoliths from cod in the Eastern Baltic generally do not show well-defined seasonal growth zones. Recent investigations show that the development of winter rings differs between the eastern and western Baltic Sea. The later spawning time in the eastern Baltic compared with the western Baltic and Kattegat is reflected in a smaller nucleus and a less evident juvenile ring as the growth period during the winter is shorter. These features cause **substantial age reading problems for this**	**Action**: National labs **Action**: PGCCDBS recommends regular exchanges and workshops (see workshop proposals under ToR e, Annex 5). **Action**: WG stock coordinators should use appropriate discard raising procedures according to WKDRP. **Action**: PGCCDBS recommends regular exchanges and workshops (see workshop proposals under ToR e, Annex 5).	

			stock. **Gulf of Riga Herring:** **No discards are reported or accounted for**. **Baltic Sprat:** The **amount of this discard is unknown**.	**Action**: RCM Baltic should ensure complete discard sampling coverage.	
Baltic Salmon and Trout Assessment Working Group	WGBAST			(not considered)	
Working Group on Assessment of New MoU Species	WGNEW			(not considered)	

4 Review changes in data collection procedures to check if these present problems for stock assessment data and where appropriate propose procedure changes for rectifying the problems. Such proposals shall be communicated to the DCR system (through DG Fish) for action

4.1 Data issues

4.1.1 Data availability

Stocks with age data that are not assessed with VPA

An overview of all stocks assessed by ICES is compiled in Table 4.1, and information of assessment type is given (age based analytical assessment, No assessment etc). Information has been derived from the various ICES 2006 AWG reports. Mandatory species (sampling for age) listed in annex XV in the DCR are also put in the table and some conclusions can be done from the compilation exercise.

- Some of the stocks that are not being assessed with age based information within the AWG have to be sampled for age in the relation to the DCR. That means that a lot of age data have to be sampled by different countries even though no clear end-user exists within the ICES body. For the species where this mismatch appears it should be evaluated if the sampling is still of importance. If it is, the data should be delivered to the proper AWG.
- Also, the opposite results appear in the table. Age data that are used for some stocks within different AWG for a full analytical assessment is not listed as a mandatory species in the DCR (Annex XV) and the countries are not funded for collecting the information. This should be reviewed in the revision of the DCR.

The proposed DCR revision has stocks classified based on assessment requirements rather than specifying all the stocks in an Annex. The stocks in Table 4.1 which are expected to change data requirements under the revised DCR are the stocks which require age data but are not being assessed by age.

Maturity data used for assessments

Stocks assessed by ICES and stocks that are sampled for age and maturity according to the DCR are shown in Table 4.1. Unfortunately the maturity data used for assessments does not always appear in the reports. For a number of stocks, maturity data used have been collected on an annual basis and either used annually or a mean over e.g. the last three years is used. Maturity data for some stocks has not been updated for a number of years and the same maturity ogives are used for the whole time series. It does not appear in the information in the various ICES AWG reports whether maturity data is available to the AWGs or data is not collected. It should be noted that even though data on age and maturity has been collected it is not always possible to conduct an analytical assessment. For some of the stocks where this is not possible, other analyses are carried out in order to give an advice on exploitation of the stocks.

As it shown in Table 4.1 an update of the maturity ogives used for a number of stocks should be considered. It should be recommended for the AWGs to specify maturity data requirements that could be taken into account by PGCCDBS and the RCM's in order to make collected data available for the AWGs.

See Section 3.3.1 and WKMAT report (ICES, 2007b) for more information about maturity sampling and the usage of maturity data by the ICES community.

Building on this work

We have built on work by WKMAT and we propose that the information presented in Table 4.1 is basic information which could be stored (on the wiki or similar place) and should be developed further in coming years. For example, the information of what the different countries are collected regarding maturity, age, etc, for the different stocks could be connected to this. The idea would be to have a few documents with basic information regarding sampling which could be updated and improved every year. This task should be undertaken by the new ICES Quality Manager (still to be appointed). The updates would be reviewed and the table would be further developed by the PGCCDBS.

Table 4.1 gives details of the maturity data used by the assessment working groups. This was compiled from working group report text, quality handbooks, assessment input files and personal communication. The column descriptions for Table 4.1 are as follows:

- original order: Number from 1 to 173 used to sort the table into its original row order.
- row id in age determination table: Gives the row id number in Table 6.1 that is relevant to this stock. For example, the value of 14 shows that Table 6.1 row id 14 contains relevant information on age exchanges for this stock (Icelandic cod (Division Va)).
- ICES stocks: List of stock names from DCR Annex 15. The relevant assessment working group acronym is given in brackets.
- Assessment: Type of assessment used.
- DCR Annex 15. Mandatory species: Yes or No.
- Last year maturity data updated: Taken from working group report text, quality handbook, assessment input file or personal communication. In a few cases maturity data may have been reviewed or updated more recently than suggested here. This is due to changes not being reported or being applied to the entire time period in the assessment input file. NA indicates no assessment or maturity data not used in assessment.
- Knife-edge ogive: Yes or No (N) Does the maturity ogive go from 0 at age a to 1 at age a+1
- Data source: Source of maturity data given by assessment WG report. Mostly blank values as PGCCDBS have only started to fill in this information.

Table 4.1 – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
1		**ICELAND AND EAST GREENLAND**					
2	14	**Icelandic cod (Division Va)**	Age based analytical assessment	Yes	2004	N	survey
3		**Icelandic haddock (Division Va)**	Age based analytical assessment	Yes	2006	N	survey
4		**Icelandic saithe (Division Va)**	Age based analytical assessment	Yes	2005	N	GLM model by ACFM
5	51	**Greenland halibut in Subareas V, VI, XII and XIV**	No analytical assessment	Yes	none, due to no age data		
6	40	***Sebastes marinus* in Subareas V, VI, XII and XIV**	Length based analytical assessment including growth	Yes	fitted to length		
7	40	**Demersal *Sebastes mentella* on the continental shelf in Subareas V,VI and IV**	No analytical assessment	Yes	ANNUAL ??		surveys
8	40	**Pelagic fishery for *Sebastes mentella* in the Irminger Sea**	No analytical assessment	Yes	NA		
9		**Icelandic summer-spawning herring (Division Va)**	No analytical assessment	Yes	2006	N	survey
10		**Capelin in the Iceland-East Greenland-Jan Mayen area (Subareas V and XIV and Division IIa west of 5˚W**	Survey based assessment including age	No			
11		**THE BARENTS SEA AND THE NORWEGIAN SEA**					
12	14	**Northeast Arctic cod *(AFWG)***	Age based analytical assessment	Yes	2005	No	
13		**Norwegian coastal cod (Subareas I and II) *(AFWG)***	Age based analytical assessment	Yes	2005	No	
14		**Northeast Arctic haddock (Subareas I and II) *(AFWG)***	Age based analytical assessment	Yes	2005	No	
15		**Northeast Arctic saithe (Subareas I and II) *(AFWG)***	Age based analytical assessment	Yes	2005	No	

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
16	40	**Redfish (*Sebastes mentella*) in Subareas I and II *(AFWG)***	Experimental age based analytical assessment	Yes	2001	No	
17	40	**Redfish (*Sebastes marinus*) in Subareas I and II *(AFWG)***	Experimental age based analytical assessment	Yes	2005	No	
18	51	**Greenland halibut in Subareas I and II *(AFWG)***	Age based analytical assessment up to 2004	No	2005	No	
19		**Barents Sea capelin (Subareas I and II, excluding Division IIa west of 5°W) *(AFWG)***	Age based analytical assessment	No	1980	No	
20		**THE FAROE PLATEAU ECOSYSTEM**					
21		**Faroe Plateau cod (Subdivision Vb_1) *(NWWG)***	Age based analytical assessment	Yes	1983 + some revised 2003	N	Faroe survey
22		**Faroe Bank cod (Subdivision Vb_2) *(NWWG)***	No assessment	Yes	NA		
23		**Faroe haddock (Division Vb) *(NWWG)***	Age based analytical assessment	Yes	2003 - uses 3 yr avg	N	Faroe survey
24		**Faroe saithe (Division Vb) *(NWWG)***	Age based analytical assessment	Yes	2003 - uses 3 yr avg	N	Faroe survey
25		**CELTIC SEA AND WEST OF SCOTLAND**					
26	13	**Cod in Division VIIa (Irish Sea) *(WGNSDS)***	Age based analytical assessment	Yes	1996 reviewed "more recently"	No	
27	13	**Cod in Divisions VIIe-k (Celtic Sea Cod) *(WGSSDS)***	Age based analytical assessment	Yes	1999	No	
28	21	**Haddock in Division VIIa (Irish Sea) *(WGNSDS)***	Age based analytical assessment	Yes	NA	Yes	
29	21	**Haddock in Divisions VIIb-k *(WGSSDS)***	Age based analytical assessment	Yes	2002	yes	
30	22	**Whiting in Division VIIa (Irish Sea) *(WGNSDS)***	Age based analytical assessment	Yes	NA recent research quoted	Yes	

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
31	22	**Whiting in Divisions VIIe-k *(WGSSDS)***	Age based analytical assessment	Yes	2002	Yes	
32	31	**Plaice in Division VIIa (Irish Sea) *(WGNSDS)***	Age based analytical assessment	Yes	1992	No	
33	31	**Celtic Sea Plaice (Divisions VIIf and g) *(WGSSDS)***	Age based analytical assessment	Yes			
34	31	**Plaice in Division VIIe (Western Channel) *(WGSSDS)***	Age based analytical assessment	Yes	info not found	No	
35	31	**Plaice West of Ireland (Division VIIb,c)** *(WGSSDS)*	Age based analytical assessment	No	NA	NA	
36	31	**Plaice Southwest of Ireland (Divisions VIIh-k) *(WGSSDS)***	No analytical assessment	No	NA	NA	
37	41	**Sole in Division VIIa (Irish Sea) *(WGNSDS)***	Age based analytical assessment	Yes	NA	No	
38	41	**Sole in Division VIIf and g (Celtic Sea) *(WGSSDS)***	Age based analytical assessment	Yes	1997	No	
39	41	**Sole in Division VIIe (Western Channel) *(WGSSDS)***	Age based analytical assessment	Yes	1997	No	
40	5	**Irish Sea herring (Division VIIa) *(HAWG)***	Age based analytical assessment	No			
41	5	**Celtic Sea and Division VIIj herring *(HAWG)***	Age based analytical assessment	No	NA	NA	
42		**Herring in Divisions VIa South and VIIb,c *(HAWG)***	Age based analytical assessment	No	NA	NA	
43		**Sprat in Divisions VIId,e *(HAWG)***	No analytical assessment	No			
44	18	**Megrim (L. whiffiagonis) in Divisions VIIb-k and VIIIa,b,d *(WGHMM)***	Age based analytical assessment	Yes			
45	20	**Anglerfish in Divisions VIIb-k and VIIIa,b (L. *piscatorius* and L. *budegassa*) *(WGHMM)***	Age based analytical assessment	Yes			

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
46		**Cod in Division VIa (West of Scotland) *(WGNSDS)***	Age based analytical assessment	Yes	NA	No	
47		**Cod in Division VIb (Rockall) *(WGNSDS)***	No analytical assessment	Yes	NA		
48	21	**Haddock in Division VIa (West of Scotland) *(WGNSDS)***	Age based analytical assessment	Yes	NA recent research quoted but not used	No	
49	21	**Haddock in Division VIb (Rockall) *(WGNSDS)***	Age based analytical assessment	Yes	2002 ? WD in 2006	No	
50	22	**Whiting in Division VIa (West of Scotland) *(WGNSDS)***	Age based analytical assessment	Yes	NA	Yes	
51	22	**Whiting in Division VIb (Rockall) *(WGNSDS)***	No assess	Yes	no whiting at rockall		
52	18	**Megrim in Subarea VI (West of Scotland and Rockall) *(WGNSDS)***	No assess	No			
53	20	**Anglerfish in Division IIa (Norwegian Sea), Division IIIa (Kattegat and Skagerrak), Subarea IV (North Sea), and Subarea VI (West of Scotland and Rockall) (*Lophius piscatorius* and *L. budegassa*) *(WGNSDS)***	Length based assessment	Yes			
54		**Herring in Division VIa North *(HAWG)***	Age based analytical assessment	No	2005		
55	47	**Norway pout in Division VIa (West of Scotland) *(WGNSDS)***	No assessment	No			
56	1	**Sandeel in Division VIa *(WGNSDS)***	No assess	No			
57		***Nephrops* in Division VIa *(WGNSDS)***	No analytical assess	Yes	NA	NA	NA
58		***Nephrops* in Division VIIa, North of 53 *(WGNSDS)***	No analytical assess	Yes	NA	NA	NA
59		***Nephrops* in Divisions VIIb,c,j,k *(WGHMM)***	No analytical assess	Yes	NA	NA	NA
60		***Nephrops* in Divisions VIIf,g,h, excluding Rectangles 31 E1, 32 E1-E2 + VIIa, South of 53°N (Management Unit M) *(WGSSDS)***	No analytical assess	Yes	NA	NA	NA

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
61	41	**Sole Southwest of Ireland (Division VIIh-k) *(WGSSDS)***	No analytical assess	Yes	NA	NA	
62	41	**Sole West of Ireland (Division VIIb,c)** *(WGSSDS)*	No analytical assess	Yes	NA	NA	
63		**Edible crab all area**	Not dealt with by ICES	Yes			
64		**Gulper shark all areas**	Not dealt with by ICES	Yes	NA		
65		**Leafscale gulper shark all areas**	Not dealt with by ICES	Yes	NA	NA	NA
66		**Portuguese dogfish all areas**	Not dealt with by ICES	Yes	NA	NA	NA
67	7	**Conger X**	Not dealt with by ICES	Yes	NA	NA	NA
68	16	**Bluemouth rockfish IXa, X**	Not dealt with by ICES	Yes	NA	NA	NA
69		**Lobster all areas**	Not dealt with by ICES	Yes	NA	NA	NA
70		**Common squid VIIc, IXa**	Not dealt with by ICES	Yes	NA	NA	NA
71	17	**Four-spot megrim VIIc, IXa**	Not dealt with by ICES	Yes	NA	NA	NA
72	19	**Black bellied angler IV, VI/VIIb-k, VIIIabd**	Not dealt with by ICES	Yes	NA	NA	NA
73	19	**Black bellied angler VIIIc, IXa,**	Not dealt with by ICES	Yes	NA	NA	NA
74		**Whiting VIII, IX, X**	Not dealt with by ICES	Yes	NA	NA	NA
75	49	**Stribed red mullet all areas**	Not dealt with by ICES	Yes	NA	NA	NA

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
76		**Common octopus VIIIc, IXa**	Not dealt with by ICES	Yes	no formal assessment		
77		**White shrimp IXa**	Not dealt with by ICES	Yes			
78	27	**Forkbeard X**	Not dealt with by ICES	Yes	NA	NA	NA
79	32	**Saithe VII, VIII**	Not dealt with by ICES	Yes	NA		
80		**Wreckfish X**	Not dealt with by ICES	Yes	NA	NA	NA
81	37	**Spanish mackerel VII, IX**	Not dealt with by ICES	Yes	NA	NA	NA
82		**Cuttlefish VIIIc, IXa**	Not dealt with by ICES	Yes	NA	NA	NA
83	42	**Sea brem VIIIc, IXa, X**	Not dealt with by ICES	Yes	NA	NA	NA
84	45	**Blue jack mackerel X**	Not dealt with by ICES	Yes	NA	NA	NA
85	48	**pouting VIIIc, IXa**	Not dealt with by ICES	Yes	NA	NA	NA
86		**NORTH SEA**					
87	12	**Cod in the Kattegat *(WGBFAS)***	Age based analytical assessment	Yes	2005	No	
88	12	**Cod in Subarea IV (North Sea), Division VIId (Eastern English Channel) and Division IIIa (Skagerrak) *(WGNSSK)***	Age based analytical assessment	Yes	reviewed 1987	No	
89	21	**Haddock in Subarea IV (North Sea) and Division IIIa (Skagerrak – Kattegat) *(WGNSSK)***	Age based analytical assessment	Yes	reviewed 1987	No	
90	22	**Whiting in Subarea IV (North Sea), IIIa and Division VIId (Eastern Channel) *(WGNSSK)***	Age based analytical assessment	Yes	1960	N	

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
91	31	**Plaice in Division IIIa (Skagerrak – Kattegat) *(WGNSSK)***	Age based analytical assessment	Yes	2005	Yes till 2004	
92	31	**Plaice in Subarea IV (North Sea) *(WGNSSK)***	Age based analytical assessment	Yes	reviewed 2004	No	
93	31	**Plaice in Division VIId (Eastern Channel) *(WGNSSK)***	Age based analytical assessment	Yes	info not found	No	
94	41	**Sole in Division IIIa *(WGBFAS)***	Age based analytical assessment	Yes	1996	Yes	
95	41	**Sole in Subarea IV (North Sea) *(WGNSSK)***	Age based analytical assessment	Yes	1960s - reviewed 2006	Yes	
96	41	**Sole in Division VIId (Eastern Channel) *(WGNSSK)***	Age based analytical assessment	Yes	1981?	Yes	
97	32	**Saithe in Subarea IV (North Sea) Division IIIa (Skagerrak) and Subarea VI (West of Scotland and Rockall *(WGNSSK)***	Age based analytical assessment	Yes	1967	No	
98		***Nephrops* in Division IIIa (Skagerrak and Kattegat) and IV (North Sea) *(WGNSSK)***	No analytical assessment	Yes	NA	NA	NA
99		***Nephrops* in Division IVa, Rectangles 44-48 E6-E7+44 E8 (Management Area F) *(WGNSSK)***	No analytical assessment	Yes	NA	NA	NA
100		***Nephrops* in Division IVa west of 2˚E, excluding Management Area F (Management Area H) (WGNSSK)**	No analytical assessment	Yes	NA	NA	NA
101		***Nephrops* in Division IVb,c, east of 1˚E, excluding Rectangles 43 F5-F7**	No analytical assessment	Yes	NA	NA	NA
102	4	**Herring in Subdivisions 22-24 and Division IIIa (spring spawners) *(HAWG)***	Age based analytical assessment	Yes	1991		
103	5	**Herring in Subarea IV, Division VIId and Division IIIa (autumn spawners) *(HAWG)***	Age based analytical assessment	Yes	2005	No	
104	44	**Sprat in Division IIIa *(HAWG)***	No analytical assessment	Yes	NA	No	
105	44	**Sprat in the North Sea (Subarea IV) *(HAWG)***	Age based analytical assessment	Yes	NA	NA	

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
106	46	**North Sea horse mackerel (*Trachurus trachurus*) (Division IIIa (eastern part), Division IVb,c VIId) *(WGMHSA)***	No assessment	Yes			
107	47	**Norway pout in Subarea IV (North Sea and Division IIIa (Skagerrak – Kattegat) *(WGNSSK)***	Age based analytical assessment	Yes	2005	No	
108	1	**Sandeel in Division IIIa (Skagerrak – Kattegat) *(WGNSSK)***	No analytical assessment	Yes	Not found	Not found	
109	1	**Sandeel in Subarea IV *(WGNSSK)***	Age based analytical assessment	Yes	Not found	Yes	
110	1	**Sandeel in the Shetland area *(WGNSSK)***	No analytical assessment	Yes	Not found	Not found	
111		**Shrimp (*Pandalus borealis*) in Division IVa (Fladen Ground) *(WGPAND)***	No analytical assessment	Yes			
112		**Shrimp (*Pandalus borealis*) in Division IIIa and Division IVa East (Skagerrak and Norwegian Deeps) *(WGPAND)***	Bayesian version of a surplus-production model	Yes			
113		**Northern Shrimp (*Pandalus borealis*) in the Barents Sea, ICES Divisions I and II *(WGPAND)***	Bayesian version of a surplus-production model	Yes			
114		**Demersal elasmobranchs in the North Sea, Skagerrak, and eastern English Channel *(WGEF)***	No analytical assessment	Yes			
115		***Nephrops* in Division IVb,c, west of 1˚E (Management Area I) *(WGNSSK)***	No analytical assessment	Yes	NA	NA	NA
116		***Nephrops* in Division IVa, east of 2˚+ Rectangles 43 F5-F7 (Management Area S) *(WGNSSK)***	No analytical assessment	Yes	NA	NA	NA
117		**Shrimp *(Ctrangon crangon)* IV, VIId**	No analytical assessment	Yes			
118	9	**Seabass IV, VIId**	Not dealt with by ICES	Yes	NA	NA	NA
119	17	**Four spot megrim IV, VIId**	Not dealt with by ICES	Yes	NA	NA	NA
120	18	**Megrim IV, VIId**	Not dealt with by ICES	Yes	NA	NA	NA

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
121	19	**Black bellied angler IV, VIId**	Not dealt with by ICES	Yes	NA	NA	NA
122	25	**Lemon sole IV, VIId**	Not dealt with by ICES	Yes	NA	NA	NA
123	50	**Red mullet IV, VIId**	Not dealt with by ICES	Yes	NA	NA	NA
124	49	**Stribed red mullet IV, VIId**	Not dealt with by ICES	Yes	NA	NA	NA
125		**Common scallop VIId**	Not dealt with by ICES	Yes	NA	NA	NA
126	33	**Turbot IV, VIId**	Not dealt with by ICES	Yes	NA	NA	NA
127	39	**Brill IV, VIId**	Not dealt with by ICES	Yes	NA	NA	NA
128		**BAY OF BISCAY AND IBERIAN SEAS**					
129	23	**Hake-Southern stock (Division VIIIc and IXa excluding the Gulf of Cadiz) *(WGHMM)***	Age based analytical assessment	Yes			
130	18	**Megrim (L. *boscii* and L. *whiffiagonis*) in Divisions VIIIc and IXa *(WGHMM)***	Age based analytical assessment	Yes			
131	20	**Anglerfish in Divisions VIIIc and IXa (L. *piscatorius* and L. *budegassa*) *(WGHMM)***	Coruna fleet	Yes			
132	46	**Southern horse mackerel (*Trachurus trachurus*) (Division IXa) *(WGMHSA)***	No analytical assessment	Yes			
133	36	**Sardine in Division VIIIc and IXa *(WGMHSA)***	Age based analytical assessment	Yes			
134	10	**Anchovy in Subarea VIII (Bay of Biscay) (WGMHSA)**	Bayesian Biomass based model (BBM) assessment.	Yes			
135	10	**Anchovy in Division IXa *(WGMHSA)***	No analytical assessment	Yes			

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
136		***Nephrops*** **in Divisions VIIIa,b (Management Area N) *(WGHMM)***	No analytical assessment	Yes	NA	NA	NA
137		***Nephrops*** **in Divisions VIIIc (Management Area O) *(WGHMM)***	No analytical assessment	Yes	NA	NA	NA
138		***Nephrops*** **in Divisions IXa (Management Area Q)**	No analytical assessment	Yes	NA	NA	NA
139	41	**Sole in Divisions VIIIa,b (Bay of Biscay) *(WGSSDS)***	Age based analytical assessment	Yes	2000	No	
140		**THE BALTIC SEA**					
141	11	**Cod in Subdivisions 22-24 (including Subdivision 23) *(WGBFAS)***	Age based analytical assessment	Yes	1995	No	
142	11	**Cod in Subdivisions 25-32 *(WGBFAS)***	Age based analytical assessment	Yes	2000	No	
143	6	**Herring in Subdivisions 22-24 and Division IIIa (spring spawners) *(HAWG)***	Age based analytical assessment	Yes			
144	4	**Herring in Subdivisions 25-29 (excluding Gulf of Riga herring) and 32*(WGBFAS)***	Age based analytical assessment	Yes	1974	No	
145	4	**Herring in the Gulf of Riga*(WGBFAS)***	Age based analytical assessment	Yes	1970	No	
146	4	**Herring in Subdivision 30, Bothnian Sea*(WGBFAS)***	Age based analytical assessment	Yes	2005	No	
147	4	**Herring in Subdivision 31, Bothnian Bay*(WGBFAS)***	Age based analytical assessment	Yes	2005	No	
148	43	**Sprat in Subdivisions 22-32*(WGBFAS)***	Age based analytical assessment	Yes	2002	No	
149	29	**Flounder *(WGBFAS)***	No analytical assessment	Yes	NA	NA	
150		**Salmon in the Main Basin and the Gulf of Bothnia (Subdivisions 22-31) *(WGBAST)***	Bayesian assessment	Yes			

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
151		**Salmon in the Gulf of Finland (Subdivision 32) *(WGBAST)***	No analytical assessment	Yes			
152		**Sea Trout in the Baltic *(WGBAST)***	No analytical assessment	Yes			
153		**WIDELY DISTRIBUTED AND MIGRATORY STOCKS**					
154	23	**Hake – Northern stock (Division IIIa, Subareas IV, VI and VII and Divisions VIIIa,b,d *(WGHMM)***	Age based analytical assessment	Yes			
155	38	**Northeast Atlantic Mackerel (combined Southern, Western and North Sea spawning components) (WGMHSA)**	Age based analytical assessment	Yes			
156	46	**Western horse mackerel (*Trachurus trachurus*) (Divisions IIa, IVa, Vb, VIa,, VIIa-c, e-k, IIIa-e) *(WGMHSA)***	Age based analytical assessment	Yes	2004	N	survey
157	24	**Blue whiting combined stock (Subareas I-IX, XII and XIV) *(WGNPBW)***	Age based analytical assessment	Yes			
158	6	**Norwegian spring-spawning herring *(WGNPBW)***	Age based analytical assessment	Yes			
159		**Northeast Atlantic spurdog *(WGEF)***	Only experimental assessments	No			
160		**Northeast Atlantic porbeagle *(WGEF)***	No analytical assessment	Yes			
161		**European Eel *(WGEEL)***	No analytical assessment	Yes			
162		**Ling in Subdivision Va *(WGDEEP)***	No assessment	Yes	NA	NA	
163		**Ling in Subarea Vb *(WGDEEP)***	No analytical assessment	Yes	NA	NA	
164		**Ling in Divisions IIIa and IVa, and in Subareas VI, VII, VIII, IX, XII, and XIV *(WGDEEP)***	No analytical assessment	Yes	NA	NA	
165		**Blue ling in other areas (Subdivisions I, II, IIIa, IVa, VIII, IX, and XII) *(WGDEEP)***	Assessment based only on trends in landings	Yes in area X	NA	NA	

Table 4.1.cont. – Use of maturity data by assessment working groups.

original order	row id in age determination table	ICES stocks	Assessment	DCR annex 15. Mandatory species	Last year maturity data updated	Knife-edge ogive	Data source
166		**Greater silver smelt in Subdivision Va *(WGDEEP)***	No assessment	Yes	NA	NA	
167		**Greater silver smelt in other areas (Subdivisions I, II, IIIa, IV, Vb, VI, VII, VIII, IX, X, XII, and XIV) *(WGDEEP)***	No assessment	Yes			
168		**Orange roughy *(WGDEEP)***	No analytical assessment	Yes	NA	NA	
169	8	**Roundnose grenadier *(WGDEEP)***	Preliminary age-based assessment	Yes	NA	NA	
170	2	**Black scabbard fish *(WGDEEP)***	No analytical assessment	Yes	NA	NA	
171	3	**Alfonsinos/Golden eye perch (*Beryx* spp.) *(WGDEEP)***	No analytical assessment	Yes only in area X			
172		**Not in Annex XV**					
173	5	**Herring in Subarea Irish Sea VIIaN *(HAWG)***	Age based analytical assessment	No	2005	No	

These first two columns are useful when working with the data table. They are an initial small step towards making the tables produced easier to combine and work with at subsequent meetings.

Opportunities for increased data availability

As well as reviewing possible problems from changes to data collection procedures, PGCCDBS is the appropriate group to identify new opportunities for data collection and to share this information. An example is where automatic fish-grading machines are being used or introduced in larger fish markets. This creates the possibility of access to individual fish weights for entire hauls.

4.1.2 Data Policy

Data Access

Currently there are some restrictions on access to data collected by member states under the DCR, for example data provided for meetings cannot be kept for more than 20 days. Increased public data access has been proposed by the EU in the new data collection regulations. PGCCDBS recognise that data access can be a sensitive, political subject which is legally complex and that it will be dealt with at a higher level by member states and the Commission. However, the results of any change to data access will directly affect the scientific community working in fisheries, so we raise the following points on the subject.

We draw attention to the possible levels of data access between full copyright and totally free access. For example, a Creative Commons licence (http://creativecommons.org/) is a new system, built within current copyright law, which allows data and product sharing with selected restrictions. We think that conditions on data collected under the regulations should include that the data provider must be acknowledged and data freely supplied should not be used for profit by a third party.

We support the proposed delay between data collection and access, as this will allow time for the data to be properly processed. A final important point is there will be considerable costs to institutes in setting up and maintaining an increased level of data access and the source of funding for this needs to be established.

Access to vessels for observers

The Draft Commission proposal includes a legal requirement that a vessel's master MUST accept observers on board. PGCCDBS feels that, overall, this will be beneficial. Vessels might occasionally change their fishing practises for the duration of a trip with an observer and this would cause a bias in sampling. However, this bias is unlikely to be worse than the effect of sampling from a limited pool of vessels when access is not a legal requirement. Obviously, observer programmes should continue to be based on good relations with the fishermen and observers must not be placed in a situation where they are compelled to go on a vessel, against their will.

Scientific data used for enforcement

Each institute needs to be aware of the legal situation for data collected for scientific purposes. In several member states data collected for scientific purposes must be provided to enforcement authorities if requested, and this has happened. PGCCDBS recognises that this may present a problem for staff that could now be looked upon as enforcement officers rather than scientific observers. Once again, good communication with the fishing industry and good relations "on the ground" are required to prevent this issue causing problems for data collection programmes.

4.1.3 Requests to stock co-ordinators

Concerns were raised about the amount of data requests for stock coordinators generated by PGCCDBS and its workshops. To prevent duplication of effort PGCCDBS will co-ordinate these requests. So far, in 2007, the questionnaire for stock co-ordinators developed at WKMAT is the only one we are aware of. Our review of PGCCDBS 2006 recommendations (Section 2) proposes other methods, not annual questionnaires, to implement the data requests developed in the 2006 report. The data tracking tables that ICES tried last year are not going to be reused. A new system of tracking which data are supplied and used in stock assessments will be developed. This system will be based on Intercatch.

PGCCDBS recommends that the new ICES Quality Manager (still to be appointed) co-operates with PGCCDBS to develop online data tables containing basic data collection information, including age calibration and maturity staging information and its use by assessment working groups.

4.2 Fisheries-based sampling

This section describes the steps to be taken in the process of moving towards a fishery-based data collection system that complies with the data requirements which will come into force with the new DCR.

The current DCR does not suit the data needs of a fishery-based sampling approach; neither does it with the need for collection of mixed-fisheries data. The revised DCR will be designed to suit these needs as well as it will continue to serve the requirement to deliver data for single stock assessments. As the new DCR is designed to meet both these needs, it is not expected that its implementation will present problems for stock assessment purposes.

The following paragraphs provide guidelines and recommendations in order to facilitate the shift towards a fishery or métier-based sampling framework.

4.2.1 Problems expected and proposal for exploratory métier-based sampling

The implementation of the proposed shift in the EU data collection framework from species-based to métier-based sampling and, above all, the requirement on concurrent length sampling of the landings (Anon., 2007), are likely to cause significant problems for the institutes involved in length sampling.

Several problems can be foreseen in connection with the required changes in sampling scheme. One of the problems is associated with the difficulty to track the origin (vessel/fishing trip) of the samples taken during market sampling. This is not a new problem but it is likely to become critical in the new sampling framework, and has to be resolved in order to be able to perform the sampling in accordance with the new DCR. Another group of problems can be related to the physical access to the fish to obtain the samples required. The first group of problems can only be resolved if certain improvements in the handling procedure at the market can be made, while the other group probably needs restructuring of the sampling procedures and schemes.

In order to ease the shift from species-based to métier-based sampling and to at least maintain the current level of quality of the length composition data collected, it is important to prepare this shift well before the new DCR comes into force.

The conditions under which length sampling of the landings is to be performed, is known to be very different from country to country and sometimes even from harbour to harbour within one country, in relation to the logistics of the landing, handling and auctioning procedures. Therefore, it is suggested that each lab which foresees problems with the implementation of concurrent métier-based market sampling, selects two or three métiers that can be regarded as typical (in terms of local landing and auctioning arrangements) and hence, are likely to reveal both typical as well as general problems in relation to concurrent length sampling.

Each of these métier should then be test-sampled according to the general principles of concurrent sampling for a period of one month. The results of these so-called "implementation studies" should form the basis for designing best practice sampling schemes that fulfil the demands of the new DCR with regards to métier-based market sampling. It is suggested to carry out the implementation studies in 2007, preferably within the existing national programme budgets. However, in some cases, major changes in working procedures and workload are expected, so additional funding may be necessary.

The implementation studies are purely meant to gain experience with the logistic and practical aspects of concurrent métier-based sampling and not for comparison of results between métiers. Such analysis should be performed on already collected, comprehensive material. Guidelines for the different working procedures that can be tested during the study are given below.

The results of the implementation studies should be reviewed during an ICES Workshop (WKISCON, see Annex 5), scheduled to take place at the end of January or the beginning of February 2008, so that EU Member States can take the Workshop's conclusions into account when putting together their data collection programmes for 2009 and after. The main aim of this Workshop would be to translate the experience gained during the implementation studies into sampling schemes that meet the requirements of the metier-based data collection framework. The workshop should address the following ToRs:

a) Review the results of the 2007 implementation studies on concurrent length sampling of commercial landings.

b) Advice on best practice for concurrent sampling, taking into account both technical feasibility and quality aspects of data collection.

Well before the workshop, a standardized format for reporting and presenting the results will be sent around by the chairs. The workshop will be organized as an ICES expert group with participation and support from PGMED.

The Commission informed the PGCCDBS that additional funding for carrying out the implementation studies can be requested through the national correspondents. The requests must be made on the shortest possible notice after the PGCCDBS.

4.2.2 Implementation studies in practice

PGCCDBS proposes a limited number of scenarios to be tested as part of the implementation studies. These scenarios are schematized in Figure 4.1.

Sampling scheme	Frequency	Group 1 --- Target and recovery species				Group 2 --- Other TAC regulated species and major by-catch species						Group 3 --- All other by-catch species									
		Species 01	Species 02	Species 03	Species 04	Species 05	Species 06	Species 07	Species 08	Species 09	Species 10	Species 11	Species 12	Species 13	Species 14	Species 15	Species 16	Species 17	Species 18	Species 19	Species 20
Scheme 1A	Every sampling operation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Scheme 1B	Every sampling operation	■	■	■	■	■	■	■	■	■	■	Data derived from at-sea sampling									
Scheme 2A	Every 1st sampling operation	■	■	■	■	■	■	■	·	·	·	■	■	■	■	■	·	·	·	·	·
	Every 2nd sampling operation	■	■	■	■	·	·	·	■	■	■	·	·	·	·	·	■	■	■	■	■
Scheme 2B	Every 1st sampling operation	■	■	■	■	■	■	■	·	·	·	Data derived from at-sea sampling									
	Every 2nd sampling operation	■	■	■	■	·	·	·	■	■	■	Data derived from at-sea sampling									
Scheme 3A	Every 1st sampling operation	■	■	■	■	■	■	·	·	·	·	■	■	■	·	·	·	·	·	·	·
	Every 2nd sampling operation	■	■	■	■	·	·	■	■	·	·	·	·	·	■	■	■	■	·	·	·
	Every 3rd sampling operation	■	■	■	■	·	·	·	·	■	■	·	·	·	·	·	·	·	■	■	■
Scheme 3B	Every 1st sampling operation	■	■	■	■	■	■	·	·	·	·	Data derived from at-sea sampling									
	Every 2nd sampling operation	■	■	■	■	·	·	■	■	·	·	Data derived from at-sea sampling									
	Every 3rd sampling operation	■	■	■	■	·	·	·	·	■	■	Data derived from at-sea sampling									
		■	Species to be sampled for length																		

Figure 4.1 – Implementation studies possible scenarios.

In the proposed sampling schemes, a distinction is made between three groups of species:

- Group 1: Species that "drive" the management process and for which the data requirements are highest (target species of the fishery and species under a recovery plan).
- Group 2: Other TAC-regulated species and major non-regulated by-catch species.
- Group 3: All other by-catch species.

For the purpose of the implementation studies, countries are free to define these three species groups, but once a species is allocated to a particular slot in the sampling scheme (Species 01, Species 02, etc. in the table above), it should remain there for the duration of the implementation study. Once the new DCR comes into force, the definition of the species groups should be done on a regional scale by the Regional Co-ordination Meetings.

With regards to the sampling schemes themselves, a distinction is made between schemes that cover all species groups, inclusive of the landings of minor by catch species (the schemes labelled "A"), and those that exclude the minor by catches from market sampling and that rely on at-sea sampling programmes for length-frequency data on these species (the schemes labelled "B").

Also, a distinction is made between sampling schemes that address all species in each sampling operation (comprehensive concurrent sampling) (schemes "1") and sampling schemes that address all target and recovery species plus a restricted number of the other by-catch species in a "rolling" system (schemes "2" and "3"). A "rolling" system means that part of the species is sampled during each xth sampling operation, and the other part(s) during each (X+1)th or (X+2)th sampling operation.

In the light of their existing knowledge of sampling conditions for the selected métiers (time window available for sampling, number of species to be expected in a single vessel's landings, etc. - also see previous section), sampling teams should be instructed to follow one or two of the above sampling schemes, and test these for a period of one month.

During the implementation studies, additional data on the sampling procedure and circumstances are to be collected. Table 4.2 provides an overview of the minimum set of variables that needs to be collected. The table must be filled out for all vessels sampled. In addition to this, when feasible, the table should also be completed for other vessels belonging to the same métier that have landed their catches on the same day.

Table 4.2 – Variables to be collected during implementation studies.

FIELDS	COMMENTS
Date	yyyy/mm/dd
Harbour	
Vessel code	
Flag of the vessel	
Métier	
Geographical area of catch	By RFO sub-division
How was vessel selected for sampling?	
Time window available for sampling	hh:mm
Starting hour of time window	hh:mm
Duration of sampling	hh:mm
Sampling method applied	According to coding in table above
Was sampling procedure finished?	Yes/No
If No, why?	
Nº of technicians involved	
Nº of Group 1 species landed	
Nº of Group 1 species sampled	
Nº of Group 2 species landed	
Nº of Group 2 species sampled	
Nº of Group 3 species landed	
Nº of Group 3 species sampled	
Were predefined sampling targets per species met?	Yes/No
If No, why?	
Remarks	

4.2.3 Discard sampling procedures

PGCCDBS notes that at-sea sampling of retained catches and discards is dealt with in different ways. In some countries, the number of fishing operations covered (e.g. fishing hauls) is restricted (e.g. one on two or more), but each of these is sampled for both retained and discarded catch fractions. In other countries, the number of fishing operations investigated is much higher, but each of them is only sampled for either retained or discarded catch.

With regards to this issue, however, it is important to remember that the retained and discarded fractions are complementary parts of a larger entity (the unsorted catches) and that the species and size composition of one is directly linked to the species and size composition of the other.

Therefore, it is essential that both the retained and the discarded catch fractions are always sampled concurrently, i.e. from the same fishing operation. In practice, this means that sea-going observers may not be able to sample all fishing operations but that each fishing operation sampled will include data on both the discarded and retained fractions of the catch. In doing so, it is also possible to spot how discard patterns change in the course of a fishing trip or how the catch rates of one species affect the discard rates of the others.

4.2.4 SGRN 06–03 (Anon., 2007) recommendations

The Chair of SGRN 06–03 provided a general overview of the issues that were discussed at the November meeting of the SGRN 06-03 on the revision of the Data Collection Regulation

(DCR). A short summary of the most important conclusions and recommendations is given below.

New DCR

- Under the new DCR, fishery-related data should be collected by type of fishing activity or métier and population-related data by stock or part thereof. The latter is of particular relevance to age, fecundity and maturity sampling which, in the view of SGRN 06-03, would no longer be required by fleet or métier, but only at the population level. Unless there is evidence of age-specific selection patterns in a fishery, in which case it may be necessary to stratify age sampling accordingly.
- A truly métier-based data collection system requires that basic fishstats (fishing effort, landings, discards and revenues) are collected for all cells in the métier matrices separately. For basic fishstats, the unit stratum for data collection thus is the single métier matrix cell. Groupings of cells, however, should be acceptable for the collection of discard data, provided that the groupings feature similar exploitation patterns.
- The "single cell approach" should also apply to the collection of length frequency data, but the SGRN 06-03 is aware that this may not be feasible for all cells in the métier matrices and hence, that there is a need for objective methods to reduce the number of cells to be sampled and to keep the system workable.
- The new DCR should address all removals from fish and shellfish stocks, regardless of whom or what is at their origin. This, however, does not imply that the distinction between landings and discards should completely disappear in the new DCR. This includes removals by recreational fishers and therefore, there is no excuse for not including the recreational fisheries in the new DCR.
- The survey revision meeting takes a similar top-down approach and defines the data requirements first (preferably in consultation with the end-users), before deciding on which surveys should be eligible under the new DCR. The SGRN 06-03 also agreed that research surveys should increasingly be viewed as ecosystem research platforms instead of primarily being used as generators of stock indices.
- Management systems are likely to change with time and hence also the types of advice that will be requested from the RFOs and the types of data that will be needed to underpin the advice. Therefore, it is essential that the new DCR is made sufficiently flexible and adaptable to allow for such changes, without having to revise the entire Regulation. Ideally, the new DCR should be conceived in such a way that it can constantly be adjusted through dynamic interaction between the end-users and the data providers.

International Co-ordination

- By RFO-area, should be possible to define groupings of species with similar data needs, according to the type of stock evaluation that is applied (e.g. age-based vs. length-based assessment models).
- Above all, the métier matrices should be seen as an operational tool to define regionally harmonised strata for sampling purposes, and not as a means to produce standard datasets that can readily be fed into the evaluation or management process.

Data access

- It is essential that all DCR-data be stored in raw format, so that data aggregation and reporting in accordance with the changing needs of the end users remains possible.
- It is essential that the VMS data are made available for scientific purposes. Free access to the VMS data also would serve the data needs of the ecosystem approach, as it would allow to plot fishing effort at a sufficiently fine scale in relation to, e.g., marine protected areas or the distribution of sensitive habitats.
- Remaining question marks in the data needs identified so far are:
    - the data requirements for the Mediterranean

- the data requirements for the Black Sea
- the data needs for salmon, including riverine salmon
- the identification of the sub-sets of glass eel, silver eel and yellow eel surveys that can be used to calculate pan-European indices of eel recruitment, spawning stock biomass and escape to the sea rates

Data quality

- The precision levels should be used as tools for defining target sampling levels and not as threshold for financing purposes. This implies that precision should be calculated at the level where the sampling has been designed (either national or regional), and that there is no need to change the existing precision levels for the new DCR. However, should the precision levels also be used for implementation purposes, then the precision levels for outstanding problem areas, such as effort and landings for the < 12 m vessels, discards estimates, etc., will have to be re-addressed.
- Make sure that the DCR is sufficiently flexible, so that data collection can better be tuned to the changing data needs of the end-users without having to revise the entire DCR. The general principles of flexibility and adaptability should not be restricted to the quality aspects of the data, but should also apply to the types of data collected.

Required changes to other fishery-related EU Regulations

- Logbook: the following changes / extensions are required:
  - An extension of the gear list to match the current gears in use, including rigs, so that the effort and landings data can easily be fed into the métier matrices.
  - An obligation to report the mesh size and mesh shape (diamond, square) of the gear(s) used, by trip, and in the event of multiple gear uses, by haul.
  - An obligation to report the presence and type of selective devices (separator grids or panels, escape windows, etc.) by trip, and in the event of multiple gear uses, by haul.
  - An obligation to report the shooting position, by fishing operation.
  - An appropriate metric of effort for all gears.
  - An obligation to report the fishing depth range by haul. This information is not required if scientists get free access to the VMS data, otherwise it is.
  - An obligation to report the fishing mode, particularly for the tuna fisheries (free school, fish aggregating device, etc.).
  - An obligation to report the number of fishers on board, particularly for bait boats, pole lines, etc.
  - A reduction of the reporting threshold to a much lower level than the current 50 kg per species: Note: this is already done for the Mediterranean, where the threshold was lowered from 50 to 15 kg.
- Landings Declaration: all landings declarations should include gear, effort and quantities landed, and not be restricted to registered vessels that have logbook obligations.
- VMS:
  - For the effort estimates from VMS data to be sufficiently reliable, it is indispensable that the recording frequency of a vessel's position be increased from the current once every two hours to at least once every 15 minutes. In so doing, it should be possible to make a sufficiently fine distinction between time spent on fishing and on steaming, which can then be used to estimate fishing effort.
  - In would also be helpful if scientific institutes could have real-time access to the VMS data to establish which vessels have been fishing where, and thus,

to identify possible candidates for biological sampling when the vessels call to port.

Two-stage approach for the implementation of the new DCR

The SGRN 06–03 suggests a two-stage approach to move forward:

- A transition period of limited duration (three years at the most) during which the collection of basic fishstats (fishing effort, landings and revenues, but exclusive of discards) is put into place by métier matrix cell, and the collection of biological data (discards and length frequency data) is organised by any grouping of fishing voyages that gives the best possible approximation of the métier definitions in the matrices (i.e. whenever possible, by "true" matrix métier and, in their absence, by "pseudo-métier"). In SGRN's opinion, this transition period should not last longer than three years, to avoid that Member States simply continue their current data collection schemes without even attempting the crucial move towards harmonised métier-based data collection.
- Once the three years' datasets of basic fishstats by métier matrix cell are available, the selection of métier matrix cells to be sampled for discards and length composition data, and the mergers of cells can be refined, and the data collection system can move from using "pseudo-métiers" to using the actual métiers of the matrices.

PGCCDBS supports the recommendations made by SGRN.

SGRN second revision meeting

SGRN presented the results of the SGRN 06–03 meeting on the revision of the DCR, focusing on the fishery-based collection of biological data (Report of SGRN 06–03, in preparation). In this presentation, a clear overview was given on the implementation of fishery-based sampling.

SGRN 06–03 states that it has dealt with the first steps of the revision of the DCR, facilitating the major shift in working procedures that will be caused by the implementation of the new DCR. During its meeting, SGRN identified the data needs by Regional Fishery Organisation, settled the stratification (by métiers) of the sampling population, proposed general rules for the implementation of the new DCR in the field, and identified the required changes in associated regulations to the DCR.

Based on the results of the first meeting, SGRN 06–03 concludes that important issues are not dealt with in full detail. These include, for example:

- Define or re-address the data needs for the Mediterranean and Black Sea area and species specific data needs for salmon.
- Identification of glass eel, silver eel and yellow eel surveys to be included in the new DCR.
- Definition of criteria for species grouping and data requirements by species group for all areas.
- Definition of tasks and responsibilities of the RCM's, to fully embed the RCM's within the structure of the DCR.

As some of these issues are of major importance for a successful revision of the DCR, it is of prime importance that they are taken in account thoroughly in the revision process.

Therefore, PGCCDBS endorses the proposal by SGRN 06–03 to have a second SGRN revision meeting dealing with the issues mentioned above and as described in the proposed ToR for this meeting.

5 Define the framework for standards and best practises for sampling commercial fisheries. The framework shall include methods to evaluate whether submitted data conforms to the standards. Agree a prioritized workplan for establishing such standards and best practices and initiate intercessional work.

The Study Group on Quality Assurance (SGQUA) completed in 2005 a gap analysis on Quality Assurance (QA) Procedures in ICES (ICES, 2005b). One of the recommendations from SGQUA was to develop: "Standard Operating Procedures for any routine procedure used to underpin generation of advice." In response to this, ICES' Client Commissions emphasised the importance of quality assurance within ICES and consequently the EC, NASCO and NEAFC have accepted as part of the revision of the MoUs with ICES to contribute to paying for the ICES quality assurance programme. Further, in the new MoU between ICES and EC issues in relation to the Data Collection Regulation have been included:

"Data – Concerning the advice for fisheries, the Commission will arrange – through member states or directly – for any data collected through the Data Collection Regulation (DCR) and legally available for scientific analysis to be available to ICES. The Commission will assist ICES in getting access to any other data which has been collected under Community legislation or is collected with the support of Community funding while respecting legal status regarding the distribution of this information (i.e. confidentiality or public availability such as pertaining to environmental information). The Commission will provide information from the inspection services which may be useful for the advice while preserving confidentiality.

ICES will communicate any problems encountered regarding access to data, data quality and completeness of data. This shall in particular apply to data are collected through the DCR or which have been collected with other Commission support.

ICES is responsible for quality control of the aggregated data used in assessments and shall decide which data are considered a useful basis for advice. If the quality of landings data cannot be accurately documented ICES may decide to base its advice exclusively on other types of information such as survey data.

ICES will explain in the background documentation for the advice which data were used and how and will evaluate data quality and completeness on a stock, country, fleet and data type basis.

The Parties will facilitate that stakeholders are invited to contribute to data preparation and evaluation of data quality.

ICES will provide advice and services relating to the Data Collection Regulation. These services include recurrent review of data delivered for ICES' advisory obligations and on request specific services regarding standards, manuals and coordination."

PGCCDBS discussed the interpretation of this ToR in relation to the new item in the MoU regarding ICES responsibility of quality assurance of the aggregated data. Quality assurance of the aggregated data is closely related to quality assurance on the steps preceding the level at which the data reach ICES, i.e. the stock and national levels. Sampling the commercial fisheries is done within the DCR for all the EC member countries and procedures, standards and quality assurance need therefore also to be dealt with under the DCR. To assure quality at the aggregated level needs therefore to rely on quality already assured by the individual countries and under the DCR.

In dealing with this ToR Figure 5.1 was produced to get an overview of the different levels and steps of quality assurance in the data process and usage of data in the advisory process.

The levels and responsibilities identified at each level helped the group to have a clearer view of the ToR.

Within this system sets of quality indicators should be provided together with the data all the way from the national to the advice level, so that each responsible can take the decisions regarding the usage of the information based on clear criteria and document the choice made.

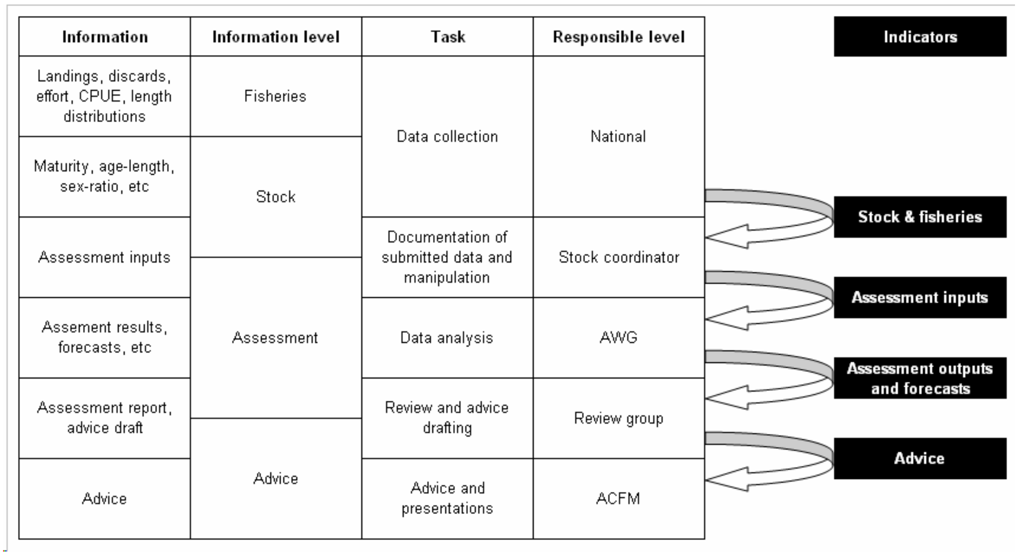


Figure 5.1 - Process of quality data checking.

PGCCDBS agreed that in spite of the formal ICES area of influence this group has the expertise to develop a framework for QA of fisheries and stock information collected at the national level:

1) Fisheries information collected or estimated by National authorities and Fisheries Institutes, constituted by series of parameters by metier (landings, discards, effort, cpue and length distributions).
2) Stock information collected by Fisheries Institutes, constituted by basic population data (eventually raw samples) of maturity, growth, sex ratio, individual weights, etc.

This information is the basis of the stock coordinator work and should be provided with the necessary quality indicators and documentation, to allow the compilation of data for stock assessment based on clear criteria.

Section 5.1 defines some terminology. In Section 5.2 PGCCDBS developed a procedure that can be used for QA of the above mentioned data. In Section 5.3 we describe some examples related to stock and fisheries data QA, in particular we present some candidates to quality indicators. Finally in section 5.4 a 3 step workplan is presented for 2007/2008 to test these ideas.

5.1 Terminology

Procedure: is a specification of the series of actions, acts or operations which have to be executed in the same manner in order to obtain always the same result in the same circumstances (for example, Quality handbooks). Less precisely speaking, this word can indicate a sequence of activities, tasks, steps, decisions, calculations and processes, that when undertaken in the sequence laid down produces the described result, product or outcome. The procedure should also describe the right Quality level, both qualitative and quantitative and what action that should be undertaken when the Quality level is not reached. A Procedure may also refer to:

Data analysis: is the act of transforming data with the aim of extracting useful information and facilitating conclusions. This might include application of statistical methods, models, or other techniques, used to execute assessments or input data of assessments e.g. maturity ogives, Alk, etc.

Standards: are publicly available documents that contain implementable specifications. Allowing anyone to obtain a standard and create a product based on it increases compatibility between related users that are familiar with the same specification. It also increases documented use since anyone with the necessary technical knowledge and resources can set and check analysis and statistics according to predefined "rules".

Indicator: a detector to give guidance of how well some parameters can explain the activity looked upon. Indicators can be qualitative (*e.g.* compliance with a specific protocol) or quantitative (*e.g.* precision obtained by a sampling programme on the estimation of a variable).

Accuracy: is the degree of conformity of a measured or calculated quantity to its actual (true) value. Accuracy is closely related to precision. The results of calculations or a measurement can be accurate but not precise; precise but not accurate; neither; or both. A result is called valid if it is both accurate and precise. The related terms in surveying are error (random variability in research) and bias (non-random or directed effects caused by a factor or factors unrelated by the independent variable). Acceptance conditions e.g. coverage of area/gear/season, percentages of catches up against samples – with the aim of ensure that the right Quality level is reached.

Precision: characterises the degree of mutual agreement among a series of individual measurements, values, or results.

5.2 QA & Indicators

As stated before indicators are tools to detect how well a parameter can explain the activity. Indicators can be qualitative, based on processes that have to be followed, or quantitative, based on data analysis.

The procedure we foreseen regarding QA of stock and fisheries data is described in Figure 5.2. It relies on the establishment of protocols and the definition of a set of standards we want our data to be consistent with. Data must be collected in agreement with the protocols and analysed to compute statistics of interest for stock assessment. Before submitting data to the stock coordinator the indicators must be computed by comparing the data collected with the standards defined. All information must then be provided to the stock coordinator, which should compile inputs to stock assessment and document its choices. The indicators may be:

- Compliance with protocols – qualitative indicator about deviations from protocols, e.g. it can be the comparison with the minimum protocol referred in Section 2.1.
- Coverage of the sampling achieved – quantitative indicator of the % of the fishing activity covered by the sampling programme, it's an important indicator about biased estimates.
- Precision of the estimates – quantitative indicator of the precision achieved by the sampling programme, it can be the minimum CV or variance accepted to provide high quality assessment.

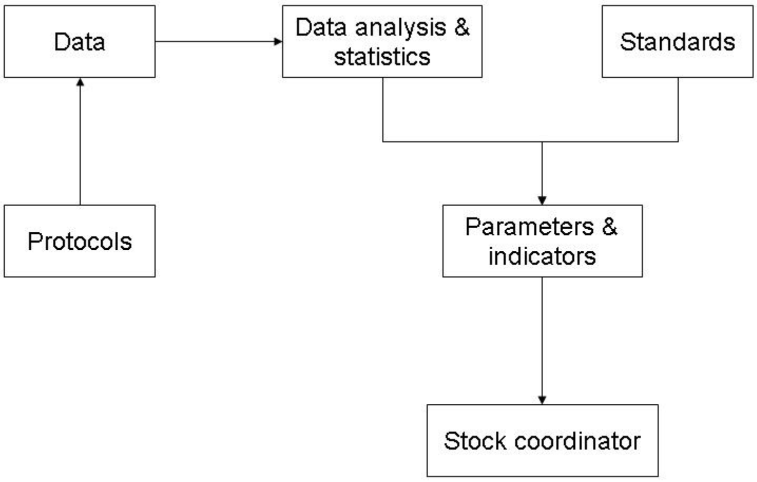


Figure 5.2. – Schematic illustration of how indicators and standards are meant to be implemented in the data handling process before delivery to the ICES Stock coordinator.

5.3 Examples

5.3.1 Accuracy and precision of fisheries data

Accuracy of fishery statistics

In order to establish quality indicators that can be used to evaluate/ estimate the accuracy of the fishery statistics and biological information about the catches, it is necessary to make use of different sources of information and analyse the consistency between them with regards to the relevant parameters.

Such a quality control thus needs to check different sources for the same information, e.g. logbooks compared with sale slips from the same vessel and/or trip. In many countries there are too bad, or even no control by comparing landing statistics with logbooks. In addition, logbooks often report an underestimate of the real catches and thus reduce the quality of both the catch statistics itself and cpue, both parameters essential and important input to any stock assessment. Another possibility would be to compare logbook data from vessels or trips with and without observers (e.g., Anon., 2005).

Another example of a possible source of information, i.e., indicator, that can be used to compare and check the quality of official catch statistics is the method used by the Norwegian Directorate of Fisheries combining fishing inspection (onboard observations) and control of landings with VMS data (name and frequency of vessels going to harbour) (Anon., 2006b; Aanes and Nedreaas, 2006).

Precision of the catch statistics

Estimation of all removals should be done and preferably be presented with confidence intervals, st.dev., st.error, CV, or some other measure of the quality of the estimate which

PGCCDBS suggest to use as indicators for this purpose. Then the value of the chosen indicator should be compared with the established standard.

Accuracy of catch samples

A possible indicator to use to evaluate accuracy could be to check how well the catch samples cover the area by stock, season and fleet. The geographical distribution of the national catches should be shown on a map including the same geographical cells/strata that are the basis for the geographical collection of biological stock data.

On the same map, or on a copy of the map, suitable information about the coverage of the samples should be presented– with the aim of ensuring that all areas with catches are sampled. Percentages of catches up against samples could be an indicator if it is done on a geographical cells/strata basis.

Precision of catch samples

Suitable parameters (e.g., mean length) for precision estimation should be chosen. Focus on the precision of estimates of e.g., the mean length will indirectly represent the precision of the estimates of the length-frequency distributions (Helle and Pennington, 2004; Pennington *et al*., 2002) (see Figure 5.3 as an example). A variance component analysis (e.g., Searle *et al*., 1992) may be used to estimate the contribution of each sampling stage to the total variability, and based on these estimates, also various sampling schemes may be considered.

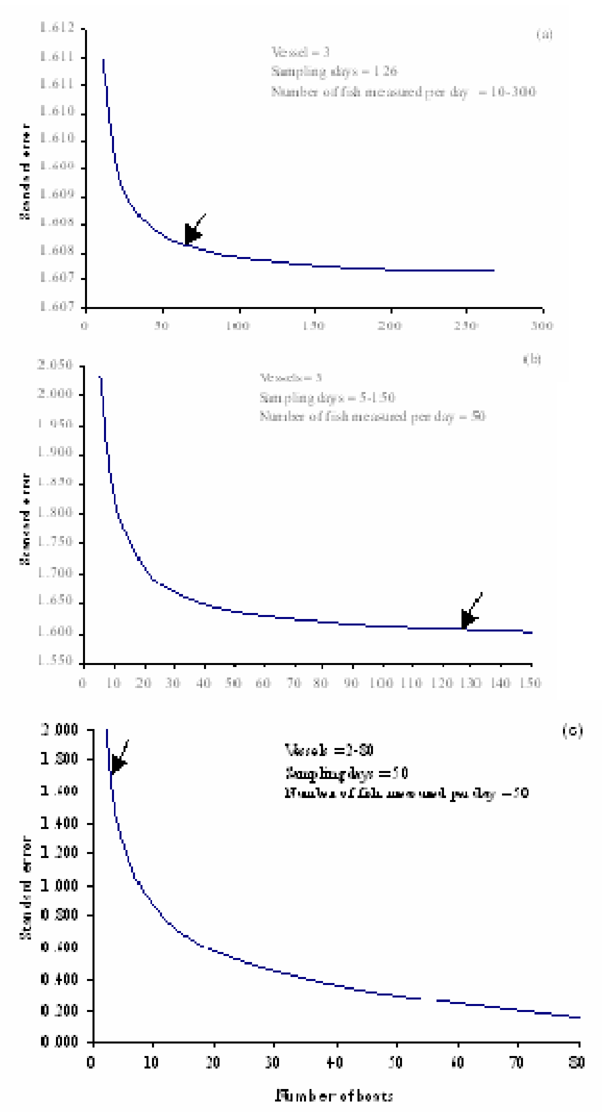


Figure 5.3 - Precision of the estimate of the mean length of tusk (*Brosme brosme*) as a function of (a) the number of fish sampled per day, (b) the number of days which each boat has been sampled, and (c) the number of boats sampled in the fleet. The arrows denote the precision of the 2003 data (Helle and Pennington, 2004).

Other methods that estimate catch-at-age incl. precision by combining data from different sources are also available (Ref. to Workshop on Precision, Hirst *et al*., 2004, 2005). Such methods will be further developed and improved during the planned EU COST project.

5.3.2 Accuracy and precision of biological stock data

Because fish caught together are usually more similar than those in the general population, a total of M fish collected in n clusters will contain less information about the population length or age distribution than M fish sampled randomly. One way to measure the information contained in a sample is to estimate the number of fish that one would need to sample at random (the effective sample size) to obtain the same information on length contained in the cluster samples (Pennington *et al*., 2002).

Estimation of effective sample size may thus be a better indicator than the total number of fish in the sample (Lehtonen and Pahkinen, 2004; Pennington *et al*., 2002). The higher the effective sample size, the better the quality of the parameter in question.

A simpler method to use for exploring accuracy and precision could simply be to do a retrospective comparison of the same parameter, e.g., length, mean length-at-age, individual weights, maturity ogives etc. in last year data and compare it with previous years' data. Any peculiar discrepancies should be described and explained.

Furthermore, laboratories that participate at an international research level must develop appropriate QA and QC procedures for their age readings. Countries obtaining agreements less than xx% for readers supplying data to ICES working groups should review their procedures and training protocols. It is important to increase the production of know age material (reference material).

5.4 Further recommended workplan

PGCCDBS agreed on the following prioritized workplan:

1) To develop a "minimum" international protocol to be used as a standard, and which should contain a minimum of procedures that the national protocols need to meet to fulfil the requirements set. Such requirements are e.g., how the fish is measured – total length, fork length, rounding to nearest cm below etc., stratification system etc. A possible indicator of quality could be the percentage agreement of compliance with the minimum protocol. This analysis should be done prior to WKACCU (see below).

2) A workshop (WKACCU) with terms of reference to establish standardized/joint methods on how to evaluate and estimate the accuracy of submitted fisheries data should be held in 2008. This should include analyses of sample coverage and methods to use for estimating/evaluating the quality of total catches, i.e., whether and how discards, misreportings, unreportings, etc. are included.

3) A workshop (WKPRECISE) with terms of reference to establish standardized/joint methods and indicators for evaluating and estimating the precision of submitted fisheries data should be held. Definitions of standards (i.e., minimum requirements) should then be made. Although some laboratories already have developed suitable tools for such precision estimation, the planned EU COST-project should preferably be finished (about 2 year) before holding the workshop, as this EU-project may contribute a lot to this issue.

6 Review and update protocols for age calibration and maturity staging workshops

PGCCDBS assessed which recommendations were common to both age calibration and maturity staging workshops.

PGCCDBS agreed that a general shift in attitude would be beneficial, moving from a reactive to a predictive perspective with the aim of enhancing performance and not criticise.

PGCCDBS agreed that both age calibration and maturity staging could benefit from a review process and will start action to submit the latest age calibration workshops to ICES Cooperative Research Reports during 2007 (see also section 1.5)

Sections 6.2 and 6.3 developed guidelines and generic ToR for age calibration and maturity staging workshops. These are still under development and should be adjusted after consultation with other experts.

6.1 TACADAR Concerted Action 2002–2006. Towards Accreditation and Certification of Age Determination of Aquatic Resources

Quality Control can develop a range of operational definitions. It is particularly important to identify and respond to the end-users' needs. Timeliness, for example may be more critical for the customer than the highest level of quality control. The key components in the application of QA and QC are the prevention of errors through training and documentation, the detection of errors by inspection and analysis of outputs, and correction by adjustments to procedures to improve results. Methods must be documented before they can be evaluated and it is essential to do both. The aim is to enable age readers to move towards a position where they know they are doing it right and can prove it. It is essential to match effort on the implementation of quality management to the importance of the customer's need and to take into consideration the diversity of the community of age readers, as well as the diversity of the customers for fish age data. The costs of implementing QA and QC are considerable and ongoing and there must be a long-term commitment to the programme.

It is important to understand age estimation as a skill. The best practitioners are found among those who have practised extensively and performance will decline over time without practice. The effectiveness of the network will decrease over time if the working relationships are not supported and strengthened by an appropriate structure. Changing attitudes and behaviour are more important than enforcing standards and the aim is to enhance performance, not criticise. If done well it will build confidence and improve the morale of staff. The complexities of this process increase with scale and social and cultural issues become more important. Therefore it is important to pay attention to the development of shared goals and the maintenance of good communication. Database edits should be controlled and traceable, while the data should be readily accessible to all users. Reports and presentations from workshops and exchanges should be made public and circulated within the age reading laboratories, to make everyone aware of problems and new techniques.

6.1.1 TACADAR recommends

- The EFAN-Homepage should be maintained for the existing network as an information source and exchange platform.
- Currently, different programmes for the use in otolith image analysis are developed in different labs. The recommendations of projects to develop (or agree upon) an image analysis programme for routine age reading and output formats, should be taken into consideration in the future.
- To define age reading standards as prerequisites for the submission of data in the context of the DCR, similar to the minimum sampling requirements defined for the DCR.
- Full implementation of the Accreditation and Certification of the age readings in the national labs is premature and not appropriate. More input should be directed towards quality assurance within the national labs to define and meet pan-European standards.
- TACADAR has now produced a guideline for quality assessment and quality control for fish aging. It is recommended that PGCCDBS continues refining these guidelines.
- It is recommended to support initiatives (projects) for validating age structures, which include the underlying research on the biological basis of formation of age structures. It is also recommended to support training of staff by networks and by exchange workshops.
- With regard to deciding on lab methods and equipment for age determination, it is recommended to refer to EFAN/TACADAR-procedures as elaborated in several EFAN Reports 3-2000 (Eltink *et.al*, 2000), 4–2000 (Morales-Nin, 2000) and 5–2000 (McCurdy *et.al*, 2000). National labs should establish a quality assurance section on their homepages. Here method descriptions for each species

dealt with should be made public. These homepages should be linked to the EFAN-homepage.

- Quality assurance and control are not static but a process that requires continuous development. It is recommended that there be support for relevant research and active links between researchers and age readers to communicate and exchange development needs and research results.

6.2 Age Calibration Workshops

The scientists involved in stock assessment and environmental monitoring are the users of age reading results provided by the different laboratories. It is important in the evaluation of stock assessment problems to be able to minimise inconsistent age determination as a factor. Therefore quality assurance and quality control in age reading is very important. This topic has been addressed by the EU concerted actions EFAN & TACADAR.

The information provided in following sections is largely extracted from EFAN and TACADAR reports. These reports provide elaborate guidance on how to carry out ageing calibration. Especially the EFAN 3–2000 report (Eltink *et al.*, 2000) should be examined by anyone undertaking an age calibration exercise. This information has been condensed into guidelines in the following sections. Occasionally the suggestions and recommendations given previously by EFAN or TACADAR are updated based on new insights or adapted for the purposes of PGCCDBS.

6.2.1 Time table for exchanges and workshops

PGCCDBS considers that cooperation and coordination in fish age determination should be arranged on a permanent and regular basis. Therefore it is recommended to hold regular otolith exchanges and workshops. Exchanges should be carried out at least once every two years and the possibility for a workshop should be offered at least once every four years.

The frequency of exchanges and workshops mainly depends on the quality of the age determination. This can be characterised as good, medium or bad (Table 6.1). The current nature and the proposed frequency for exchanges and workshops is preliminary and will be revised by national age determination coordinators and by expert groups, as is the proposed division of several species by area, where the age structures of which are considered to differ significantly.

The regular otolith exchanges are intended to be small scale exchanges consisting of relatively few recently collected otoliths. Before the workshop it is recommended that the expert group carries out an exchange of a larger scale (see guideline in section 6.1.3.). If this is not possible then the workshop will have to fall back on the data from the small-scale regular exchanges. Note that it is impossible to organise an effective workshop without exchange data.

For fish species which do not have major problems in age determination regular organisation of workshops would not be mandatory. However, it is generally considered that workshops improve ageing quality and should not only be held in the case of (large) ageing problems. It is anticipated that proposals for the organisation of workshops would be mainly initiated by experts themselves. But PGCCDBS may need to recommend workshops mainly in those cases when age determination problems were revealed by the exchanges.

The proposed frequency of exchanges and workshop by species (and area) is presented in Table 6.1. This table also lists the history of exchanges and workshops and the workshops planned for 2008 and 2009. This table is preliminary and must be updated/completed by the AWGs and the national age coordinators no later than 1 October, 2007. It is the responsibility of the chair of PGCCDBS and the ICES secretariat that this information is obtained from the AWGs and age coordinators.

Table 6.1 – Age determination exchanges and workshops overview and proposed realisation frequency.

row id	Species	Scientific name	Stock, area for ageing purposes	Analytical assessment	Previous exchanges	Previous workshops	Proposed workshops in 2008	Proposed workshops in 2009	Necessary exchange regularity	Necessary workshop regularity	Ageing performance
1	Sandeel	*Ammodytidae*		*yes*	2005 (DK), 2006 (DK)	2005 (DK), 2006 (DK)					good
2	Scabbardfishes	*Aphanopus spp*		*no*	1998-1999 (ES)	2000					bad
3	Alfonsinos	*Beryx spp*		*no*							bad
4	Herring	*Clupea harengus*	Baltic sea	*yes*	2001, 2003, 2005, 2006	1998 (LV), 2000 (FI)	2008 (LV)				good
5			North Sea, Irish Sea, Celtic Sea	*yes*	2004	2005 (FI)					good
6	Atlanto-Scandian Herring	*Clupea harengus*	Norwegian spring spawners	*yes*		1999					good
7	Conger	*Conger conger*									
8	Roundnose Grenadier	*Coryphaenoides rupestris*		*no*	2005 (FR), 2006 (FR)	2006 (FR), 2007 (FR)					bad
9	Seabass	*Dicentrarchus labrax*	North Sea, Mediterranian ?	*no*	1997-1998 (ES)						medium
10	Anchovy	*Engraulis encrasicolus*		*yes*	2001 (ES), 2005	2002 (ES), 2006 (ES)					good
11	Cod	*Gadus morhua*	Baltic sea	*yes*	2004-2005 (SE), 2006	2001, 2005 (LT), 2006 (PL)					bad
12			North Sea	*yes*	1997-1998 (SC), 2000-2001 (IE), 2002 (IE), 2005	2001	2008 (?)				good
13			Irish Sea, Celtic Sea	*yes*	2006 (IE)						
14			Arctic cod[2]	*yes*	2006	2006	2008 (?)				good/medium[2]
15	Witch	*Glyptocephalus cynoglossus*									
16	Bluemouth rockfish	*Helicolenus dactylopterus*									
17	Four-spot Megrim	*Lepidorhombus boscii*			2004 (ES)	1997 (ES)					
18	Megrim	*Lepidorhombus whiffiagonis*		*yes*	1997, 2003, 2004 (PT)	1997, 2004 (ES)					medium
19	Black-bellied Angler	*Lophius budegassa*		*no*	2001, 2004	1991 (FR, ES), 1997 (FR, ES, PT), 1999 (PT), 2002, 2004 (PT)					bad
20	Anglerfish	*Lophius piscatorious*		*yes*	2001	1999 (PT), 2002, 2004 (PT)					bad
21	Haddock	*Melanogrammus aeglefinus*	North Sea and Atlantic stocks	*yes*							good
22	Whiting	*Merlangius merlangus*	North Sea and Atlantic stocks	*yes*	1999, 2004 (SC)	1997 (ES), 1998 (DK), 1999 (UK), 2000, 2005 (UK)					good/medium
23	Hake	*Merluccius merluccius*		*yes*	1994 (FR,ES), 1997 (ES), 1999, 2001, 2003, 2004 (ES	1997 (ES), 1999 (ES), 2004 (ES), 2006 (ES)					bad[1]
24	Blue whiting	*Micromesistius poutassou*		*yes*	2003, 2004 (DK)	2005 (DK)					medium?
25	Lemon sole	*Microstomus kitt*									medium
26	Blue ling	*Molva dypterygia*									
27	Forkbeard	*Phycis phycis*									
28	Flounder	*Platichthys flesus*	Baltic Sea	*no*	2006	2006 (GE), 2007 (SE)					bad
29			North Sea	*no*	none	none					?
30	Dab	*Limanda limanda*		*no*	none	none					medium
31	Plaice	*Pleuronectes platessa*		*yes*	2003	2003					good
32	Saithe	*Pollachius virens*		*yes*	2006 (FR)						good
33	Turbot	*Psetta maxima*		*no*	2005 (NL), 2008	none	2008 (NL)				medium
34	Salmon	*Salmo salar*		*yes*	2002, 2003, 2005	2002, 2003, 2006 (LV)					good
35	Sea trout	*Salmo trutta*		*no*	none	none					bad/medium
36	Sardine	*Sardina pilchardus*		*yes*	2004 (PT)	2001 (RU), 2005 (PT)					medium
37	Spanish mackerel	*Scomber japonicus*									
38	Mackerel	*Scomber scombrus*		*yes*	2001	1995					medium
39	Brill	*Scophthalmus rhombus*		*no*	2004, 2005 (NL)						good
40	Redfishes	*Sebastes spp*		*no*	2000-2003 (GE), 2007-2008 (GE, ES)	1991 (RU), 1995 (GE), 2006 (ES)	2008 (Ca)				medium
41	Sole	*Solea solea*		*yes*	2001 (UKE), 2006	2002 (UK-E), 2005 (UK-E)					good
42	Seabreams	*Sparidae*									
43	Sprat	*Sprattus sprattus*	Baltic Sea	*yes*	2004, 2007	2006 (DK)	2008 (?)				medium
44			North sea	*yes*	1994, 1996, 2001, 2002	1992, 1994, 2004 (NO)					good
45	Blue jack mackerel	*Trachurus picturatus*									
46	Horse mackerel	*Trachurus trachurus*		*yes*	2005 (NL), 2006	1999 (NL), 2006 (NL)					medium
47	Norway pout	*Trisopterus esmarki*		*yes*							good
48	Pouting	*Trisopterus luscus*									
49	Red stripe mullet										
50	Red mullet										
51	Greenland halibut	Reinhardtius hippoglossoides			2005	1996, 2006 (CA)					

[1] validation showed ageing was wrong

[2] regular annual exchanges and workshops between Norway and Russia

6.2.2 Explanation of frequently used terminology

Reference Collections

'Reference Collections' should be merely regarded as a generic term to include several completely different types of collections. Three types of collections are distinguished and they cover sets of calcified structures of fishes whose ages are either unknown, or agreed, or known. It is important to state which type of reference collection is used. All collections should be large enough to prevent immediate previous image recognition to the readers.

Control collections:

Control collections are sets of calcified structures of unknown age, which are re-aged at regular time intervals to estimate changes in the precision and relative bias at age over time.

Agreed Collections:

Agreed collections are sets of calcified structures of unknown age which have achieved a certain level of agreement. This differs between species but 80% agreement is often used.

Validated Collections:

Validated collections are sets of calcified structures of known age (from either direct or indirect validation exercises, see Morales-Nin, 2000).

Precision

Precision is defined as the variability in the age readings. The precision errors in age readings are best described by the coefficient of variation (CV) by age group. This measure of precision is independent of the closeness to the true age.

Accuracy

Accuracy is defined as the closeness of a measured value to its true value. The bias quantifies the degree of accuracy. We distinguish 2 types of bias: absolute bias and relative bias.

Absolute bias

Absolute bias can be defined as a systematic over- or underestimation of age compared to the true age. To be able to estimate absolute bias, known age sets must be available

Relative bias

In the absence of calcified structures of known age, the age readings can be compared to modal age, which is defined as the age determined for an individual structure for which most of the readers have a preference. Relative bias can be defined as a systematic over- or underestimation of age compared to the modal age. The age reading comparisons to modal age provide a low estimate of relative bias compared to absolute bias, when most readers have a similar serious bias in age reading.

6.2.3 Guidelines for ageing exchanges

The objective of exchanges of calcified structures is to estimate precision and relative/absolute bias in the age readings from age readers of the different age reading laboratories.

An exchange program should be carried out regularly to check whether the precision in age reading and bias of the age readers is still within acceptable levels. Exchange programs 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). It is important to read the exchange programme otoliths in exactly the same way as they are read for stock assessment and not to make a special effort to get the best possible result.

The age span in an exchange set of calcified structures should, if possible, be from age 0 to the maximum age possible (try to exceed the age range as used for stock and environmental assessment purposes). As a rule of thumb one could say that 10 specimens are needed within each age group for a reliable estimation of CV at age. A much higher number of calcified structures is needed, if CV's by month/stratum have to be compared.

It is recommended that calcified structures are included in a set in such way that the number with translucent edges and the number with opaque edges are representative of the annual distribution. 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.

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 ability to age. 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.

Try to eliminate all calcified structures you know are poorly prepared or have other obvious reasons why they are different from the rest of the otoliths in the exchange.

Bearing this in mind, the co-ordinator 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.

To optimise output from exchanges, fully annotated images from each participant are essential and should become obligatory. Manually collating all annotations from every reader onto a master image has not been feasible for all otoliths in exchanges, simply due to the exorbitant amount of time this exercise takes. The Marine Institute Ireland has developed a Paint Shop Pro X script to automate the merging of annotated layers.

However, digitised images can at present only be made for sectioned otoliths because of their perfectly flat surface. In general, whole otoliths and transversely broken otoliths/bones do not have such a flat surface.

The co-ordinator should contact other age reading laboratories and identify the age readers who will participate in the exchange. At the same time he should also inquire how much experience the readers have in age reading this species and other species.

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. The co-ordinator should keep track of where the otolith sets are, who is reading them and to whom each set should be sent next. 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.

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.

6.2.4 Guidelines for ageing workshops

The main objective of an age reading workshop is to decrease the relative/absolute bias and to improve the precision (reduce CV) of age determinations (their reproducibility) between age readers of the different age reading laboratories.

An exchange of calcified structures should be carried out first to indicate the errors in age reading before a recommendation for an age reading workshop can be made (see previous section).

At a workshop an attempt should be made to solve the problems indicated by the exchange. The following possible problems in age reading might exist:

- the age reading methods differ too much (as indicated by statistical tests);
- the precision in age reading is too low for certain age readers;
- there is a strong bias in the age readings of young and/or old fish;
- precision differs considerably for different preparation methods
- inexperienced readers;
- other age reading problems.

The following topics can be relevant for a workshop, and all should be considered:

- The biology of the species;
- The results of previous exchanges and workshops;
- When and how the age reading technique was validated;
- The sample processing techniques used at the different age reading laboratories
- If necessary, try to standardise the processing techniques of calcified structures;
- Agreement on age determination criteria;
- Discuss disagreements in age reading results from the sets of the calcified structures read during the exchange and at the workshop and try to agree on the age reading method;
- Prepare or update a manual for age reading (date of birth, interpretation of rings and edges, period of opaque and translucent ring formation);
- Determine at the end of the workshop the precision in age reading and the relative bias (if possible the absolute bias);
- Estimate improvement in age reading concerning precision and bias by comparing exchange set and the last set at the workshop;
- Make recommendations on how to improve the age reading quality;
- Indicate which calcified structures can be used for the "agreed collection" and (if possible) produce digitised images.

Other topics may be addressed based on the conclusions from the exchange.

Everyone who participated in the exchange should also participate in the workshop. And visa versa, no one should participate in the workshop unless they also took part in the exchange.

Workshops usually compare the performance of readers between the start and end of the workshop. These comparisons need to be planned from the start of the exchange and carried out using the principles of designed experiments. The most important ideas for experiment 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 exchange from one area then read otoliths from a different area at the end of the workshop.

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.

The procedure for generating two sets of otoliths for comparison of exchange and workshop results should be: Define the relevant strata and assign otoliths by strata randomly to either the first or second set. The two sets do not have to be the same size. When the first set is for the exchange and the second set for the end of the workshop it is sensible to make the second set smaller. If the age workshop coordinator can specify changes in reading bias or CV that are biologically meaningful to detect then sample size calculations can be carried out to help decide how big the data sets should be.

6.2.5 Generic ToR's for ageing workshops

a) Provide information on laboratory procedures

- Sampling and storing of calcified structures.
- Equipment and preparation of calcified structures
- Documentation on processes and protocols (QA)
- How age determination are being checked within laboratories (QC):
    - availability of reference collections
    - results age reading comparisons between readers
    - percentage of samples re-read
- Estimate (relative) accuracy and precision

b) Resolve interpretation differences between readers and labs

Disagreements on the interpretation of annual increments can exist between experienced readers. Usually these differences are resolved when the readers discuss the otoliths jointly (note: annotated images largely simplify this process). However, this is not always the case and then follow-up actions must be formulated.

a) Update (create) on ageing manual

There should be a standard ageing manual for each species that is internationally agreed upon by all experienced age readers. This manual focuses on the interpretation of the structures (e.g. date of birth, interpretation of rings and edges, period of opaque and translucent ring formation). The manuals on preparation of calcified structures are usually created and updated on the national level.

a) Collate agreed age reference collection.

Output of every workshop should be an agreed age reference collection. Preferably the agreed interpretation should be annotated in (a separate layer of) the images. These sets of images could then be made available on line to train new age readers or to have as a reference set for experienced readers. If establishing digital collection on website is not possible then information about location of the reference collection and contact person should be available on the website.

a) Formulate follow-up actions

See the guide lines in the following section

a) Formulate species (and stock specific) target and threshold statistics

As tool for the evaluation of the quality of age readings we recommend that target and threshold statistics are formulated for each species and stock. The statistics refer to the percentage agreement, the CV and the bias. The target value is the value you would like to achieve and know is possible based on exchange and workshop results. The threshold value is the (subjectively defined) minimum value required before a reader is qualified to supply data to working groups.

6.2.6 Guidelines for follow-up actions

Dissemination of the results

Dissemination of the results is in principle the responsibility of the coordinator of the exchange and/or workshop.

The full report of the workshop should be made available on internet. Preferably the full report (in pdf format) should be placed on the PGCCDBS document repository.

An extended summary of all workshops and exchanges should be submitted to PGCCDBS and to the relevant working groups. This extended summary should provide sufficient information to enable the working group to judge whether or not the quality of the ageing data (by country) is sufficient to include the data in a quantitative stock assessment.

The extended summary should contain the following information:

1) Description of sets of calcified structures included in the exchange and/or workshop:
   - N
   - composition (age and/or length structure, area)
   - preparation methods
   - images available?

2) Description of participants
   - number of readers, laboratories and countries
   - expertise level of each reader (trainee, intermediate, experienced)
   - which readers provide ageing data to the WG’s
   - which laboratories provide ageing data to the WG’s but are not represented in calibration

3) Accuracy and precision estimates
   - percentage agreement, CV and bias by age group
     - only readers providing data to WG’s
     - readers combined
     - by reader (anonymous, but lab/country stated)
     - if relevant, by stratum (spatial and/or temporal differentiation)

4) Summarise currently existing ageing problems, either detected in exchange or not solved in workshop.

5) Evaluation of quality of age data provided to WG
   - preferably a quantitative evaluation (i.e. in relation to target and threshold statistics)
   - if not possible than a qualitative evaluation

6) A list of the expert groups to be informed.

Specific follow-up actions

If ageing problems are not solved within the ageing workshop than the participants must formulate clear follow-up actions which will lead to solving the ageing problems. If there are no distinct ageing problems, but the workshop thinks the general ageing quality can be improved by follow-up actions than these should be formulated clearly. The workshop should point out who is responsible for coordinating and carrying out the follow-up actions and in what time frame. The required follow-up can differ depending on the species and the problem occurring. To aid the workshop some possible follow-up actions are listed here:

- Validation exercises should always be encouraged. Continuous comparisons of age readings does not always solve the problem (an example to be learned from: the bias in hake ageing).
- In some species in which the contrast between the structures is poorly visible it may be advisable to do innovative research on preparation methods
- If 1 or a few readers are disagreeing with the majority of experienced readers, than small scale regional exchanges and or meetings can be organised.
- If interpretation problems of the first annuli are occurring, than back-calculated growth can provide an indication on the correct interpretation.
- If age reading protocols are not available for all participants this should be remedied.

6.3 Maturity Staging Workshops

6.3.1 TORs for Maturity Workshops

The PG is aware of the amount of effort needed to organise Maturity Workshops and due to the new approaches on Quality Assurance, generic TORs and improved communication, the PG proposes to divide the responsibilities over key areas i.e. the Chair, the Data Manager (DM) and the Public Relation (PR).

The Chair has the final responsibility on all aspects but should delegate large parts of the workload to the Data Manager and the Public Relation. Prior to the meeting, the Chair should decide what essential information is needed and in which format. The participants should then deliver all the necessary information to the Database Manager who is not only responsible for the collation of the data but also for the preliminary analyses. The role of the Public Relation is to assure that for all TORs the essential information is well documented and distributed (protocols, sources of data table, data delivers,…) but also has the task to keep track on the Follow-up of the Workshop and maintain and update the centerpoint where all the information is stored and accessible.

The participants of the Workshop should not be restricted to the Countries that routinely collect maturity data but should invite all countries who have appropriate access to the species of interest. In the light of international co-ordination and task sharing, countries that at present do not stage a certain species, could be called upon.

It is important that protocols for the collection of the data and material are decided by the chair so that the participants can collate and deliver the requested data to the Data Manager well in advance of the meeting even if the information still has to be collected (e.g. histological samples, reference pictures,…). At least two months in advance of WK, all information should be available with particular emphasis on reference pictures, maturity keys, validation studies, survey and commercial fisheries data.

6.3.2 Generic TORs:

a) Produce reference collection

The Workshop must build agreed reference collections for all the species and areas that they have covered. The Public Relation is responsible for this aspect which is also part of the Follow-up as this TOR is seen as too extensive to be finalised during the meeting itself and must be updated through time when additional information becomes available.

a) Produce maturity stage sampling protocols

The Workshop must build protocols on how to stage all the species within areas that they have covered. This topic can only be dealt with near the end of the Workshop and quite often doesn’t get covered. The Public Relation is responsible for this aspect which is also part of the Follow-up.

a) Review/define prime sources of data

WKMAT (ICES, 2006b) started compiling all ongoing data sources. The Workshop should review and finalise this work. The collection of this information must be done prior to the meeting and it is the responsibility of the Data Manager. The prepared table can then be used to identify appropriate sources of data and this information must be sent to the stock co-ordinators (PR).

a) Review/define the Data Deliverers to Assessment Working Groups

Based on the sources of data Table, the Workshop should produce a simple table that clearly identifies the Data Deliverers and responsible national scientists. An indication of the timing when the data will be forwarded for incorporation in the Assessment is also needed. This table must be sent to the stock co-ordinators so he/she can check if data is missing and knows who to contact (PR) via ICES Secretariat.

a) Propose Follow up for problems, uncertainties

This TOR is meant to keep track of the tasks that are unfinished or have the potential to be updated through time. A checklist for tasks to be finalised together with a indication on the timing of the action should be provided. This is the responsibility of the PR. Also a table is needed that keeps track of the recommendations, unsolved problems, etc of the Workgroup. This table should be simple; stating the fact together with the year it was made and when/if an action was undertaken. The PR is requested to update this table on the centerpoint.

a) Distribution scheme for the results

This should follow the rules described in Section 1.6 and provide a list of expert groups to be contacted.

6.3.3 Specific TORs

- Validate macroscopic maturity scales with histological analysis of samples collected, confirming the mapping from keys used to the 5-stage maturity scale proposed by WKMAT (ICES, 2007b).
- TOR for WKMSCWHS and WKHHM - Making use of validated reference material, compare and calibrate the criteria, used by the scientists/technicians involved in stage sampling, to classify each maturity stage for males and females.
- Tor for WKMSMAC - Compare and calibrate the criteria, used by the scientists/technicians involved in stage sampling, to classify each maturity stage for males and females.
- Tor for WKMSMAC - Evaluate alternative methods to identify immature and mature fish – GSI and HIS.
- Identify the optimal sampling time to estimate maturity ogives and indicate appropriate source for data collection taking into account spatial and temporal issues as well as distribution of spawning aggregations and sub-populations (Section 4. WKMAT).
- Agree on procedures for assessing effectiveness of the outcomes of the workshop, incorporating suitable exchange exercises.

The time-trigger for investigating the need for new actions must be the year before the benchmark assessments.

Each Institute should collect maturity staging photos of all stages during a one year cycle, putting special attention to spawning period (if it is known) and reinforcing the maturity sampling level.

7 References

Aanes, S. and Nedreaas, K., 2006. Evaluation of 'Status report for 2005 "Russian cod and haddock fishing/reloading at sea". Working Document no. 4, Arctic Fisheries Working Group, 2006. 7 pp.

Anon., 2005. Analysis of illegal fishery for cod in the Barents Sea. WWF-Russia report, August 2005. 34 pp.

Anon., 2006a. Commission Staff Working Paper: Report of the Ad hoc Meeting of Independent Experts on Fleet-Fishery Based Sampling. Nantes, France, 12–16 June 2006, 101 pp.

Anon., 2006b. Status report for 2005 – "Russian cod and haddock fishing/ reloading at sea". Report from the Directorate of Fisheries (www.fiskeridir.no), Norway, March 2006. 13 pp.

Anon., 2007. Commission Staff Working Paper: STECF Sub-group on Research Needs (SGRN) - Revision of the Biological Data Requirements under the Data Collection Regulation, Brussels, 27 November – 1 December 2006, 95 pp.

Campana, S. E., Annand, M. C., and McMillan, J. I., 1995. Graphical and statistical methods for determining the consistency of age determinations. Transactions of the American Fisheries Society, 124: 131e138

Eltink, A.T.G.W., A.W. Newton, C. Morgado, M.T.G. Santamaria and J. Modin, 2000. Guidelines and tools for age Reading. (PDF document version 1.0 October 2000) Internet: http://www.efan.no

ICES, 1994. Report of the Workshop on Sampling Strategies for Age and Maturity. ICES CM 1994/D:1

ICES, 2005a. Report of the Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS). ICES CM 2006/ACFM:15, 153 pp.

ICES, 2005b. Report of the Study Group on Quality Assurance (SGQUA). ICES CM 2005/MCAP:04, 30 pp.

ICES, 2006a. Report of the Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS). ICES CM 2006/ACFM:18, 62 pp.

ICES, 2006b. Report of the Workshop on Age Determination of Redfish (WKADR). ICES CM 2006/RCM:09, 43 pp.

ICES, 2007a. Report of the Workshop on Discard Raising Procedures (WKDRP). ICES CM 2007/ACFM:06, 58 pp.

ICES, 2007b. Report of the Workshop on Sexual Maturity Sampling (WKMAT). ICES CM 2007/ACFM:03, 89 pp.

Hirst, D.,Aanes, S.,Storvik, G. And Tvete, I.F., 2004. Estimating catch at age from market sampling data using a Bayesian hierarchical model. Journal of the royal statistical society. Series c, applied statistics, 53: 1–14.

Hirst, D., Storvik, G., Aldrin, M., Aanes, S., and Huseby, R.B., 2005. Estimating catch-at-age by combining data from different sources. Canadian journal of fisheries and aquatic sciences, 62: 1377–1385.

Helle, K. and Pennington, M., 2004. Survey design considerations for estimating the length composition of the commercial catch of some deep-water species in the northeast Atlantic. Fisheries Research 70 (2004) 55–60.

Lehtonen, R. and E. Pahkinen, 2004. Practical Methods for Design and Analysis of Complex Surveys, 2nd ed. Wiley, New York.

Mc Curdy,W.J., Appelberg M., Ayers R., Belcari P., Bolle L., Cendrero O., Easey M.W., Fossum P., Hammer C., Hansen F. I., Raitaniemi J., 2000. Guidelines for the Quanlity Assurance of Fish Age Determinations. Internet: http://www.efan.no

Morales-Nin, B., 2000. Guidelines for validation studies. Internet: http://www.efan.no

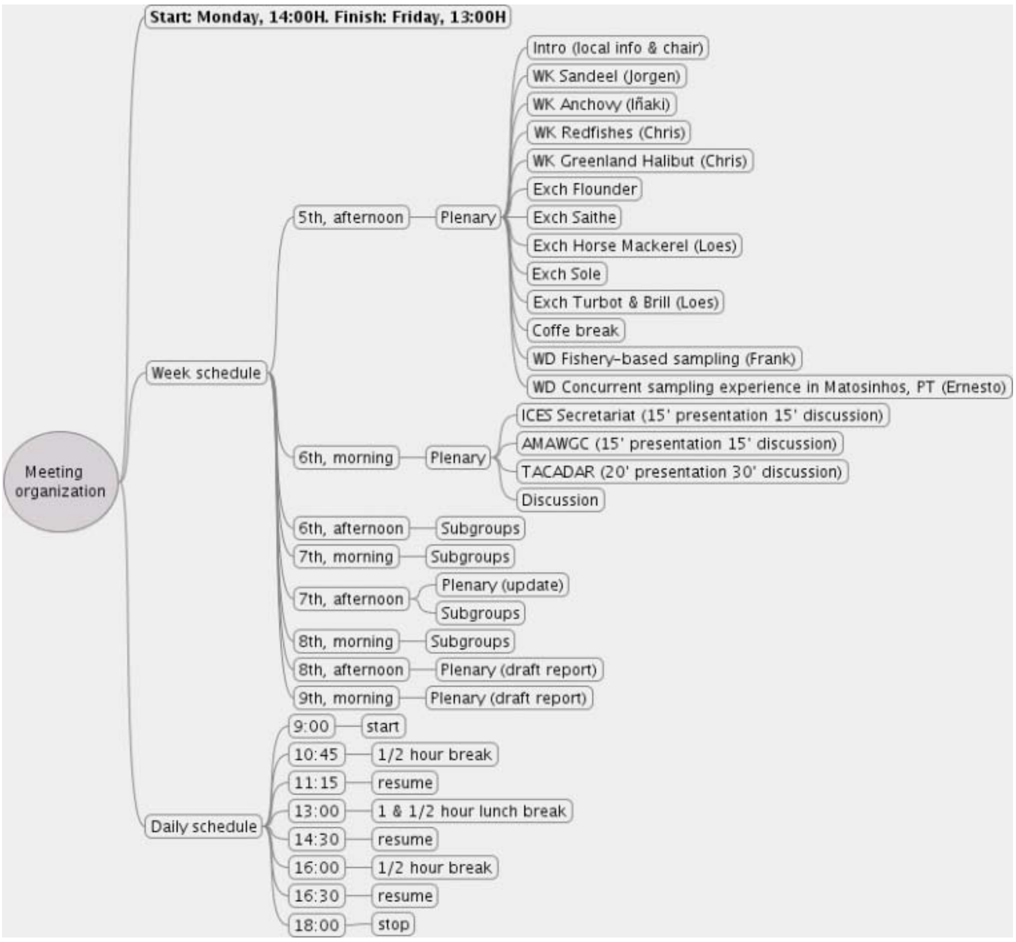
Pennington, M., Burmeister, L.-M., and Hjellvik, V., 2002. Assessing the precision of frequency distributions estimated from trawl-survey samples. Fish. Bull. 100, 74–81.

Searle, S.R., Casella, G., McCulloch, C.E., 1992. Variance Components. Wiley, New York.

Annex 1: List of participants

Name	Address	Phone/Fax	Email
Åge Fotland	IMR, Norway		aage.fotland@imr.no
Angeles Armesto	IEO, Spain		angeles.armesto@gi.ieo.es
Antonio Cervantes	DGFish-EC		Antonio.Cervantes@ec.europa.eu
Antonio Punzón	IEO, Spain		antonio.punzon@st.ieo.es
Bart Maertens	ILVO-Fisheries, Belgium		bart.maertens@ilvo.vlaanderen.be
Beatriz Guijarro	IEO, Spain		beatriz.guijarro@ba.ieo.es
Charis Charilaou	DFMR, CYPRUS		ccharilaou@dfmr.moa.gov.cy
Christoph Stransky	Germany		christoph.stransky@ish.bfa-fisch.de
Dália Reis	DOP-Portugal		dreis@notes.horta.uac.pt
David Maxwell	CEFAS, UK(E&W)		david.maxwell@cefas.co.uk
Edyta Gosz	SFI, Poland		goszed@mir.gdynia.pl
Eric Muscat	Malta		eric.muscat@gov.mt
Ernesto Jardim (chair)	IPIMAR, Portugal		ernesto@ipimar.pt
Frank Redant	ILVO-Fisheries, Belgium		frank.redant@ilvo.vlaanderen.be
Georgs Kornilovs	LATFRA, Latvia		georgs.kornilovs@latzra.lv
Gráinne Ní Chonchúir	MI, Ireland		grainne.nichonchuir@marine.ie
Henrik Degel	DIFRES, DK		hd@difres.dk
Iñaki Artetxe	AZTI, Spain		iartetxe@suk.azti.es
Isabel González Herraiz	AZTI, Spain		igonzalez@suk.azti.es
Joël Vigneau	IFREMER, France		joel.vigneau@ifremer.fr
Jørgen Dalskov	DIFRES, DK		jd@difres.dk
José Luis Pérez Gil	IEO, Spain		joseluis.perez@mu.ieo.es
Jukka Pönni	FGFRI, Finland		jukka.ponni@rktl.fi
Katja Ringdahl	IMR, Sweden		katja.ringdahl@fiskeriverket.se
Kay Panten	Germany		kay.panten@ish.bfa-fisch.de
Ken Coull	MarLab UK (Sco)		coullka@marlab.ac.uk
Kjell Nedreaas	IMR, Norway		kjell.nedreaas@imr.no
Konstantin Drevetnyak	PINRO, Russia		drevko@pinro.ru
Lavrendios Vassiliades	DFMR, CYPRUS		lvasiliades@dfmr.moa.gov.cy
Loes Bolle	RIVO, The Netherlands		loes.bolle@wur.nl
Margaret Bell	MarLab UK (Sco)		bellma@marlab.ac.uk
Maria Hansson	Sweden		maria.hansson@fiskeriverket.se
Maria Sainza	IEO, SPAIN		maria.sainza@vi.ieo.es
Maris Plikshs	LATFRA, Latvia		maris.plikss@latzra.lv
Mark Dimech	Malta		mark.dimech@gov.mt
Matthew Camilleri	GFCM		matthew.camilleri@fao.org
Mette Bertelsen	ICES		mette@ices.dk
Michael Darmanin	Malta		michael.darmanin@gov.mt
Philippe Moguedet	DGFish-EC		Philippe.MOGUEDET@ec.europa.eu
Richard Millner	CEFAS, UK(E&W)		richard.millner@cefas.co.uk
Romas Statkus	FRL, Lithuania		statrom@gmail.com
Sarunas Toliusis	FRL, Lituania		sarunast@gmail.com
Sieto Verver	RIVO, The Netherlands		sieto.verver@wur.nl
Tiit Raid	Estonia		tiit.raid@gmail.com
Ulrich Berth	Germany		ulrich.berth@ior.bfa-fisch.de
Vassiliki Vassilopoulou	HCMR-Greece		celia@ath.hcmr.gr
Willie McCurdy	UK (NI)		willie.mccurdy@afbini.gov.uk
Wlodzimierz Grygiel	SFI, Poland		grygiel@mir.gdynia.pl

Annex 2: Agenda



Annex 3: PGCCDBS terms of reference 2008

Please use the example below to formulate your draft resolutions.

The **Planning Group on Commercial Catches, Discards and Biological Sampling** [PGCCDBS] (Chair: Ernesto Jardim, Portugal) will meet in XX from 10–14 March, 2008 (dates to be confirmed):

b) Review and follow up of last year's recommendations;

c) Review recommendations addressed to PGCCDBS by ICES Assessment Working Groups and other relevant Expert Groups or Workshops, the Liaison Meeting and relevant STECF sub-groups. Where appropriate propose actions to be taken within the ICES system;

d) Review changes in data collection procedures to check if these present problems for stock assessment data and where appropriate propose procedure changes for rectifying the problems. Such proposals shall be communicated to the DCR system (through DG Fish) for action;

e) Continue developing the framework for standards and best practises for sampling commercial fisheries. Review the workplan and actions taken so far for establishing standards and best practices and continue intersessional work.

f) Continue the work on developing protocols for age calibration and maturity staging workshops;

Supporting Information

PRIORITY:	
Scientific justification and relation to action plan:	
Resource requirements:	
Participants:	
Secretariat facilities:	
Financial:	
Linkages to advisory committees:	
Linkages to other committees or groups:	
Linkages to other organizations:	
Secretariat marginal cost share:	

Annex 4: Working Documents

Working Document to the 2007 ICES Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS) (26 Feb.–2 March, 2007)

Fishery-based sampling: implementation test on the Portuguese Trawl Fleet operating off Matosinhos, Portugal

Feijó, Diana <dfeijo@ipimar.pt>; Gonçalves, Marta <mgoncalves@ipimar.pt>; Jardim, Ernesto <ernesto@ipimar.pt>

IPIMAR – Instituto Nacional de Investigação Agrária e das Pescas

Introduction

The Biological Sampling Programme (PNAB), integrated in the Eu Data Collection Regulation (DCR) allows the collecting of data on the activity of the continental Portuguese coast fishing fleet, in particular the length composition of landings and captures, growth data, sex and maturation of the most important commercial species. This information is destined to the assessment of biological resources.

PNAB is implemented in several portuguese fishing harbours throughout the country: Póvoa de Varzim, Matosinhos, Aveiro, Figueira da Foz, Peniche, Setúbal, Sesimbra, Sines, Portimão, Armação de Pêra, Olhão and Vila Real de Santo António.

In Matosinhos (the harbour considered in this study), as in other harbours, the First Sale Fish Market is divided in three auctions, according to the fleet; "Cerco" (purse seiners); "Arrasto" (trawlers); and "Artesanal" (nets and small scale fisheries). The sampling programme is organized on a weekly basis, during which a certain number of length frequency samples are requested for the target species (Table A4.1).

Table A4.1 – Number of samples to be collected on each species for the three auction markets.

Common Name	Scientifical Name	Artisanal	Trawl	*Cerco*
Angler	*Lophius piscatorius*	3	3	-
Atlantic horse mackerel	*Trachurus trachurus*	2	4	2
Atlantic mackerel(1)	*Scombrus scombrus*	1	1	-
Axillary seabream	*Pagellus acarne*	1	1	-
Black-bellied angler	*Lophius budegassa*	3	3	-
Blue whiting	*Micromesistius poutassou*	-	2	-
Chub mackerel(1)	*Scombrus japonicus*	-	1	-
Common sole	*Solea vulgaris*	3	-	-
European hake	*Merluccius merluccius*	4	3	-
European pilchard	*Sardina pilcharus*	-	1	4
Fourspotted megrim	*Lepidorhombus boscii*	1	1	-
Pouting	*Trisopterus luscus*	1	1	-
Rays	*Raja spp.*	1	1	-
Sand sole	*Solea lascaris*	3	-	-
Senegalese sole	*Solea senegalensis*	3	-	-
Norway lobster	*Nephrops novergicus*	-	1	-
Common cuttlefish	*Sepia officinalis*	1	-	-
Common octopus	*Octopus vulgaris*	1	1	-
Common european squid	*Loligo vulgaris*	-	1	-

Flying squid	*Illex coindetii*	2	-	-

[(1)]**Every fourtnight**

With the foreseen introduction of new rules to the EU DCR in 2009, shifting the sample unit from single species to fishing activities, an experiment was conducted to test the implementation of length frequency sampling of trips. The experiment was carried out between January and February 2007 in the trawl auction market.

Methodology

During the months of January and February 2007 length frequency sampling was carried out on a trip basis, collecting length frequency samples of all the species landed by one trawl vessel, randomly chosen among those landing on that day. The number of species sampled, the number of technicians performing the work and the duration of the sampling period were recorded.

Results and discussion

The results obtained throughout this study are presented on Tables A4.2 (January) and A4.3 (February).

Table A4.2 – Results obtained during the month of January 2007.

Week day	Day	Arrival Order	Vessel	Fish Origin	Total Capture (Kg)	Nr. Landed Species	Nr. Sampled Species	Nr Teams /Nr Technicians	Motive
MON	1								
TUE	2	1	Deneb	PT	1644,7	22	0	2/4	Late Landing
		2	Península	PT	3110,0	13	0		
WED	3	1	Cruz de Malta	PT	2542,16	25	12	2/4	Sale
		2	Deneb	PT	1323,2	19	-		
		3	Península	PT	2081,4	15	-		
		4	Juvenilia	PT	1824,7	13	-		
THU	4	1	Península	PT	3462,2	12	10	2/4	Sale
		2	Cruz de Malta	PT	1887,2	8	-		
		3	Deneb	PT	786,4	16	-		
FRI	5	1	Deneb	PT	1325,3	15	15	2/4	-
		2	Península	PT	2162,4	6	-		
		3	Juvenilia	PT	1292,8	20	-		
		4	Cruz de Malta	PT	541,0	8	-		
SAT	6								
SUN	7								
MON	8	1	Juvenilia	PT	3489,2	14	-	2/4	Sale
		2	Rosamar	SP	1920,0	3	-		
		3	Cruz de Malta	PT	2488,9	14	13		
		4	Deneb	PT	1575,2	18	-		
		5	Península	PT	1730,2	13	-		
TUE	9	1	Cruz de Malta	PT	1693,3	20	18	2/4	Sale
		2	Deneb	PT	1355,8	15	-		
		3	Península	PT	2370,3	10	-		
WED	10	1	Deneb	PT	705,65	20	19	2/4	Sale
		2	Zenite	PT	1303,3	15	-		

Week day	Day	Arrival Order	Vessel	Fish Origin	Total Capture (Kg)	Nr. Landed Species	Nr. Sampled Species	Nr Teams /Nr Technicians	Motive
		3	Pássaro	PT	262,8	16	-		
		4	Cruz de Malta	PT	1069,3	17	-		
		5	Península	PT	1062,1	11	-		
THU	11	1	Península	PT	2518,9	21	-	2/4	Late Landing
		2	Juvenilia	PT	529,0	15	-		
FRI	12	1	Deneb	PT	999,65	16	16	2/4	-
		2	Península	PT	1376,5	12	-		
SAT	13								
SUN	14								
MON	15	1	Juvenilia	PT	3975,4	18	18	2/4	-
		2	Deneb	PT	1493,5	17	-		
		3	Foz da Nazaré	SP	2100,0	2	-		
TUE	16	1	Península	PT	2034,0	13	-	2/4	Late Landing
		2	Deneb	PT	1197,6	16	-		
WED	17	1	Península	PT	3141,1	18	-	2/4	Late Landing/ Rapid Sale
		2	Deneb	PT	800,4	17	-		
		3	Rosamar	SP	1632,0	2	-		
THU	18	1	Justino Ramalheira	PT	867,8	13	-	2/4	Late Landing/ Rapid Sale
		2	Deneb	PT	766,7	20	-		
		3	Península	PT	2782,1	17	-		
		4	Rosamar	SP	732,0	2	-		
FRI	19	1	Deneb	PT	1040,8	19	-	2/4	Rapid Sale
		2	Península	PT	1496,3	11	-		
		3	Mar de Lagos	PT	559,6	22	-		
SAT	20								
SUN	21								
MON	22	1	Deneb	PT	1238,2	17	-	2/4	Otoliths Workshop
		2	Juvenilia	PT	4068,6	16	-		
		3	Justino Ramalheira	PT	2779,4	15	-		
		4	Península	PT	7253,3	16	-		
		5	Rosamar	SP	2464,0	4	-		
TUE	23	1	Rosamar	SP	2528,0	2	-	2/4	-
		2	Deneb	PT	2245,3	16	16		
		3	Península	PT	3346,1	14	-		
WED	24	1	Deneb	PT	1361,3	16	-	2/4	Rapid Sale
		2	Península	PT	1722,0	10	-		
		4	Foz da Nazaré	PT	2600,6	2	-		
		3	Rosamar	SP	1080,0	1	-		
THU	25	1	Deneb	PT	1011,8	13	12	2/4	Sale

Week day	Day	Arrival Order	Vessel	Fish Origin	Total Capture (Kg)	Nr. Landed Species	Nr. Sampled Species	Nr Teams /Nr Technicians	Motive
		2	Justino Ramalheira	PT	1396,5	15	-		
		3	Juvenília	PT	417,2	20	-		
		4	Península	PT	1621,3	10	-		
		5	Foz da Nazaré	SP	2544,0	2	-		
		6	Rosamar	SP	1308,0	2	-		
FRI	26	1	Deneb	PT	310,8	11	-	2/4	Late Landing/ Rapid Sale
		2	Santa Mãe Laura	PT	672,9	11	-		
		3	Juvenília	PT	2524,4	21	-		
SAT	27								
SUN	28								
MON	29	1	Justino Ramalheira	PT	1983,5	17	17	1/3	-
		2	Península	PT	4073,0	17	-		
		3	Juvenília	PT	2991,1	16	-		
		4	Deneb	PT	1537,4	16			
		5	Foz da Nazaré	SP	5025,1	3	-		
TUE	30	1	Península	PT	4583,9	13	12	1/3	Sale
		2	Deneb	PT	736,6	12	-		
		3	Rosamar	SP	1404,0	2	-		
WED	31	1	Santa Mãe Laura	PT	1631,4	11	-	1/3	-
		2	Deneb	PT	533,9	11	11		
		3	Península	PT	3095,0	15	-		
		4	Foz da Nazaré	SP	397,3	2	-		

In January, in 22 week days, samplings were only performed on 13 days (59,1%). Of the nine days in which there were no sampling, 66,7% of the times it was due to the very late landings, 22,2% to the rapid sale of the fish which does not allow the sampling procedure and 11,1% (1 day) was due to a workshop on otoliths attended by all the sampling technicians. On the 13 days in which there were samplings, all the species landed by the vessel were sampled in only 53,8% of those. When they were not complete, it was due to the fish sale that interrupted the sampling.

Of the 208 samplings that could be performed to the different species, there were only made 189 (90,9%).

Table A4.3 – Results obtained during the month of February 2007.

Week day	Day	Arrival Order	Vessel	Fish Origin	Total Capture (Kg)	Nr. Landed Species	Nr. Sampled Species	Nr. Teams /Nr. Technicians	Sampling Duration	Motive
THU	1	1	Península	PT	2994,4	13	-	1/3	-	Late Landing/ Rapid Sale
		2	Deneb	PT	1024,0	13	-			
FRI	2	1	**Deneb**	PT	591,55	14	14	2/4	-	-
		2	Península	PT	2926,1	11	-			
SAT	3									
SUN	4									
MON	5	1	**Deneb**	PT	1545,3	21	12	2/4	-	Late Landing/ Rapid Sale
		2	Península	SP	8296,4	18	-			
		3	Rosamar	SP	10583,0	14	-			
TUE	6	1	Deneb	PT	1155,7	12	-	2/4	-	Bad Weather/ Rapid Sale
		3	Foz da Nazaré	PT	1728,0	2	-			
		2	Península	PT	3320,3	12	-			
WED	7	1	**Deneb**	PT	335,9	12	12	1/3	20min	-
		2	Juvenília	PT	1921,0	25	-			
		3	Península	PT	3418,3	9	-			
THU	8	1	Juvenília	PT	737,7	26	-	2/4	-	Bad Weather/ Rapid Sale
		2	Península	PT	2272,9	11	-			
		3	Deneb	PT	1287,0	11	-			
FRI	9	1	Juvenília	PT	76,8	11	-	2/4	-	Late Landing
SAT	10									
SUN	11									
MON	12	1	**Mar de Nazaré**	PT	2335,45	33	15	1/3	1h10min	Sale
		2	Foz da Nazaré	SP	4246,3	4	-			
		3	Deneb	PT	754,9	15	-			
		4	Península	PT	4419,2	13	-			
TUE	13	1	Juvenília	PT	984,3	24	-	2/4	-	Bad Weather/ Rapid Sale
		2	Península	PT	3144,3	10	-			
		3	Nadir	PT	3415,1	17	-			
		4	Deneb	PT	1355,2	10	-			
		5	Rio Águeda	PT	1384,5	25	-			
WED	14	1	Península	PT	2331,7	10	-	2/4	-	Late Landing
THU	15	1	**Ria de Aveiro**	PT	3564,3	25	21	2/4	1h30min	Sale
		2	Beira Litoral	PT	2093,6	25	-			
		3	Juvenília	PT	2059,6	28	-			
		4	Deneb	PT	1239,3	11	-			
		5	Rio Águeda	PT	612,3	24	-			
FRI	16	1	Deneb	PT	323,6	12	-	1/3	20min	Bad Weather/ Rapid Sale
		2	**Juvenília**	PT	344,5	19	10			
SAT	17									
SUN	18									
MON	19	1	Península	SP	5380,9	4	-	2/4	2h00min	-
		2	Deneb	PT	4233,5	35	-			
		3	**Justino Ramalheira**	PT	4208,4	19	19			
		4	Juvenília	PT	3034,2	16	-			
TUE	20									

Week day	Day	Arrival Order	Vessel	Fish Origin	Total Capture (Kg)	Nr. Landed Species	Nr. Sampled Species	Nr. Teams /Nr. Technicians	Sampling Duration	Motive
WED	21	1	Península	SP	2607,2	2	-	2/5	1h40min	-
		2	**Deneb**	PT	3780,4	19	19			
		3	Justino Ramalheira	PT	1607,0	21	-			
		4	Juvenília	PT	2202,1	24	-			
THU	22	1	Aster	PT	1759,6	27	-	2/4	-	Bad Weather/ Rapid Sale
		2	Deneb	PT	2262,9	9	-			
FRI	23	1	Justino Ramalheira	PT	925,0	22	-	1/3	-	Bad Weather/ Rapid Sale
		2	Rosamar	SP	1752,0	1	-			
SAT	24									
SUN	25									
MON	26	1	Roaz	SP	4875,9	27	-	3/7	1h50min	-
		2	**Juvenília**	PT	3669,4	17	17			
		3	Deneb	PT	2795,0	9	-			
TUE	27	27	Península	SP	1918,0	2	-	2/3	-	Bad Weather/Rapid Sale
		2	Mar Nosso	PT	1482,2	12	-			
		3	Deneb	PT	2120,4	13	-			
WED	28	1	Roaz	PT	3913,0	21	-	2/3	-	Late Landing/ Rapid Sale
		2	Juvenília	PT	1391,6	12	-			
		3	Deneb	PT	2026,5	25	-			

In February there were 19 week days and of those samplings were only performed on eight days (47,4%). On the days where there were no samplings, 60,0% of the times it was due to the bad weather observed during this month and 40,0% to the very late landings. In both cases the samplings were not conducted because the fish landed was immediately sold after it was weighed.

Of the days on which samplings were performed, in 55,6% of the times all the species landed were sampled. On the other days the samplings were interrupted by the fish sale.

Of the 179 samplings that could be performed to the different species, there were only made 139 (77,7%).

The vessels sampled were almost always the first to arrive on port (76,9% of the times in January and 55,6% in February). The second vessel to arrive was sampled on two days in January (15,4%) and on three days in February (33,3%). The third vessel to arrive was sampled just in one day in both months (7,7% in January and 11,1% in February). The vessels sampled were not randomly chosen. As the sale of the fish is almost immediately done after the fish is weighed, the vessel to be sampled was chosen on the basis of the assessment of the technicians in which that it would be the vessel that had the best chance to be completely sampled.

In January, the "Deneb" was sampled 6 times (46,2%), the "Cruz de Malta" 3 times (23,1%), the "Península" 2 times (15,4%), and "Justino Ramalheira" and "Juvenília" 1 time each (7,7%). In February, the "Deneb" was sampled 4 times (44,4%), the "Juvenília" 2 times (22,2%), "Justino Ramalheira", "Mar da Nazaré" and "Ria de Aveiro" 1 time each (11,1%). There was no much variability on the vessels sampled because, in this port, the vessels that land fish more frequently are part of one small group. There is also a group of Portuguese vessels operating in Spain (SP), whose captures are then transported to Portugal by land, from Vigo, to be sold at the Matosinhos's First Sale Fish Market.

In January the samplings were performed by 4 technicians on 76,9% of the days and by 3 technicians on 23,1% of the days. In February the samplings were performed by 4 technicians on 44,4% of the days, by 3 technicians on 33,3% of the days, by 5 technicians on 11,1% of the days and by 7 technicians on 11,1% of the days.

In January the sampling period was not recorded, but in February it varied between 20 minutes and two hours.

In January and February 45 species were sampled each month. In the total period of the study 53 species were sampled (Table A4.4).

Table A4.4 – Samples performed during the period of the study.

Scientific Name	Portuguese Name	English Name	Nr Samples	%	Nr Samples	%
-	Bodiões spp.	Wrasse	0	0,00	3	3
-	Longueirão	Unidentified fish	2	1,06	1	1
Boops boops	Boga-do-mar	Bogue	0	0,00	1	1
Chelidonichthys cuculus (Aspitrigla cuculus)	Cabra-Vermelha	Red gurnard	2	1,06	2	2
Chelidonichtys lastoviza (Trigloporus lastoviza)	Cabra-Riscada	Streak gurnard	1	0,53	0	0
Chelidonichtys lucerna (Trigla lucerna)	Cabra-Cabaço	Tub gurnard	5	2,65	3	3
Chelidonichtys lyra	Cabra-Lyra		0	0,00	1	1
Chelidonichtys obscurus (Aspitrigla obscura)	Cabra-da-Bandeira	Long fin gurnard	1	0,53	1	1
Conger conger	Congro	European conger	10	5,29	6	6
Decapterus punctatus	Carapau-Negrão	Blue jack mackerel	8	4,23	1	1
Dicentrarchus labrax	Robalo-Legítimo	European seabass	0	0,00	2	2
Diplodus sargus sargus	Sargo-Legítimo	White seabream	7	3,70	2	2
Eledone cirrosa	Polvo-Cabeçudo	Horned octopus	1	0,53	2	2
Eutrigla gurnardus	Cabra-Morena	Grey gurnard	1	0,53	0	0
Helicolenus dactylopterus dactylopterus	Serrão	Blackbelly rosefish	2	1,06	6	6
Lepidorhombus boscii	Areeiro-4-Manchas	Four-spot megrim	2	1,06	0	0
Loligo vulgaris	Lula	Common european squid	2	1,06	3	3
Lophius budegassa	Tamboril	Black-bellied angler	0	0,00	1	1
Lophius piscatorius	Penadeira	Angler	0	0,00	1	1
Merlangius merlangus	Badejo	Whiting	2	1,06	3	3
Merluccius merluccius	Pescada	European Hake	2	1,06	5	5

Scientific Name	Portuguese Name	English Name	Nr Samples	%	Nr Samples	%
Microchirus variegatus	Azevia-Raiada	Thickback sole	2	1,06	2	2
Micromesistius poutassou	Verdinho	Blue whiting	5	2,65	3	3
Mullus surmuletus	Salmonete	Red mullet	9	4,76	4	4
Mustelus mustelus	Cação-Liso	Smooth-hound	2	1,06	8	8
Octopus vulgaris	Polvo	Common octopus	6	3,17	4	4
Pagellus acarne	Besugo	Axillary seabream	7	3,70	4	4
Pagellus bogaraveo	Goraz	Blackspot seabream	3	1,59	5	5
Pagrus pagrus	Pargo-Legítimo	Red porgy	1	0,53	1	1
Phycis phycis	Abrótea-da-costa	Forkbeard	1	0,53	1	1
Platichtlys flexus	Solha-Legítima	Flounder	3	1,59	0	0
Pleuronectes platessa	Solhão	European plaice	3	1,59	1	1
Raja brachyura	Raia-Pontuada	Blonde ray	8	4,23	2	2
Raja clavata	Raia-Lenga	Thornback ray	8	4,23	8	8
Raja microocellata	Raia-Zimbreira	Small-eyed ray	0	0,00	1	1
Raja montagui	Raia-Manchada	Spotted ray	3	1,59	4	4
Raja naerus	Raia-São-Pedro	Sandy ray	1	0,53	3	3
Raja undulata	Raia-Curva	Undulate ray	6	3,17	3	3
Sardina pilcharus	Sardinha	European pilchard (=Sardine)	1	0,53	0	0
Scombrus japonicus	Cavala	Chub mackerel	1	0,53	1	1
Scombrus scombrus	Sarda	Atlantic mackerel	11	5,82	7	7
Scophthalmus maximus	Rodovalho	Turbot	1	0,53	1	1
Scyliorhinus stellaris	Pata-Roxa	Nursehound	6	3,17	5	5
Sepia officinalis	Choco	Common cuttlefish	1	0,53	1	1
Solea lascaris	Linguado-Areia	Sand sole	1	0,53	0	0
Solea senegalensis	Linguado-Branco	Senegalese sole	3	1,59	0	0
Solea vulgaris	Linguado-Legítimo	Common sole	4	2,12	0	0
Spondyliosoma cantharus	Choupa	Black seabream	8	4,23	1	1
Torpedo torpedo	Tremelga	Common torpedo	0	0,00	1	1
Trachurus trachurus	Carapau	Atlantic horse mackerel	13	6,88	5	5

SCIENTIFIC NAME	PORTUGUESE NAME	ENGLISH NAME	NR SAMPLES	%	NR SAMPLES	%
Trigla spp.	Cabras (Mistura)	Gurnards nei	7	3,70	4	4
Trisopterus luscus	Faneca	Pouting	11	5,82	9	9
Zeus faber	Galo-Negro	John dory	5	2,65	6	6
Total Number of Samples	189	100	139	100		

The ten most frequently sampled species during the period of the study were: Pouting (6,1%), Atlantic mackerel (5,5%), Atlantic horse mackerel (5,5%), European conger (4,9%), Thornback ray (4,9%), Red mullet (4,0%), Axillary seabream (3,4%), Small-spotted catshark (3,4%), John dory (3,4%), Smooth-hound (3,0%), Common octopus (3,0%) (Figure A4.1).

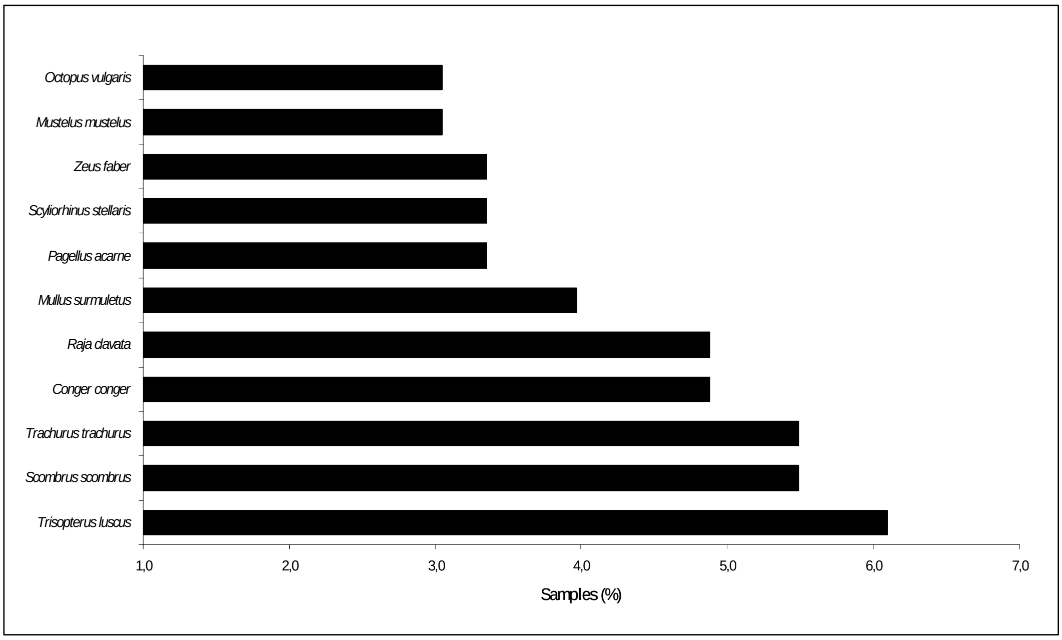


Figure A4.1 – Ten most frequently sampled species during the period of the study (January and February 2007).

Annex 5: Workshop proposals

[WKISCON] Workshop on Implementation Studies on Concurrent Length Sampling

A Workshop on Implementation Studies on Concurrent Length Sampling [WKISCON] (Co-chairs: Sieto Verver, The Netherlands, and Frank Redant, Belgium) will take place in the Azores, Portugal, end of January or first half of February 2008 (dates to be decided) to:

Terms of Reference:

a) Review the results of the 2007 implementation studies on concurrent length sampling of commercial landings.
b) Advise on best practice methods for concurrent sampling, taking into account both technical feasibility and quality aspects of data collection.

A standardized format for reporting and presenting the results will be sent around by the chairs before the meeting.

Supporting Information

Priority:	High. The implementation of the proposed shift in the EU data collection framework from species-based to métier-based sampling and, above all, the requirement on concurrent length sampling of the landings (both foreseen as part of the new EU Data Collection Regulation, DCR), are likely to cause significant problems for the institutes involved in length sampling of commercial catches.
Scientific justification and relation to action plan:	In order to ease the shift from species-based to métier-based sampling and to at least maintain the current level of quality of the length composition data collected, it is important to prepare this shift well before the new DCR comes into force (January 1st, 2009). Therefore, it is suggested that each lab which foresees problems with the implementation of concurrent métier-based market sampling, selects two or three métiers that can be regarded as typical (in terms of local landing and auctioning arrangements) and hence, are likely to reveal both typical as well as general problems in relation to concurrent length sampling. The results of these implementation studies should then form the basis for designing best practice sampling schemes that fulfil the demands in the new DCR with regards to concurrent métier-based sampling. It is suggested to carry out the implementation studies in 2007 or early 2008. The results of the implementation studies should be reviewed during a Workshop scheduled to take place at the end january 2008, so that EU Member States can take the Workshop's conclusions into account when putting together their data collection programmes for 2009 and after. The main aim of this Workshop would be to translate the experience gained during the implementation studies into sampling schemes that meet the requirements of the metier-based data collection framework.
Resource requirements:	XX.
Participants:	The Workshop is expected to attract wide interest from fisheries institutes involved in market sampling, both within and outside the ICES community. The proposal for this Workshop is supported by both PGCCDBS and PGMED. A participation of around 25 is expected.
Secretariat facilities:	None.
Financial:	To ensure wide attendance of relevant experts, some additional funding may be required, and efforts will be made to explore funding opportunities through the EU DCR.
Linkages to advisory committees:	The implementation studies and the proposed Workshop have a direct link with the upcoming shift from stock-based to metier-based sampling and hence, are of relevance to all bodies that make use of length composition data collected under the DCR (assessment WGs, advisory committees, etc.).
Linkages to other committees or groups:	There will be important outcomes from this Workshop of interest to the ICES Living Resources and Resource Management Committees.
Linkages to other organizations:	Outcomes from this Workshop will be relevant to several regional fisheries organisations and advisory bodies, including ICES, NAFO, GFCM, STECF and others.
Secretariat marginal cost shares:	

[WKACCU] Workshop on methods to evaluate and estimate the accuracy of fisheries data used for assessment

A workshop on Methods to evaluate and estimate the accuracy of fisheries data used for assessment [WKACCU] (Chair candidates: Michael Pennington & Sondre Aanes, IMR, Norway) will take place in Bergen, Norway, from XXX to XXX 2008.

Terms of Reference

a) To review the sources of bias and establish general parameters (indicators) to assess the bias on national level of fishery statistics (quantities landed, discards, fishing effort, cpue) using available data and advice on best practices.

b) To review the sources of bias and establish general parameters (indicators) to assess the bias on national level of biological data collected from the fisheries by investigating (both visual and quantitative) the data coverage by stock, area, season and fleet

Supporting Information

In the current DCR and other national sampling strategies, data quality is almost solely addressed by means of target precision levels for a number of fishery-related and stock-related parameters (fishing effort, quantities landed and discarded, age composition of the landings and discards, growth curves, maturity and fecundity ogives, etc.). However, it is not because an estimate is precise that it is also accurate. For example, estimates of the landings based on sales slips will usually be very precise, but they may be very inaccurate if there is a problem of unreported landings. Similarly, estimates of the length distribution of the landings may be very inaccurate if they only cover a small part of the spatial distribution of the total landings. Therefore, there is a need of objective indicators of data accuracy that could be taken into account when setting up sampling schemes.

For this Workshop to succeed, the following tasks need to be completed by each participating country prior to the meeting

1) Each participating country should choose one fishery as an example and present ways to assure accuracy in each of the data handling steps from the fish are caught until national data on catch-at-age is provided to the ICES stock coordinator (InterCatch).

2) Possible ways to look at this could be logbooks compared with sale slips from the same vessel and/or trip; compare logbook data from vessels or trips with and without observers; combining fishing inspection (onboard observations) and control of landings with VMS data (name and frequency of vessels going to harbour).

3) Each participant should prepare geographical distribution charts to the workshop of the national catches shown on a map including the same geographical cells/strata that are the basis for the geographical collection of biological stock data.

4) On the same map, or on a copy of the map, suitable information about the coverage of the samples should be presented– with the aim of ensuring that all areas with catches are sampled. Percentages of catches up against samples could be presented on this geographical cells/strata basis.

5) Present a list of national (does DCR include anything on this??) conversion factors used to estimate round weight from product weight (or does this item/concern only relate to precision??)

6) Each country to provide details of sampling intensities (eg. number of trips sampled against total number of trips) for all sampled fleets (defined according to the Nantes meetings).

7) Recommend that where possible, countries should complete the Discard Sampling Review Form (from Charlottenlund) for 2005 by fleet. If sampling design does not allow the completion of this information, the Form should be used as a means of inspiration to provide relevant data.

8) Each country to provide a description of variables that are available to them for raising procedures.

[WKMOG] Workshop on Estimation of Maturity Ogives for Stock Assessment

A Workshop on Estimation of Maturity Ogives for Stock Assessment [WKMOG] (Chair: ??) will be held from ?? in ??, to:

a) identify and summarise the concerns countries have in relation to raising procedures;

b) review the data structures commonly used at a national and international level and agree on a common format for analysis purpose;

c) apply several raising procedures to a maturity dataset made available by different countries;

d) compare the results between raising methods and data sources, identifying the advantages and limitations of each procedure.

Priority:	
Scientific Justification and Relation to Action Plan:	Since 2002 the European Union requires member states to collect maturity data under the Data Collection Regulation (DCR, EC Regulations No 1543/2000, No 1639/2001 and No1581/2004). Consequently most countries collect maturity data, but lack guidance in raising maturity data. A common raising procedure would be applied to a set of data covering a maximum of different data sources, sampling programmes and regions. The objective is to establish, if not common methods for raising, at least a set of common best practise to be used to raise maturity data. In the process, countries would have a chance to learn how to resolve specific raising issues related to their maturity sampling programs, but also to apply (new) methods to provide national maturity estimates.
Relation to Strategic Plan:	
Resource Requirements :	
Participants :	
Secretariat Facilities:	
Financial:	
Linkages to Advisory Committees:	
Linkages to other Committees or Groups:	
Linkages to other Organisations:	
Cost Share	

[WKADR] Workshop on Age Determination of Redfish

A Workshop on Age Determination of Redfish [WKADR] (Co-Chairs: F. Saborido-Rey*, Spain, and C. Stransky*, Germany) will be held from 2–5 September 2008 (dates to be confirmed) in Nanaimo, Canada, to:

a) review information on age determinations, otolith exchanges and validation work since the age reading workshop in 2006;

b) identify sources of age determination error in terms of bias and precision, describe the corresponding interpretational differences between readers and laboratories, and agree on the ageing criteria;

c) identify the most appropriate otolith preparation method for age determination of redfish and provide stock-specific guidelines for ageing;

d) collate sex-specific growth information and analyse differences in growth estimates between otolith readers and preparation methods;

e) investigate the progress in the implementation of quality control and quality assurance (QC/QA) in redfish ageing labs;

f) prepare the publication of the results of the 2006 and 2008 workshops and the recent otolith exchanges (2007-2008) in the ICES CRR series.

WKADR will report by 15 October 2008 for the attention of the Resource Management Committee, North-Western Working Group, Study Group on Redfish Stocks, Arctic Fisheries Working Group and ACFM.

Supporting Information

Priority:	The Workshop is essential for the continuation of the efforts directed at analytical age-based assessment for redfish within the North-Western Working Group and NAFO.
Scientific Justification and Relation to Action Plan:	Reliable age determination data are the basis of age-based analytical assessment of the species and stocks under investigation. For redfish, recent studies and the 2006 age determination workshop have revealed considerable discrepancy in ageing criteria. Due to these discrepancies, redfish otoliths are seldom routinely aged, and hence age-based analytical assessment is normally not conducted for any stock. For the alternative length based or age-length based methods, reliable estimates of growth rates are essential. The 2006 workshop has collated the latest knowledge on redfish age determination since the previous workshop in 1995. Several sets of otoliths were read during that workshop, giving hints on the interpretational differences between readers and the effects of different otolith preparation methods on the age estimates. The results clearly illustrated the need for further intercalibration. Since the workshop in 2006, several thousand additional age readings and a series of otolith exchanges have been carried out, and the age reading labs have started implementing quality control and quality assurance (QC/QA) measures. A workshop in 2008 is highly recommended to analyse the results of these latest data and to monitor the QC/QA progress in the age reading labs. Action Plan Numbers: 1.1, 1.2, 4.1, 4.2, 4.3, 4.12
Relation to Strategic Plan:	Provide sound, credible, timely, peer-reviewed, and integrated scientific advice on fishery management and the protection of the marine environment in response to requests from regulatory commissions, Member Countries, and partner organisations.
Resource Requirements :	
Participants :	10–15
Secretariat Facilities:	N/A
Financial:	
Linkages to Advisory Committees:	ACFM
Linkages to other Committees or Groups:	LRC, NWWG, SGRS, AFWG, SGASAM?

Linkages to other Organisations:	NAFO, NEAFC
Cost Share	

[WKARBH] Workshop on Age Reading of Baltic Herring

A workshop on Age Reading of Baltic Herring [WKARBH] (Chair: ??) will take place in ??, Latvia, from XXX to XXX 2008.

Terms of Reference:

a) Compile information on laboratory procedures;

b) Resolve interpretation differences between readers and labs;

c) Update (create) the ageing manual;

d) Collate agreed age reference collection;

e) Formulate follow-up actions;

f) Formulate target and threshold statistics.

[WKARNSC] Workshop on Age Reading of North Sea Cod

A workshop on Age Reading of North Sea Cod [WKARNSC] (Chair: ??) will take place in ??, from XXX to XXX 2008.

Terms of Reference:

a) Compile information on laboratory procedures;
b) Resolve interpretation differences between readers and labs;
c) Update (create) the ageing manual;
d) Collate agreed age reference collection;
e) Formulate follow-up actions;
f) Formulate target and threshold statistics.

[WKARAC] Workshop on Age Reading of Artic Cod

A workshop on Age Reading of Arctic Cod [WKARAC] (Chair: ??) will take place in ??, from XXX to XXX 2008.

Terms of Reference:

a) Compile information on laboratory procedures;
b) Resolve interpretation differences between readers and labs;
c) Update (create) the ageing manual;
d) Collate agreed age reference collection;
e) Formulate follow-up actions;
f) Formulate target and threshold statistics.

[WKART] Workshop on Age Reading of Turbot

A workshop on Age Reading of Turbot [WKART] (Chair: ??) will take place in ??, The Netherlands, from XXX to XXX 2008.

Terms of Reference:

a) Compile information on laboratory procedures;

b) Resolve interpretation differences between readers and labs;

c) Update (create) the ageing manual;

d) Collate agreed age reference collection;

e) Formulate follow-up actions;

f) Formulate target and threshold statistics.

[WKARBS] – Workshop on Age Reading of Sprat

A workshop on Age Reading of Baltic Sprat [WKARBS] (Chair: ??) will take place in ??, from XXX to XXX 2008.

Terms of Reference:

a) Compile information on laboratory procedures;
b) Resolve interpretation differences between readers and labs;
c) Update (create) the ageing manual;
d) Collate agreed age reference collection;
e) Formulate follow-up actions;
f) Formulate target and threshold statistics.

[WKARRM] Workshop on Age Reading of Red Mullet

A workshop on Age Reading of Red Mullet [WKARRM] (Chair: Chryssi Mytillineou) will take place in ??, Greece, from XXX to XXX 2008.

Terms of Reference:

a) Compile information on laboratory procedures;
b) Resolve interpretation differences between readers and labs;
c) Update (create) the ageing manual;
d) Collate agreed age reference collection;
e) Formulate follow-up actions;
f) Formulate target and threshold statistics.

[WKARRP] Workshop on Age Reading of Red Pandora

A workshop on Age Reading of Red Pandora [WKARRP] (Chair: ??) will take place in ??, Greece, from XXX to XXX 2008.

Terms of Reference:

a) Compile information on laboratory procedures;

b) Resolve interpretation differences between readers and lab's;

c) Update (create) the ageing manual;

d) Collate agreed age reference collection;

e) Formulate follow-up actions;

f) Formulate target and threshold statistics.

[WKMSSP] Workshop on Maturity Staging of Small Pelagics

A workshop on Maturity Staging of Small Pelagics [WKMSSP] (Chair: ??) will take place in ??, Italy, from XXX to XXX 2008.

Terms of Reference:

a) Produce a reference collection;
b) Produce maturity stage sampling protocols;
c) Review/define prime sources of data;
d) Review/define the Data Deliverers to Assessment Working Groups;
e) Propose Follow up for problems, uncertainties;
f) Define distribution scheme for the results;

[WKMSC] Workshop on Maturity Staging of Crustaceans

A workshop on Maturity Staging of Crustaceans [WKMSC] (Chair: ??) will take place in ??, Italy, from XXX to XXX 2008.

Terms of Reference:

a) Produce a reference collection;
b) Produce maturity stage sampling protocols;
c) Review/define prime sources of data;
d) Review/define the Data Deliverers to Assessment Working Groups;
e) Propose Follow up for problems, uncertainties;
f) Define distribution scheme for the results;

Annex 6: Recommendations

RECOMMENDATION	ACTION
1. PGCCDBS will promote the publication of calibration WK reports under the ICES Cooperative Research Report series.	McCurdy and Milner to request and compile WK reports and prepaire submission to CRR.
2. The chairs of WKAC&MS for specific stocks will make sure that the relevant WG chair is aware of the results and the report.	Chair to email this decision to 2007 WK chairs. ICES Sec. to include on the information to be sent to future WK chairs.
3. PGCCDBS decided to have internal correspondents for each AWG that should take over the responsibility of communicating with AWG chairs.	PGCCDBS chair to collect these names in Table 3.4 before next meeting.
4. To promote communication with AWG PGCCDBS will propose a template for a data section to be included in AWG reports and discuss it with AWGs chairs.	Stransky and Ringdhal to develop proposal and start discussion with AWGs chairs.
5. The Secretariat will function as distribution point for any recommendation or information from PGCCDBS to stock coordinators.	ICES Sec. to take note.
6. Recommendations and communications from PGCCDBS and it's workshops to other bodies will go via the ICES Secretariat.	ICES Sec. to take note.
7. Develop a "minimum protocol" for length frequency sampling and compare national protocols with it to identify main deviances.	Bell, Fotland and Berth to develop this taks and present proposal during next 6 month.
8. WKAC findings to be forwarded to relevant AWG.	ICES Sec. to forward to AWG.
9. WKMAT report to be distributed.	ICES Sec. to forward to EG.
10. WKDRP report to be distributed.	ICES Sec. to forward to EG.
11. Liaison meeting recommendations to be forwarded.	ICES Sec. to forward to LM.
12. AWG recommendations to be forwarded (Table 3.4)	ICES Sec. to forward to AWG.
13. Update maturity ogives used for a number of stocks should be considered (Table 4.1).	ICES Sec. to forward to AWG.
14. Take advantage of new technology in fish markest like automatic fish-grading machines.	ICES Sec. to forward to National Laboratories.
15. PGCCDBS recommends that the new ICES Quality Manager co-operates with PGCCDBS to develop online data tables containing basic data collection information, including age calibration and maturity staging information and its use by assessment working groups.	ICES Sec. to give feedback and start cooperation with PGCCDBS (Hanson, Maxwel and Jardim).
16. Each laboratory to carry out implementation studies in 2007 following the protocol described.	ICES Sec. to forward to National Laboratories.
17. Proposal for a Workshop (WKISCON, see Annex 5) to dicuss the results of the implementation studies.	ICES Delegates to decide.
18. During discard sampling collect both the retained and the discarded catch fractions concurrently, i.e. from the same fishing operation.	ICES Sec. to forward to National Laboratories.
19. The PGCCDBS agreed on the following prioritized workplan: 1. To develop a "minimum" international protocol to be used as a standard, and which should contain a minimum of procedures that the national protocols need to meet to fulfil the requirements set. Such requirements are e.g., how the fish is measured – total length, fork length, rounding to nearest cm below etc., stratification system etc. A possible indicator of quality could be the percentage agreement of compliance with the minimum protocol. This analysis should be done prior to WKACCU (see below). 2. A workshop (WKACCU) with terms of reference to establish standardized/joint methods on how to evaluate and estimate the accuracy of submitted fisheries data should be held in 2008. This should include analyses of sample coverage and methods to use for estimating/evaluating the quality of total catches, i.e., whether and how discards, misreportings, unreportings, etc. are included. 3. A workshop (WKPRECISE) with terms of reference to establish standardized/joint methods and indicators for evaluating and estimating the precision of submitted fisheries data should be held. Definitions of standards (i.e., minimum	ICES Sec. to discuss and give feedback and/or propose to ICES Delegates.

requirements) should then be made. Although some laboratories already have developed suitable tools for such precision estimation, the planned EU COST-project should preferably be finished (about 2 year) before holding the workshop, as this EU-project may contribute a lot to this issue.	
20. PGCCDBS considers that cooperation and coordination in fish age determination should be arranged on a permanent and regular basis. Therefore it is recommended to hold regular otolith exchanges and workshops.	ICES Sec. to distribute to National Laboratories, WK chairs and AWGs chairs asking for feedback on the next 3 month. Bolle, McCurdy, Kornilovs, Chonchúir and Milner to build on these comments and propose a final version on the next 6 month, which should be approved on the next PGCCDBS meeting.
21. Guidelines for otholits exchanges.	
22. Guidelines for workshops on age calibration.	
23. Guidelines for follow up actions of workshops on age calibration.	
24. Guidelines to report relevant information of workshops on age calibration to AWGs.	
25. Generic ToR of workshops on age calibration.	
26. Generic ToR of workshops on maturity staging.	ICES Sec. to distribute to National Laboratories, WK chairs and AWGs chairs asking for feedback. To be finalised on the next PGCCDBS meeting.
27. Proposal for a WKMOG (Annex 5)	ICES Delegates to decide.
28. Several proposals for WKAC&MS (Annex 5)	ICES Delegates to decide.

Annex 7: PGMED Report

Report of the 1st Meeting of the Planning Group for the Mediterranean (PGMed)

Data Collection Regulation (DCR)

N°1543/2000, N°1639/2001 and N°1581/2004

Malta, 6th - 8th March 2007

Final Report

Table of contents

Report of the first Planning Group for the Mediterranean (PGMed 2007)

Malta, 6– 8 March 2007

1. LIST OF PARTICIPANTS

Name	Organisation	Country	Email
Matthew Camilleri	GFCM	Italy	matthew.camilleri@fao.org
Paolo Carpentieri	MIPAF	Italy	paolo.carpentieri@uniroma.it
Antonio Cervantes	DGFish	Belgium	antonio.cervantes@ec.europa.eu
Charis Charilaou	DFMR	Cyprus	ccharilaou@dfmr.moa.gov.cy
Michael Darmanin	MCFS	Malta	michael-j.darmanin@gov.mt
Mark Dimech	MCFS	Malta	mark.dimech@gov.mt
Beatriz Guijarro	IEO	Spain	beatriz.guijarro@ba.ieo.es
Philippe Moguedet	DGFish	Belgium	philippe.moguedet@ec.europa.eu
Eric Muscat	MCFS	Malta	eric.muscat@gov.mt
Jose Luis Perez Gil	IEO	Spain	joseluis.perez@mu.ieo.es
Lavrendis Vassiliades	DMFR	Cyprus	lvasiliades@dfmr.moa.gov.cy
Vassiliki Vassilopoulou	HCMR	Greece	celia@ath.hcmr.gr
Joel Vigneau	IFREMER	France	Joel.Vigneau@ifremer.fr

2. BACKGROUND

During the 2006 Regional Coordination Meeting for the Mediterranean area (Malta, 26-28 April 2006), the creation of a Planning Group for the Mediterranean (PGMed) was recommended, as a forum similar to the ICES Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS) for discussing methodological matters related to data collection referring particularly to the Mediterranean area. The need for maintaining strong links with the General Commission for Fisheries in the Mediterranean (GFCM) and the PGCCDBS was strongly supported. Following the approval of the 2006 Third Liaison Meeting, the first meeting of the PGMed was arranged to take place jointly with the 2007 PGCCDBS meeting in Malta (5^{th} – 9^{th} March 2007).

The priority tasks of this newly formed Planning Group were:

- the identification of the role of the PGMed
- the nomination of the chairman
- the review and discussion of the Terms of Reference of the PGMed already proposed during the 2006 RCM for the Mediterranean (Appendix VI of 2006 Report of the RCM for the Mediterranean area).

Ms. Charis Charilaou and Mr. Joel Vigneau were appointed rapporteurs.

3. INTRODUCTION

The GFCM representative (Matthew Camilleri) welcomed the formulation of the Planning Group for the Mediterranean (PGMed) and explained that this Group would be instrumental in linking the data needs and priorities of the GFCM with the EU Fisheries Data Collection Programme. He added that a close collaboration and coordination between the PGMed and the ICES-PGCCDBS would be beneficial to both groups and that the GFCM looks forward to extending its cooperation with ICES.

A detailed presentation of the GFCM Operational Units task 1 matrix and tables was delivered by the GFCM representative. He highlighted the importance of Task 1 in developing a standardized regional data collection framework by GSA (Geographical sub-areas) and Operational Units to monitor fisheries and assess fish stocks, together with its function as a tool for the management of fisheries by effort control. He also explained that a table with standard measurements of fishing effort by fishing operation has been endorsed by the GFCM together with a list of priority species and shared stocks for assessment purposes. He expressed that GFCM's wish to see groups working within the framework of the DCR, especially PGMed, participating actively in the workshops and meetings of the GFCM in order to ensure harmonization and enhance cooperation. In this view the EC representative clarified the PGMed that participation to GFCM workshops relevant to the DCR could be included in the already proposed National Proposals.

The GFCM representative recalled that when the creation of the matrix started (Nantes, 2005), the definition of the Operational Units was already decided by the GFCM. Recently, a matrix has been developed and adopted as resolution by the GFCM (Resolution GFCM/31/2007/1, 31st Session of the GFCM, Rome 9-12 January 2007) and this will imply having to complete two different matrices with all the implications on the effort for collecting information involved. It was agreed that comparing the two matrices is a priority. In the proposed Nantes matrix, the fleet segments have not been decided yet; the economists will make this decision. It was agreed that the PGMed, for trying to merge the proposed DCR Fleet-Fishery matrix and the GFCM Task, should make an exercise.

3.1 Identification of the role of PGMed

The group agreed that PGMED has the same technical role as the ICES PGCCDBS (see paragraph 3.1. 1). The PGMed should adapt as much as possible existing methodologies for the regional needs and at the same time, should avoid duplication of work with the PGCCDBS.

In this view, both Planning Groups will meet at the same time and place, in order to ensure their close cooperation. This will include common plenary sessions dealing with common methodological issues (i.e. precision level; workshop on maturity and/or age reading; quality control) and specific sessions on more regional aspects.

It was also agreed that the establishment of the PGMed will have to support the GFCM needs for scientific advice.

3.1.1 Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS).

The PGCCDBS was established at the ICES Annual Science Conference in 2001 for having its first meeting in 2002. The establishment of the group was to ensure continuation of international cooperation on fisheries data collection after the data collection regime was changed from international cooperation programmes to national data collection programmes in 2002.

This PG is then 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 Data Collection Regulation (DCR) and DG Fish participates to PGCCDBS to ensure proper coordination with the DCR 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 develops and approves standards for best sampling practises within its remits and for fisheries in the ICES area. The implementation of these practises is discussed regionally and implemented nationally. The PG coordinates initiatives for workshops and other activities to addresses specific problems.

The majority of PGCCDBS participants represent EU member countries. All these countries have to comply with EU Commission regulation 1639/2001 and from 1st January 2006 with EU Commission regulation 1581/2004, on fisheries data collection (these Commission Regulations are in this report referred to as the Data Directive, DCR). Therefore, this report may have a more EU focused contents. Though effort has been made to facilitate possibilities of better coordination and cooperation of data collection of fisheries data in the Baltic, the North Sea, Western and Southern waters and in the Mediterranean, still significant effort have to be put into further development of the international coordination and cooperation.

Up to know, EU member countries sampling schemes are established and operate on a national basis. Until 2004, no international mechanism to ensure that internationally coordination of the sampling of fishery dependent data was established. In 2004 the EU Commission established Regional Coordination Meetings for the Baltic, the North Sea, Western and Southern waters and in the Mediterranean respectively (further details see http://pnab.ipimar.pt/pgccdbs/doku.php?id=icesdecisions).

3.2 The nomination of the chairman

Paolo Carpentieri (Italy) was proposed as chairman of the PGMed for a duration period of three years (2007-2009).

4. TERMS OF REFERENCE

The PGMed revised the draft Terms of Reference of the PGMed already proposed during the 2006 RCM for the Mediterranean (Appendix VI of 2006 Report of the RCM for the Mediterranean area) and approved the following ones:

1) Evaluation of the need for establishing a regional database in support of the DCR implementation (Reg. EC 1581/2004 stated that: "*In the Mediterranean area, the landings by weight of a Mediterranean Member State for a species corresponding to less than 10 % of the total EU landings of that species, taken in the Mediterranean area, or to less than 200 tonnes, are exempted. This derogation shall not apply for blue fin tuna.).*"

2) Identify emerging problems resulting from changes on data collection procedures and propose actions to be taken in order to address their impacts on stock assessment input data

- Harmonization between the stratification used for the fleet-fisheries based approach (GFCM Operational Unit Task 1 and DCR Fleet-Fishery matrix)
- Definition and evaluation of the implementation of fishing effort measurements
- Recreational Fishery data requirements for the new DCR
- Concurrent sampling
- Increase quality and validation of the data used in fisheries management
- Improve the use of the data
- Harmonisation of Maturity scales

3) Proposal of Workshops to support the DCR implementation

4.1 Evaluation of the need for establishing a regional database in support of the DCR implementation

Following the request from the 2006 RCM Med, STECF/SGRN, in its July 2006 report, made a recommendation on the need for a dedicated website for the DCR. This website would comprise a comprehensive view of all sampling procedures and protocols used by all MS, but also some specific web-pages such as one acting as a reference for the Mediterranean landings data. PGMed has been informed that the follow-up of these recommendations will be considered during the year 2007. In order to start the process, PGMed decided to promote a common landings database that would serve as a reference for the selection of the species to be sampled under the current DCR.

The landings data to be used for designing sampling scheme and for assessment purposes should be the most representative collected through the DCR.

<u>It was stressed that each MS must provide landings data for the last three years (2003 – 2005) for all species in Appendix XV of the current DCR, to the next RCM Med (Cyprus, 2007).</u>
<u>During this meeting the structure and practical organization of the database will be discussed.</u>

Concerning the future sampling (from 2009) following the fleet-fishery based approach, the database will include landings and effort information, by GSA and fleet segment.

The Commission representative stressed that the Commission considers the establishment and the development of regional databases as a useful tool for DCR purposes. In this context, funding opportunities exist under the DCR to support studies and pilot projects. This topic should be considered by the RCM Med.

4.2 Identify emerging problems resulting from changes on data collection procedures and propose actions to be taken in order to address their impacts on stock assessment input data

4.2.1 Harmonization between the stratification used for the fleet-fisheries based approach (GFCM Operational Unit Task 1 and DCR Fleet-Fishery matrix)

The PGMed expressed its concern on the possibility of having to comply and fill in two different matrixes, namely DCR Fleet-Fishery matrix and the GFCM Operational Unit Task 1. It is the Commission's opinion that the DCR matrix should match with the Regional Fisheries Organisation (RFO) needs. Nevertheless, the Commission representatives and the PGMed, recognises the problem that Member States would face when participating in several RFOs.

The PGMed stressed the importance that at least the same definition should be used and the most similar frames be defined by the DCR and the GFCM.

Concerning the GFCM Task 1, the PGMed was troubled with the definition of the fleet segments. The task of selecting the appropriate fleet segments in the future DCR matrix has been allocated to the economic experts, and the PGMed has been informed that the definition of fleet segments and fishing activity in the GFCM Task 1 will be further addressed in the *Workshop on implementation of the GFCM Task 1* (Casablanca, Morocco, 19-22 June 2007). Therefore, PGMed strongly recommends the presence in this workshop of representatives of scientific groups involved in the DCR.

The PGMed stresses the need for coordination between the GFCM actions and the work made within the DCR, for avoiding future discrepancies on similar requirements.

4.2.2 Definition and evaluation of the implementation of fishing effort measurements

The PGMed analysed the GFCM effort measurement table (GFCM Report/31/2007/01 ftp://ftp.fao.org/docrep/fao/009/a0889b/a0889b00.pdf) trying to define the sources and the methods that can be used for each of the parameters. Each of the parameters of the

GFCM effort table (Table 1) were screened to assess which would be the most likely source for providing them. The source of sampling has been split in two parts, discriminating the possibility or not to check for the quality of the collected information (Table 2). If a parameter is given to be unique for a gear or a vessel throughout the year (e.g. dredge width of the mouth) or authorising visual check (e.g. number of longlines sets, type of nets), this parameter can be estimated through a survey and the quality of the information can be checked and validated. If a parameter is impossible to be measured and can only be obtained through fishers enquiries (e.g. length of nets, number of traps), this parameter can be estimated, but its quality cannot be checked and validated.

When on board a fishing vessel, almost all the parameters of the GFCM effort table can be observed, but apart from a substantial increase of the sampling intensity, these observations cannot be used to estimate the population value with sufficient precision. On the other hand, the on board observations can be used to validate other sources of information, and in this case it was noted (a) in the table. If the information on few trips were considered too weak to validate other sources of information, it was noted (b) in the table.

When more than one source are available to assess one parameter, they are to be seen as complementing each others, e.g. type of trawl, number of trips. In this case, all the sources have to be considered to provide the best estimates.

Table 1: Fishing effort measurement (GFCM Report/31/2007/1).

APPENDIX/ANNEXE I

Table on fishing effort measurement/Tableau sur la mesure de l'effort de pêche (Rome, 2006)

Gear	Number and dimension	Capacity	Activity	Nominal Effort
Dredge (for molluscs)	- Open mouth - Width of mouth	GT	Time fishing	Dredged bottom surface
Trawl (including dredges for flatfishes)	- Type of trawl (pelagic, bottom) - GT and/or GRT - Engine power - Mesh size - Size of the net (width of mouth) - Speed	GT	Time fishing	- GT*days - GT*hours - KW*days
Purse seine	- Length and drop of the net - GT - Light power - Number of small boats	-GT -Length and drop of the net	Search time set	- GT * Fishing sets - Length of the net * fishing sets
Nets	- Type of net (e.g.trammel net, gillnets, etc.) - Net length (used in regulations) - GT - Net surface - Mesh size	Net length and drop	Time fishing	- Net length * days - Surface*days
Longlines	- Number of hooks - GT - Number of longlines - Characteristics of hooks - Bait	- Number of hooks - Number of longline units	Time fishing	-Number of hooks *hours -Number of hooks *days -Number of longline units * days/hours
Traps	GT	Number of traps	Time fishing	Number of traps * days
Purse seine/FADs	Number of FADs		Number of trips	Number of FAs

The PGMed debated regarding the definition of "activity", in terms of fishing time (i.e. soaking time, day, hours…) and agreed that a common definition scientifically sound, should be adopted. The PGMed recommends that the analysis of the GFCM effort measurement table should be presented in the forthcoming RCM Med.

Other questions arisen:

- PGMed proposal for soaking time definition: *time spent at sea calculated from the point where each individual unit of gear has been set, until the time when the same unit starts to be removed*;
- need for a definition of hooks characteristics;
- need for a definition of bait (number? Type?);
- need for a fishing effort measure for longline;

It was decided that each definition will be further discussed and considered by both PGCCDBS and PGMed.

Table 2: Evaluation made by the PGMed to define the sources and the methods that can be used for each of the parameters identified from the GFCM table.

		Fleet Register	Log-Books	Sales notes	On-board observers	Sampling survey: quality check possible	Sampling survey: Quality check impossible	Other Reg.
All gears	GT	X						
	Engine power	X						
dredge (for molluscs)	Open mouth				X	X		
	Width of mouth				X	X		
	Time fishing		X		(a)	X		
Trawl (including dredges for flatfishes	Type of trawl	X	X		(a)	X		
	Mesh size							X
	Size of the net (width of mouth)				X		X	
	Speed							X
	Time fishing (days/hours)		X		(a)	X		
Purse seine	Length and drop of the net				X		X	
	Light power				X		X	
	Number of small boats				X	X		
	Search time set		X		(a)			X?
	Number of fishing sets				X	X		
Nets	Type of net (e.g. trammel net, gillnets, etc…)	X	X		(a)	X		
	Net length (used in regulations)				(b)		X	
	Net surface				(b)		X	
	Mesh size							X
	height of nets				X		X	
	Time fishing (days/hours)		X		(b)		X	
Longlines	Number of hooks				(b)		X	
	Number of longline units				(a)	X		
	Characteristics of hooks				X		X	
	Bait				(b)		X	
	Time fishing (hours/days)				(b)		X	
Traps	Number of traps				(b)		X	
	Time fishing (days)				(b)		X	
Purse seine/FADs	Number of FADs				X		X	
	Number of trips		X	X		X		

(a) information only useful for validation
(b) information not useful for validation

4.2.3 Recreational Fishery data requirements for the new DCR

Discussion took place on the need for conducting pilot studies for evaluating the species composition caught by the recreational fisheries. The PGMed decided that during the forthcoming RCM Med every MS would provide a short description of their recreational fisheries management system employed (i.e. existence of licenses, etc.) and a list of "*suspected*" species (except bluefin tuna) caught. The goal is to have a preliminary overview on the knowledge and setting up methodologies to be used for the assessment of the recreational fisheries. PGMed recommends for the incoming RCM that each country identifies and presents the methodology related to the different management systems. In support of this exercise the PGMed was informed that Spain has recently performed a project on recreational fishery (Morales-Nin, B., Moranta, J., Garcia, C., Tugores, M. P., Grau, A. M., Riera, F., and Cerda`, M. 2005. The recreational fishery off Majorca Island, western Mediterranean: some implications for coastal resource management - ICES Journal of Marine Science, 62: 727-739. Annex I)

4.2.4 Concurrent sampling

PGMed recognised the necessity for the Mediterranean countries to carry out sampling exercises on concurrent sampling (i.e.: Fishery-based sampling: implementation test on the Portuguese Trawl Fleet operating off Matosinhos, Portugal. Annex II).

This exercise will provide information on the percentage of the species that could be concurrently sampled in the Mediterranean per trip, for each operational unit under the future fishery based approach. The adoption of standard protocols is needed, for all Mediterranean countries to work using the same sampling scheme.

It was decided that sampling exercises will be carried out during 2007, and that the results will be presented at a dedicated Workshop, which will be organised most probably in January 2008. The Commission can provide extra funding for conducting this exercise;

however, MS will have to request this extra funding in the financial form of H Module as soon as possible.

4.2.5 Increase quality and validation of the data used in fisheries management

Discussion took place concerning the current quality control of the data collected under the DCR. For the moment no common source of tools are used at the regional level; it is an internal issue of each country, or even institute, to check the quality of the data.

It was recalled that tools for evaluating the quality of the data are already used in the GFCM area particularly by the Medits group, e.g. checkmed (Souplet A., 1996. Checkmed : A software to check the Medits data files. in Bertrand J. et al., 1996. Campagne internationale de chalutage démersal en Méditerranée, Medits. Campagne 1995. Rapport final. Vol. I. Rapport de contrat CEE-IFREMER-IEO-SIBM-NCMR - MED/93/020, 018, 006, 004: 21 - 26.).

PGMed has been informed that in the frame of the DCR a project should soon start, that will address the issue of accuracy and precision of the data collected by means of sampling.

4.2.6 Improve the use of the data

The improvement of the use of the data is directly linked with the communication between the data providers and the end – users, in this case between the Mediterranean scientific community involved in the DCR and the GFCM.

The PGMed recognised the importance of strengthening the link with the GFCM and the Mediterranean scientific community.

To support this, PGMed has adapted the flowcharts (Fig. 1 and Fig. 2), proposed last year by PGCCDBS in the ICES world showing the desired link and interactions. The different parts of the flow still need to be fully described both in the PGMed and GFCM context. Some progress has been already achieved during this meeting with the participation of the GFCM representative.

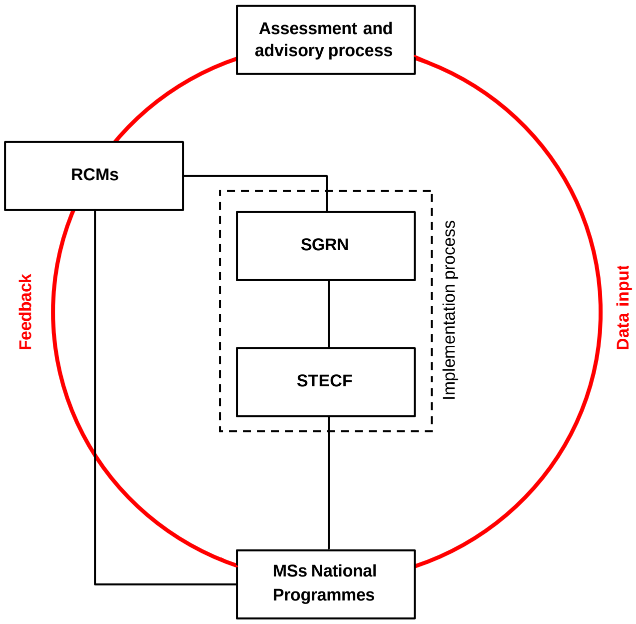


Figure 1: Information flow on DCR system (in PGCCDBS, 2006)

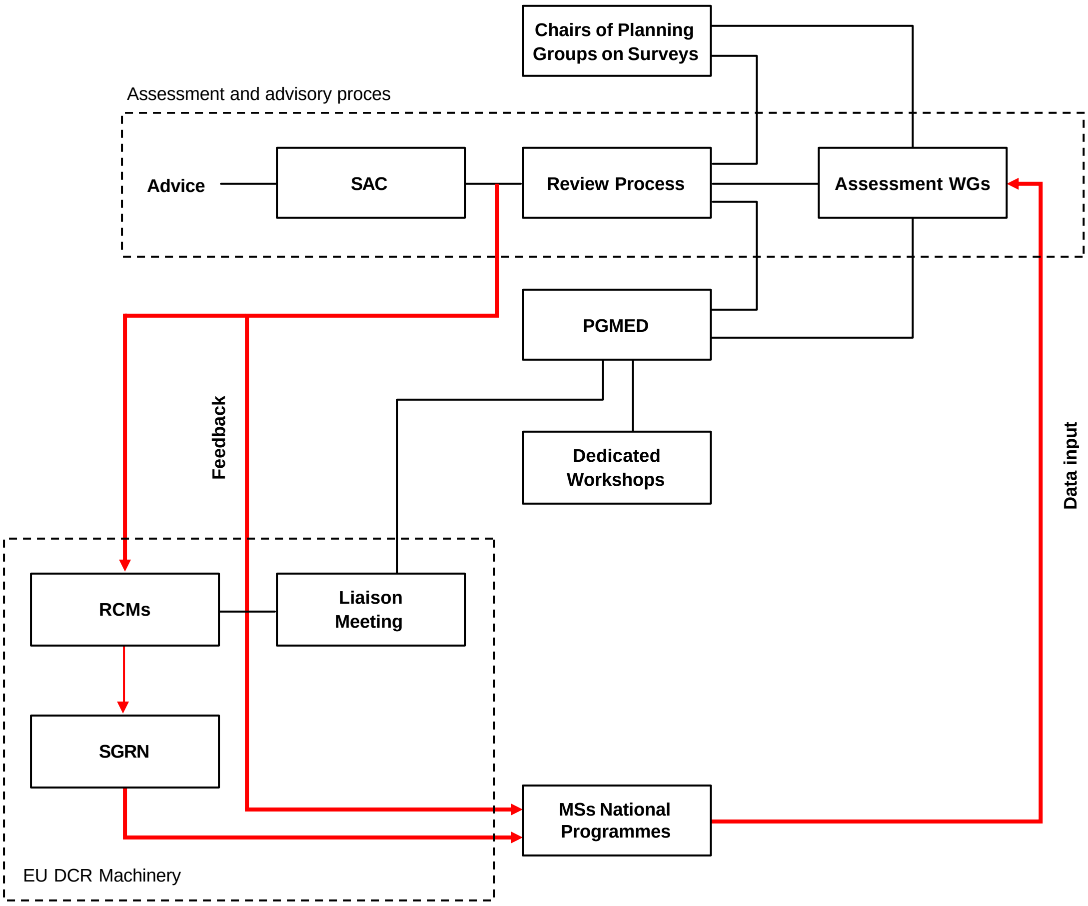


Figure 2: Information flow model (adapted from PGCCDBS, 2006)

4.2.7 Harmonisation of Maturity scales

The PGMed was informed that the decisions taken in the Workshop on Sexual Maturity Sampling in January 2007 (Lisbon, Portugal, 15-19 January 2007: http://www.ices.dk/reports/ACFM/2007/WKMAT/WKMAT07.pdf) are binding to all scientists involved with maturity stages in the DCR; therefore a common 5 stage maturity scale is to be adopted for all fish species.

Specific maturity workshops for different species groups are to be organised, for defining specifically the characteristics of each maturity stage, and for defining the sampling period in which maturity data is useful to be collected for SSB assessment purposes. This clarification created confusion within the PGMed.

As the maturity stages defined during the mentioned WKMAT differs from those used for surveys (e.g. MEDITS), the PGMed raised the issue of maturity stages to be evaluated by the next Medits Coordination Group (Rome 28-29 March, 2007). This will have to be reported to the SGRN (July, 2007).

4.3 Proposal of Workshops to support the DCR implementation

The PGMed proposed the following ageing and maturity workshops for 2008:

- Workshop on Red mullets (*Mullus barbatus, Mullus surmuletus*) ageing was postponed to 2008. (Greece, 2008; Chair Chryssi Mytillineou – see Annex III). An otoliths exchange is presently running between Italy, Greece, France, Spain and Cyprus. This group should be aware of the recommendation of the TACADAR Concerted Action (see Annex VII).

- An otoliths exchange for Common Pandora (*Pagellus erythrinus*) will run in 2007, the following workshop will be held in Greece in 2008 (Annex IV). This group should be aware of the recommendation of the TACADAR Concerted Action (see Annex VII).

- Workshop on small pelagics (*Engraulis encrasicolus, Sardina pilcardus, Trachurus mediterraneus*) maturity stages (Italy, 2008 - Annex V). This group should be aware of the recommendation of the 2005 ICES workshop on small pelagics (http://www.ices.dk/reports/acfm/pgccdbs/pil.agewk2005.pdf).

- Workshop on crustaceans (*Aristeus antennatus, Aristaeomorpha foliacea, Parapenaeus longirostris, Nephrops norvegicus*) maturity stages (Italy 2008 - Annex VI). This group should be aware of the recommendation of the 2005 Medits workshop (Report of the DCR MEDITS Working group, Nantes, France, 15-18 March 2005: wgmedits2005-wgreport-final.doc).

It is expected that GFCM provides on a yearly basis the list of workshops and meetings related to the collection of data to the chair of PGMed and the Commission (for 2007 see the Table 3).

Table 3 – List of GFCM meetings and workshops expected for 2007

Meeting	Place/Date
Workshop on trawl survey based monitoring fishery system in the Mediterranean	Rome, Italy/26-28 March 2007
Transversal workshop on EAF and MPAs in management systems	Tunis,Tunisia/22-25 May 2007
Workshop on the use of socio-economic indicators in fisheries management, including with reference to recreational and sport fisheries	Tripoli, Libya/ 4-6 June 2007
Working Group on Demersal Species	Athens, Greece/4-6 June 2007
Working Group on Small Pelagic Species	Athens, Greece/7-8 June 2007
Transversal workshop on the compilation of GFCM Task 1	Casablanca, Morocco/19-22 June 2007
Session of the Sub-Committees (SCSA-SCMEE-SCSI-SCESS)	Kavala, Greece/17-20 September 2007

5. DATE AND VENUE OF THE NEXT MEETING

Cyprus was proposed (to be confirmed) as venue of the second joint PGCCDBS/ PGMed meeting. The date was fixed around the first quarter of 2008. Athens was proposed as second option.

6. LIST OF ALL RECOMMENDATIONS

*Evaluation of the need for establishing a regional database in support of the DCR implementation***.** The PGMed recommends:

- the creation of a database that will include landings data for the last three years (2003-2005) for all the species in Appendix XV of the current DCR. Concerning the future sampling (from 2009), following the fleet-fishery based approach, the database will include landings and effort information, by GSA and fleet segment.

Harmonization between the stratification used for the fleet-fisheries based approach (GFCM Operational Unit Task 1 and DCR Fleet-Fishery matrix). The PGMed recommends:

- that both the future DCR matrix and the GFCM Operational Unit Task 1 should use at least the same definition and the most similar frames. The PGMed expressed its concern on the possibility of having to comply and fill in two different matrixes.
- the presence of representatives of scientific groups involved in the DCR during the forthcoming "Workshop on implementation of the GFCM Task 1" (Casablanca, Morocco, 19-22 June 2007) to advance on this issue.

Definition and evaluation of the implementation of fishing effort measurements. The PGMed recommends:

- that the analysis of the GFCM effort measurement table should be presented in the forthcoming RCM Med. The analysis will include also the definition of some effort parameters.
- the need for coordination between the GFCM actions and the work made within the DCR, for avoiding future discrepancies on similar requirements.

Recreational Fishery data requirements for the new DCR. The PGMed p recommends:

- that for the incoming RCM (Cyprus, 23-27 April 2007) each country should identify and present the methodology related to the different management systems. The goal is to have a preliminary overview on the knowledge and setting up methodologies to be used for the assessment of the recreational fisheries

Concurrent sampling. The PGMed recommends:

- the need for the Mediterranean countries to carry out sampling exercises on concurrent sampling (see Fishery-based sampling: implementation test on the Portuguese Trawl Fleet operating off Matosinhos, Portugal. Annex II).

Increase quality and validation of the data used in fisheries management. The PGMed recommends:

- to enforce the quality control of the data collected under the DCR. The PGMed recognised that a common tool is needed (at least at regional level). In the frame of the DCR a project should soon start, that will address the issue of accuracy and precision of the data collected by means of sampling.

Improve the use of the data. The PGMed stresses:

- the need and the importance of strengthening the link with the GFCM and the Mediterranean scientific community.

Harmonisation of Maturity scales. The PGMed recommends:

- that the issue of maturity stages (Workshop on Sexual Maturity Sampling in January 2007 Lisbon, Portugal, 15-19 January 2007) must be evaluated by the next Medits Coordination Group (Rome 28-29 March, 2007). This will have to be reported to the SGRN (July, 2007).

7. ANNEXES

ICES Journal of Marine Science,62: 727–739 (2005)
doi:10.1016/j.icesjms.2005.01.022

The recreational fishery off Majorca Island (western Mediterranean): some implications for coastal resource management

Beatriz Morales-Nin, Joan Moranta, Cristina García,
María Pilar Tugores, Antoni Maria Grau, Francisco Riera,
and Margalida Cerdà

Morales-Nin, B., Moranta, J., García, C., Tugores, M. P., Grau, A. M., Riera, F., and Cerdà, M. 2005. The recreational fishery off Majorca Island (western Mediterranean): some implications for coastal resource management. – ICES Journal of Marine Science, 62: 727–739.

The sociology and habits of recreational anglers on the Island of Majorca (western Mediterranean) were evaluated using telephone and on-site surveys, as well as fishing logbooks and recreational fishing competitions. The recreational fishery is one of the island's main leisure activities, 5.14% of the population (37 265 people) participating. Enthusiasts tend to be mainly middle class (most anglers own boats moored at marinas), middle-aged males (90% male, mean age 46 ± 2 years). The most popular fishing method is from a boat (62.9%), followed by fishing from shore (32.4%), and spearfishing (3.6%). The mean time spent fishing is $3.86 \pm 0.03\ \mathrm{h\,d^{-1}}$, and more than one type of gear (mean 1.27 ± 0.21) is used simultaneously by a single angler. The frequency of fishing is 4–6 times per month, mainly on holidays and weekends, increasing in summer. The activity has a sizeable impact on the coastal fauna, with diverse catches of at least $1209.25\ \mathrm{t\,year^{-1}}$ (about 615 000 fishing outings $\mathrm{year^{-1}}$). Thus, the amount of carbon extracted annually is at least $137.34\ \mathrm{kg\,C\,km^{-2}\,year^{-1}}$, and the recreational fishery removes about 31% of production at trophic level 4. Although these are gross estimates and more detailed study of the effect on trophic level and local production is needed, the values do highlight the pressure the recreational fishery exerts on coastal fish communities. Assuming that this level of exploitation is common to north-shore Mediterranean countries, there may be cause for concern about sustainable exploitation in the recreational fishery, and the effectiveness of current protection measures is discussed. Despite the limitations of the study, recreational fisheries clearly should be taken into account when considering measures for fisheries management. Moreover, fishing has considerable social import, and the benefits must be taken into account when investments to protect exploited resources are being contemplated.

Keywords: coastal zone, fish exploitation, Majorca Island, recreational fishing, western Mediterranean.

Received 4 August 2004; accepted 16 January 2005.

B. Morales-Nin, J. Moranta, C. García, and M. P. Tugores: UIB-CSIC IMEDEA, Miquel Marqués 21, 07190 Esporles, Balears, Spain. A. M. Grau, F. Riera, and M. Cerdà: DG de Pesca, C. Foners 10, 07006 Palma, Balears, Spain. Correspondence to B. Morales-Nin: tel: +34 971611721; fax: +34 971611761; e-mail: beatriz.morales@uib.es.

Introduction

The transformations undergone by Mediterranean countries in the last century have dramatically altered their coastal regions, especially the sea's northern shore (Morey *et al.*, 1992; Özhan, 1996; Van der Meulen and Salman, 1996; García and Servera, 2003). For instance, the Balearic Islands (western Mediterranean) have shifted their primary economy from one based on agriculture and cattle to a tertiary economy based on tourism (Rullan-Salamanca, 1998). Development has increased shoreline use, and the population increases considerably in summer, when the pressure of tourism is highest. Further, aquatic leisure activities like scuba-diving, water-skiing, sailing, and fishing have flourished, and their added impact on coastal and maritime ecosystems has grown.

Recreational fishing is one of the most frequent leisure activities in coastal zones, and it involves large numbers of people and consequently high levels of fishing effort, which may be higher than in the commercial fishery (Pollock,

1054-3139/$30.00

1980; Dunn *et al.*, 1989). Commercial and recreational fishing have similar demographic and ecological effects on fished populations, and they can have equally serious ecological and economic consequences (Coleman *et al.*, 2004). Recreational fishing has economic, social, and cultural roles in the Mediterranean, where commercial fishing is largely the domain of small-scale concerns operating in coastal areas. Over the past 20 years, catches of several key commercial stocks have been in sharp decline despite increased fishing effort, symptomatic of overexploitation. Recreational fishing is particularly important in the Mediterranean, representing more than 10% of total fisheries production in the area (EU, 2004). In the Balearic Islands recreational fishing is one of the principal leisure activities, as indicated by the number of fishing licences issued. The deep-sea sport fishery for tuna and marlin occupies relatively few (around 100) boats in the islands (unpublished data of DG Pesca, Govern de les Illes Balears: Department of Fisheries, Balearic Islands Government), and is a relatively minor activity.

Recreational fisheries have been poorly studied in the Mediterranean, although this has not prevented implementation of some management measures. For instance, a fishing licence is needed in the Balearic Islands, and current legislation limits both fishing effort (number of gears) and daily bag, and stipulates minimum lengths and closed seasons for certain species. In addition, several marine reserves have specific restrictions on fishing. While the number of licences provides a certain measure of the fishing effort expended, inspectors have detected a significant number of recreational anglers who are not official licence-holders, so the actual number of people involved and the yields remain unknown.

Although direct confirmation is unavailable, the response of certain species to protection measures suggests that the coastal fish populations around Majorca Island are probably overexploited. For instance, a shallower distribution and increased biomass for grouper (*Epinephelus marginatus*) followed closure of recreational fisheries in a protected area (Coll *et al.*, 1999). The larger mean size of razor fish (*Xyrichthys novacula*) in the same protected area compared with exploited areas is another example (Riera and Linde, 2001).

Fishing regulations designed to protect recreational fisheries from overexploitation can fail (Post *et al.*, 2003), an outcome all the more likely when basic data are lacking, as in the Balearic Islands. Therefore, the object of this study is to contribute to knowledge of current exploitation of coastal fish resources by the recreational fishery, and in the process to provide essential management data (Kearney *et al.*, 1996; Gartside *et al.*, 1999; Sutinen and Johnston, 2003; Coleman *et al.*, 2004). The results for Majorca could be illustrative of exploitation of coastal resources in other areas of the Mediterranean's north shore, thereby addressing an important yet poorly understood and poorly managed component of the ecosystem.

Material and methods

Study area

Majorca Island, the main island in the Balearic Archipelago, is located in the western Mediterranean Sea (Figure 1), has an area of 3620 km^2 and about 623 km of coastline, and had 725 000 inhabitants in December 2001 (data furnished by the Conselleria d'Economia, Comerç i Indústria: Department of the Economy, Trade, and Industry). There were 39 harbours, with a total of 14 196 moorings in October 1998. The number of fishing licences has increased since 1998, to 22 000 in 2002 (Figure 2).

The fishing regulations enforced are a bag limit (5 kg angler-day^{-1}, or 25 kg d^{-1} in boats with more than 5 anglers on board), closed seasons for some species, and protected areas along the littoral.

Data collection

Initial information for the study was gleaned from the fishing licences, but a multiple approach based on

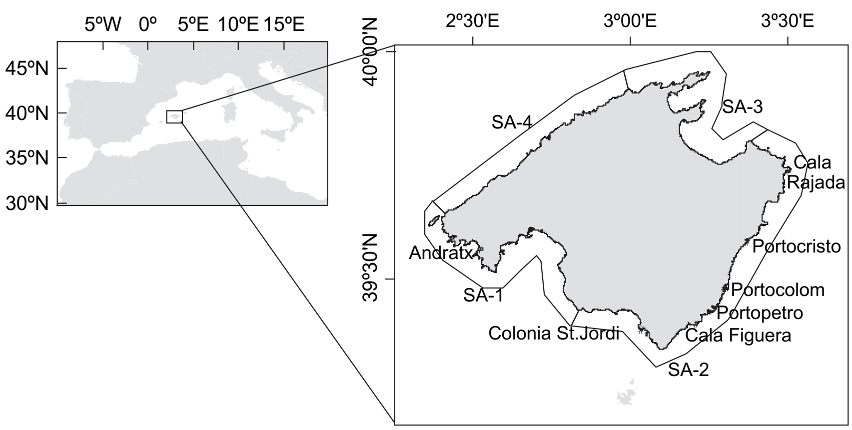


Figure 1. Location of Majorca Island.

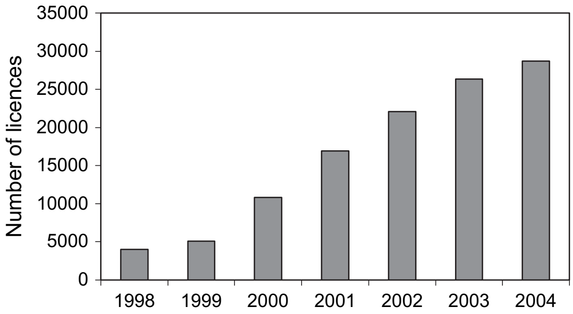


Figure 2. Number of fishing licences for the three major fishing methods on the Island of Majorca. Source DG Pesca, Govern de les Illes Balears (Department of Fisheries, Balearic Islands Government).

a telephone survey, on-site personal interviews, voluntary logbooks, and records from recreational fishing competitions was used for more reliable assessments of the actual numbers of recreational anglers and their habits and of fishing effort and yields (Tables 1 and 2). The telephone survey was based on the Dillman total design method (Dillman, 1978), and was carried out between July and November 2002. Sample size was 2585 Majorcan households chosen randomly from the directory of the most important telephone company on the island, although the number of households selected by town was proportional to population. Questions were the number of members making up the household, participation in recreational fishing by household members, and if members did fish, a series of questions to ascertain catches and fishing habits (i.e. method, time of year, time of day, frequency, number of gears used, etc.). In addition, the anglers' gender and age were requested. Whenever possible the questions were addressed to the active angler, even where this required a follow-up telephone call.

From February to December 2002, interviewers personally surveyed people observed fishing or returning from a day of fishing at harbours or along the shore, according to a stratified spatiotemporal design. The coast was divided into four study areas (Figure 1) of different size. Study area 1 (SA-1) consisted of Palma Bay and the region around Andratx off the southwestern part of the island (184.71 km of coastline), SA-2 was the southern and eastern shorelines (198.02 km of coastline), SA-3 comprised Alcudia and Pollença bays (147.75 km of coastline), and SA-4 the northwestern shoreline (92.52 km of coastline). SA-1 and SA-3 have less steep slopes than SA-2 and SA-4, and more harbours and moorings. In fact, about 64% of the island's harbours and 74% of the moorings are located in SA-1 and SA-3, primarily in SA-1.

Table 1. Number of responses for each type of information source used in the present study.

Information source	Socio-demographic data	Information on general aspects and the most common catches	Census of daily catches
Telephone household survey	1 271	75	—
On-site interviews	—	672	774
Volunteer logbooks	—	66	658
Total	1 271	813	1 432

Table 2. Summary of data collected from recreational fishing competitions monitored, by fishing method: survey period, total number of competitions, total number of anglers, total number of fish caught, and total yield by fishing method.

Method	Period	Number of competitions	Number of anglers	Number of fish	Yield (kg)
Boat-fishing	2000−2003	13	414	19 345	1 035.77
Shore-fishing	2000−2003	29	503	11 481	1 034.54
Spearfishing	1998−2003	14	552	2 207	1 155.22

Locations were selected randomly in each study area and visited on both weekdays and on either of the two days of the weekend, also selected randomly, but care was taken to visit each location on at least two weekends monthly. Interviews were held at the most active times of day, early morning and midday at harbours, and marinas and mid-morning along the shore. The questions were basically the same as in the telephone survey.

Daily catch composition and weight were estimated on the basis of the information provided by the anglers themselves, because the anglers interviewed tended to be reluctant to allow interviewers to weigh the total catch and to take the weight of each species in the bag. If the interview was held before the end of the fishing outing, the effective time spent fishing at the time the interview took place was taken into account in calculating the total daily catch.

In addition, volunteer recreational anglers kept fishing logbooks from February 2002 to March 2003. The fishing logbooks consisted of two parts. The first part was the same as the telephone surveys and the personal interviews, and was filled out by the volunteer once only. The second part was a record of catches on a single day, and was completed by the volunteer every time he or she went fishing. The data from this second part of the logbooks was used to evaluate daily catches but not fishing frequency, because many anglers forgot to complete the form on every outing.

Another source of information came from monitoring recreational fishing competitions. From 1998 to 2003, the DG Pesca monitored the recreational fishing competitions held on Majorca Island, recording the duration, number of participants, and catch by number and weight for each species, along with the size (total length, TL) of all fish caught or of a representative sample of the catch (Table 2). Where the total catch in weight for each participant could not be obtained, it was calculated using weight–length relationship information culled from the literature (Morey *et al.*, 2003). This unit contributed data from 54 boats and shore-based angling competitions from 2000 to 2003, and from 14 spearfishing competitions from 1998 to 2003. The information was used to evaluate individual bags and effort under controlled conditions (time and gear), and overall to contrast the values obtained with those from the other information sources.

Data processing

All data collected were entered in a database, using Access. Each interview with a member of a household (in the telephone survey) or with a single angler (in the general survey) was treated as a separate record (or entry), and each response to each question was considered a separate field in the database. Data from recreational fishing competitions were entered in another Access database and processed separately.

The information was extrapolated to the total population of the island using Excel to yield estimates of seasonal and annual fishing activity by fishing method, and graphically represented using Sigmaplot version 8.0. The estimates were analysed separately to calculate effort in days fished and daily yield, which were extrapolated to produce annual values. The proportion of anglers taking part in more than one type of fishing activity was taken into account to avoid duplication when calculating the total estimates.

Results

Participants in the recreational fishery

In all, there were 1271 responses to the telephone survey (Table 1), each representing a separate household with 3632 family members in all. By proportion, 5.14% of the respondents acknowledged being recreational anglers. As the population of Majorca in 2001 was 725 000 inhabitants, on this basis we estimated that there were 37 265 recreational anglers in Majorca. This number was considerably higher than the number of issued fishing licences in Majorca in 2002, signifying that only 59% of recreational anglers fulfil this legal requirement (Figure 2).

Recreational fishing is an overwhelmingly male activity (91% of the total), and the few women fishing usually accompanied a male relative. The mean age of recreational anglers in Majorca was 46 ± 2 years. Although anglers between 40 and 50 years old made up the largest segment (29.65% of the total), the percentage of recreational anglers older than 60 was also high (20.40%). These middle-aged men usually go fishing alone (43.7%) or in pairs (39.2%). The percentage of recreational anglers that went fishing in a group was rather low (12.5% in threesomes, 3.1% in foursomes, and only 1.5% in groups of more than four).

Recreational water craft in use are relatively small, and have medium-size engines, the traditional "llaüt" being the most popular (Table 3). Most boats were based at a harbour (81.5%), only few (18.5%) being towed to the coast. Spearfishers commonly used a towed boat (64.71%) as opposed to one moored at a harbour (35.29%). Fishing depth and distance from shore depended on boat type, but most activity takes place at a relatively close distance (mean 3.21 ± 1.23 km), at a depth of around 30 m (Table 3).

Fishing activity

The recreational fishing method most often employed in Majorca was from a boat (62.9%), followed by fishing from shore (33.4%), with spearfishing (3.6%) being the least common (Table 4).

Nearly all recreational anglers always used the same fishing method. The proportion of anglers who always fished from shore was 92.76%, while for boat-anglers the percentage was lower, only 72%. This flexibility can most likely be attributed to the fact that most boat-anglers (90%) are themselves boat-owners, affording them more options when it comes to choosing a fishing method.

Analysis of daily activity showed that recreational anglers mostly went out in the morning (83.8%), followed by the evening (13.8%), with night-time last (2.4%). The yearly distribution of fishing activity (Figure 3) displayed pronounced seasonality and followed the same pattern for all fishing methods employed, with a maximum in summer (34.88%) and a minimum in winter (16.95%). Most recreational anglers fished on weekends (68%) or any time during the week (26%). Only a few (6%) fished only on weekdays. The percentage fishing on weekdays was directly proportional to monthly activity.

The mean frequency of fishing was 5.5 ± 0.11 times per month. Overall, 46.7% of recreational anglers usually fish

Table 3. Characteristics of the recreational fishing fleet and distance of the fishing grounds from shore by boat type. Values are the mean ± s.e. Distance is the mean distance from the coast to the customary fishing ground.

Type	Share (%)	Size (m)	Engine horsepower	Fishing depth (m)	Distance (km)
Llaüt	55.3	6.32 (±0.51)	33.69 (±1.29)	30.7 (±2.5)	3.33 (±0.19)
Motorboat	34.9	6.19 (±0.64)	48.51 (±1.05)	144.5 (±35.6)	4.26 (±0.37)
Inflatable	8.5	5.69 (±0.39)	43.24 (±1.91)	20.3 (±5.2)	1.85 (±0.37)
Sailboat	1.3	7.56 (±0.82)	21.56 (±3.60)	42.0 (±8.7)	6.48 (±1.85)

Table 4. Share of recreational anglers, and summary of fishing effort and yield by fishing method. Effort is expressed as total number of fishing outings per year (Effort 1), mean number of gears used concurrently by a single angler (Effort 2), and mean number of hours fished per day (Effort 3). s.e. in parenthesis.

Method	Share (%)	Effort 1 (outings year^{-1})	Effort 2 (gears angler^{-1})	Effort 3 (h d^{-1})	Yield (kg bag^{-1})
Boat-fishing	62.9	387 001	1.24 (0.25)	4.05 (0.03)	4.16 (0.24)
Shore-fishing	33.4	205 552	1.31 (0.25)	3.42 (0.06)	4.03 (0.39)
Spearfishing	3.6	22 320	1.49 (0.30)	4.18 (0.15)	4.48 (0.78)

4–6 times a month, 27% 6–10 times a month, 7.6% between 10 and 15 times a month, and only 1.46% more than 15 times a month (Figure 4). Just 17.2% fish fewer than four times a month. The number of days given over to recreational fishing increased during vacations and bank holidays.

Effort for each fishing method (Table 4) was calculated from the information on the estimated number of recreational anglers (37 265), the seasonal distribution of fishing activity (Figure 3), and the mean number of fishing outings per month per angler (5.5). Total effort in the recreational fishery was 614 873 fishing outings year^{-1}. The most popular fishing method, from boats, accounted for most of the effort expended, factoring time spent fishing into the calculation.

The mean number of fishing gears used simultaneously by a single recreational angler was 1.27 ± 0.21, with some differences between fishing methods (Table 4). The mean time spent fishing by recreational anglers was 3.86 ± 0.03 h d^{-1}, though somewhat longer for spearfishing (Table 4).

Catch composition and abundance

Based on the on-site censuses of catches (1432 bags, 5.8% with no catch) and on the personal interviews (Table 1), 60 fish and cephalopod species belonging to 28 families were identified (Table 5). The catches made from boats constituted the largest number of species (54), followed by fishing from shore (43), with spearfishing (29) being the most selective method. Despite the high diversity, effort was concentrated on 32 species, depending on the different fishing methods (Figure 5). *Serranus cabrilla*, *Serranus scriba*, *Coris julis*, *Symphodus tinca*, *Diplodus annularis*, *Diplodus vulgaris*, *Diplodus sargus*, and *Octopus vulgaris* were the most abundant species in the catches. The two species with closed seasons, *Xyrichthys novacula* and *Seriola dumerili*, were also among the most frequently caught.

Bag size was calculated by different methods, with differing results. In the telephone survey, 28% of the recreational anglers interviewed said that they usually caught between 25 and 50 fish per fishing outing. According to the telephone survey responses, the mean catch on a single outing (number of fish per bag) was highest for boat-fishing (29.27 ± 0.89) and lowest for spearfishing (12.28 ± 2.77), with shore-fishing producing a mean of 19.78 ± 1.06 per outing. According to the results of the on-site interviews by surveyors, however, the mean catch per outing was an order of magnitude lower for shore-fishing (9.55 ± 0.82) and spearfishing (7.24 ± 0.63) than for boat-fishing (29.08 ± 3.64). The maximum bags recorded for each fishing method were 98 fish for boat-fishing, 35 fish for shore-fishing, and 11 fish for spearfishing.

Yield per outing

The data sources likewise furnished two different estimates of mean yield per fishing outing. The catch estimates by the

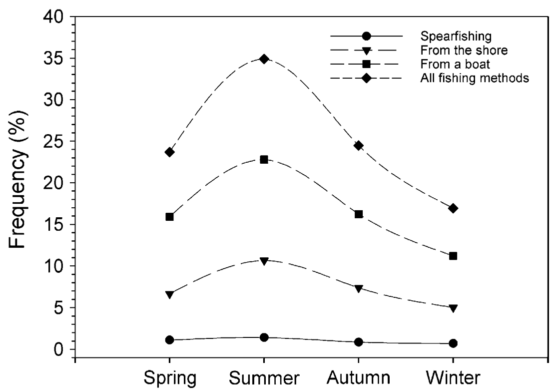


Figure 3. Seasonal distribution of fishing activity by fishing method on the Island of Majorca.

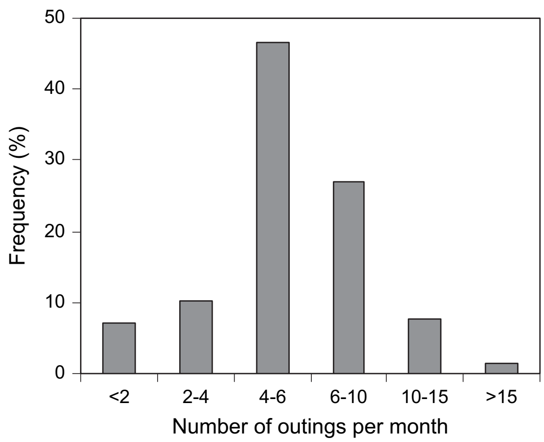


Figure 4. Relative frequency of fishing activity.

Table 5. Taxa caught by recreational fishing off Majorca. Frequency of appearance is qualitative (X = seldom, XX = regularly, XXX = very often). Asterisks indicate species also exploited by the commercial fishery.

Taxon	Boat	Shore	Spear
Apogonidae			
Apogon imberbis	X	X	
Balistidae			
*Balistes carolinensis**	XX		X
Belonidae			
Belone belone	XX		
Blenniidae			
Blennius spp.	X	X	
Bothidae			
Bothus podas	XXX	X	
Carangidae			
Lichia amia	X	XX	X
*Seriola dumerili**	XXX	X	XXX
Trachurus spp.*	XX		
Congridae			
Ariosoma balearicum		XX	
*Conger conger**		XX	XX
Coryphaenidae			
*Coryphaena hippurus**	XXX		
Dactylopteridae			
Dactylopterus volitans	XX	X	X
Labridae			
Coris julis	XXX	XXX	
*Labrus viridis**	X	XX	XXX
Symphodus ocellatus	X	XX	
*Symphodus tinca**	XX	XX	XX
Thalassoma pavo	X	XX	
*Xyrichthys novacula**	XXX		
Loliginidae			
Loligo spp.*	XX	X	
Moronidae			
*Dicentrarchus labrax**	X	XX	XXX
Mugilidae		XXX	XXX
Mullidae			
*Mullus surmuletus**	X	XX	XX
Muraenidae			
*Muraena helena**	X	XX	XXX
Octopodidae			
*Octopus vulgaris**	XX	XX	XXX
Pomacentridae			
Chromis chromis	X	X	
Rajidae			
Raja spp.*	X	X	X
Sciaenidae			
*Sciaena umbra**	X	X	XXX
Umbrina cirrosa		XX	XX
Scombridae			
*Auxis rochei**	XXX		
*Sarda sarda**	XX		
*Scomber japonicus**	XX		
*Thunnus alalunga**	XXX		
*Thunnus thynnus**	XXX		
Scorpaenidae			
*Helicolenus dactylopterus**	XX		
*Scorpaena porcus**	X	X	XX
*Scorpaena scrofa**	XX	X	XX
Scyliorhinidae			
*Scyliorhinus canicula**	X		
Sepiidae			
*Sepia officinalis**	XX	XX	XX
Serranidae			
*Epinephelus marginatus**	X	XX	XXX
*Serranus cabrilla**	XXX	XXX	
*Serranus scriba**	XXX	XXX	
Synodontidae			
Synodus saurus	XXX	X	
Sparidae			
*Boops boops**	XX	XX	
*Dentex dentex**	XX	X	XX
*Diplodus annularis**	XXX	XXX	
*Diplodus puntazzo**	X	XX	XX
*Diplodus sargus**	XX	XXX	XXX
*Diplodus vulgaris**	XXX	XXX	XX
*Lithognathus mormyrus**	XX	XXX	XX
*Oblada melanura**	XX	XXX	X
*Pagellus acarne**	XX	X	
*Pagellus bogareveo**	XX	X	
*Pagellus erythrinus**	XX	X	
*Pagrus pagrus**	XX	X	
Sarpa salpa	X	XXX	XX
*Sparus aurata**	X	XXX	XX
*Spondyliosoma cantharus**	XX	X	X
Sphyraenidae			
Sphyraena spp.*	XXX		X
Trachinidae			
Trachinus spp.*	XXX	X	X

anglers themselves were compiled from 813 general information interviews, affording 766 responses with data on yield per outing (Table 1). According to these respondents, the most frequent yield for boat- and shore-fishing was between 1 and 3 kg, while yields for spearfishing were between 3 and 5 kg (Figure 6a). The percentage of anglers taking more than 10 kg per outing was low, 7.7% for boat-fishing and 5.0% for shore-fishing.

According to the survey responses, estimates of mean yield per outing (kg bag^{-1}) for all three fishing methods (Table 4) were similar. Biomass removal took place mainly in summer (Figure 6b), in accord with the temporal distribution of fishing activity (Figure 3). In contrast, the estimates obtained from logbooks (658 records) and on-site interviews (774 records) resulted in lower values for boat-fishing (2.39 ± 0.08) and for shore-fishing (1.09 ± 0.07), but a higher value for spearfishing (2.70 ± 0.53).

Recreational fishing competitions

During the competitions considered, recreational anglers spent 4.1 ± 0.3 h fishing from a boat and 4.2 ± 0.1 h

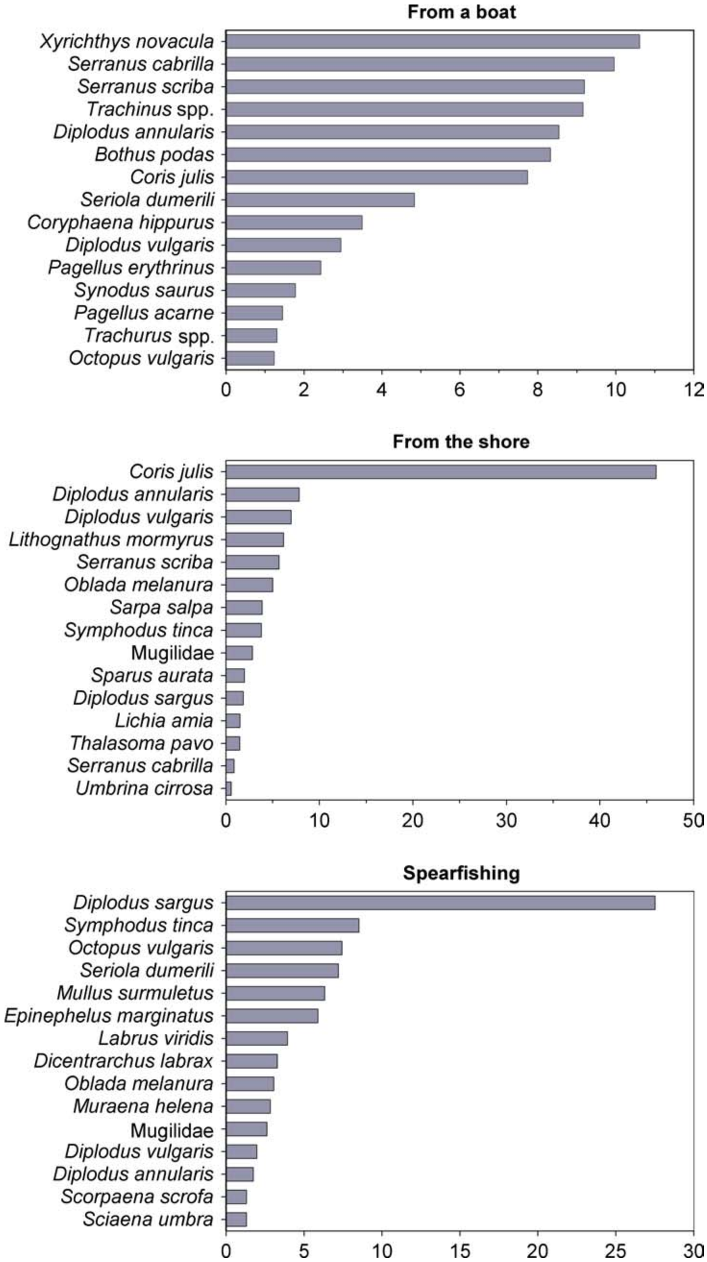


Figure 5. Percentage species abundance in recreational fishing catches by fishing method. Note that the scale of the x-axis differs for each plot.

fishing from shore. Mean catches (number of fish per bag) were much higher for boat-fishing (45.79 ± 4.27) and for shore-fishing (26.03 ± 3.45) than for spearfishing (4.39 ± 0.32).

Estimated mean yield (kg bag^{-1}) was lowest for shore-fishing (1.50 ± 0.28), while the highest values were for boat-fishing (2.45 ± 0.21), closely followed by spearfishing (2.36 ± 0.24). Table 6 gives the yields for the species most frequently caught during fishing competitions.

Size of the species caught most frequently was between 10 and 20 cm. *Seriola dumerili* was the only exception to this general pattern, ranging from 29 to 36 cm long (Figure 7). *Coris julis* and *Diplodus annularis* were consistently in the size range 10−15 cm, with a sharp peak at 13 cm. Similarly, *Symphodus tinca* and *Serranus cabrilla* had a modal size at 13 cm, though each also exhibited peaks, the main peak for the former at 18 cm and for the latter at 21 cm. *Diplodus vulgaris* was a little larger, with

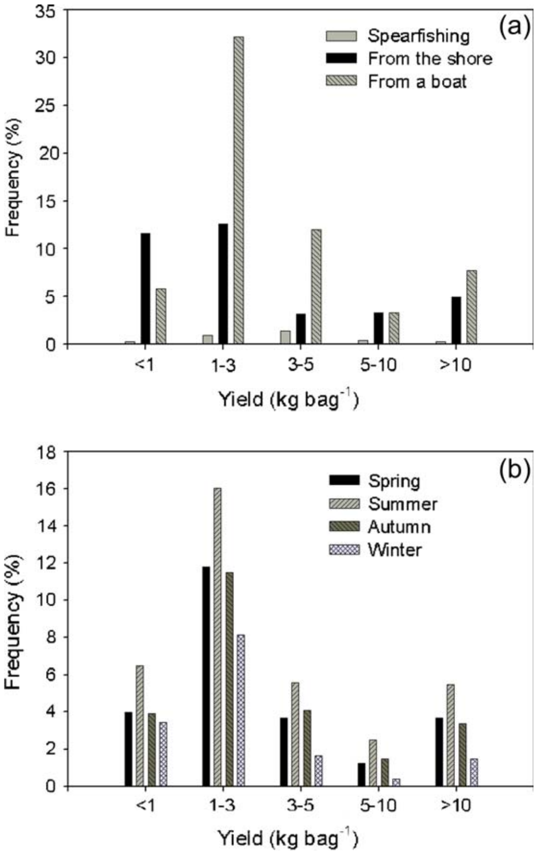


Figure 6. Daily estimated yields (a) by fishing method, and (b) by season (values expressed as percentage catch by biomass range).

a modal size at 16 cm and a main peak at 20 cm. The modal size for *Diplodus sargus* was 17 cm.

Discussion

Data reliability was tested by cross-checking the data collected from the different sources of information available. Although admittedly subject to some shortcomings (see below), the present study reveals that with 37 265 people (5.14% of the population of Majorca Island in 2001) involved, recreational fishing is one of the main leisure activities and is undoubtedly important to the coastal marine ecosystem as well as being socio-economically important. Actual numbers of recreational anglers are probably higher, because people may well not have told the truth during the telephone survey of households, either because they fish without a licence or because they have other, personal reasons of their own. A veracity check carried out on 100 households having a family member who was a member of a recreational anglers' association showed that 5% denied having any family member actively fishing (Morales-Nin *et al.*, submitted). Therefore, the results presented here could underestimate actual levels of fishing activity, though to achieve better estimates a more extensive veracity test would be needed. Moreover, the sharp rise in the number of fishing licences issued (Figure 2) is probably related to a major drive to enforce fishing regulations, and itself points to a very active fishery.

The recreational fishery on Majorca Island is a predominantly middle class (most anglers are boat-owners who keep boats at marinas), middle-aged male activity that is carried out mainly from boats. The activity is concentrated on weekends and holidays in the coastal strip to a distance of 3 km offshore.

Our inability to weigh the daily bags (except during recreational fishing competitions) precludes accurate estimation of yields in the recreational fishery. For this reason, three approaches to estimating yield were employed, namely, what anglers say they catch (both in interviews and logbooks), on-site estimates by interviewers, and the bag weights in recreational fishing competitions. The first of these three approaches resulted in the highest estimates. The other two approaches produced quite similar results, with the values based on the competition data being slightly higher. There are several different sources of error in the yield estimates. In the telephone survey, error may arise from the anglers' own perception; i.e. selective memory, exaggeration, or perhaps failing to include zero bags in their daily bag assessments. In the on-site interviews, the main source of error is the greater likelihood of interviewing the most active, and hence the best, anglers. This also applies to the fishing competitions. Assessing this source of bias is difficult, because individual fishing success varies widely even among experienced anglers. This has been highlighted by a recent study of fishing competitions in the Balearic Islands spanning 27 years, which revealed considerable variability in individual bags among participants (Coll *et al.*, 2004). In any case, the similar estimates based on the information compiled by the interviewers and the fishing competition data lend support to the results obtained.

It follows, then, that the recreational fishery is landing a minimum of 1209.25 t year^{-1} (based on the on-site interviews and logbook data) and a maximum of 2678.81 t year^{-1} (based on the anglers' own data; Table 7). Assuming that the lower value is probably more accurate, this amounts to approximately 27.44% of the commercial catch of fish and cephalopods in 2002 (unpublished data from the DG Pesca, Govern de les Illes Balears). Moreover, in many cases the commercial and the recreational fisheries exploit the same species (Table 5). In terms of the numbers of people taking part, involvement is two orders of magnitude higher in the recreational fishery (37 265 recreational anglers) than in the commercial fishery (769 professionals in 2001, according to data from the DG Pesca, Govern de les Illes Balears).

The recreational fishery in the Balearic Islands is highly seasonal, mainly the consequence of seasonal variability in abundance of the key target species and variations in the

Table 6. Total catch (number of fish), total weight, abundance in the catches (number of fish per bag), yield, and total length range of the species most frequently taken during recreational fishing competitions by the different fishing methods used (s.e. in parenthesis; n.a., not available).

Method	Species	Catch	Weight (g)	Abundance	Yield (g bag^{-1})	TL (cm) range
Boat-fishing	*B. boops*	226	7 586	2.10 (0.28)	72.3 (7.6)	11.2–22
	C. julis	2 215	47 826	7.39 (0.84)	167.4 (25.4)	8.7–20.1
	D. annularis	4 487	167 548	13.54 (1.95)	492.8 (70.3)	7.6–17.7
	D. vulgaris	472	30 712	1.56 (0.23)	96.3 (10.1)	11.5–2.1
	P. acarne	1 119	49 045	22.84 (4.90)	945.4 (136.3)	14.2–5.6
	P. erythrinus	106	22 064	1.09 (0.15)	244.5 (52.9)	14.6–31.5
	S. cabrilla	4 651	370 722	12.24 (2.58)	949.5 (254.6)	7.9–25.1
	S. scriba	4 564	187 338	13.73 (2.03)	574.5 (7.7)	9.3–21.1
	S. cantharus	222	23 722	1.60 (0.31)	197.0 (36.8)	13.2–26.1
	S. tinca	326	14 085	2.23 (0.28)	97.2 (14.0)	10.4–24
Shore-fishing	*C. julis*	1 247	21 716	9.65 (1.23)	169.0 (19.2)	9–19.9
	D. annularis	1 004	47 920	4.94 (1.19)	221.4 (53.6)	9.2–22.1
	D. sargus	1 297	31 329	2.14 (0.86)	401.8 (202.3)	12–33
	D. vulgaris	298	31 329	1.31 (0.36)	116.2 (37.9)	8.9–25.2
	L. mormyrus	2 122	121 643	14.27 (3.43)	784 (156.8)	8.5–30.9
	S. salpa	1 440	243 059	4.28 (1.28)	660 (226.9)	10.5–35.2
	S. scriba	867	37 019	5.79 (1.28)	244.1 (47.6)	9.2–22.3
	S. tinca	702	55 076	3.27 (0.66)	187.0 (31.3)	6.3–28
	T. pavo	595	12 620	4.10 (0.79)	83.5 (16.0)	7.4–18.1
	U. cirrosa	263	22 205	2.20 (0.65)	197.7 (39.7)	12–37.4
Spearfishing	Mugilidae	254	122 171	0.50 (0.06)	245.1 (31.7)	n.a.
	D. volitans	159	64 358	0.42 (0.05)	176 (18.9)	n.a.
	D. sargus	909	369 350	182.00 (0.17)	748.7 (70.6)	n.a.
	L. merula	62	24 504	0.16 (0.30)	64.4 (11.6)	n.a.
	L. viridis	97	43 838	0.26 (0.05)	116.7 (21.0)	n.a.
	M. helena	132	287 025	0.33 (0.07)	721.2 (146.3)	n.a.
	S. salpa	245	83 212	0.49 (0.05)	167.3 (19.6)	n.a.
	S. umbra	179	90 666	0.38 (0.06)	159.4 (38.7)	n.a.
	S. scrofa	117	58 341	0.26 (0.09)	125.0 (22.6)	n.a.
	S. tinca	68	20 094	0.16 (0.02)	45.0 (5.8)	n.a.

fishing methods used depending on weather conditions. The target and incidental species varied not only with season but also with fishing method, bottom substratum type, and fishing depth. Accordingly, the main species caught from shore are: on hard bottoms, *Symphodus* spp., *Coris julis*, *Diplodus annularis*, and *Serranus cabrilla* if bottom fishing, and *Oblada melanura* and *Sarpa salpa* if fishing nearer the surface; and on soft, sandy bottoms *Lithognathus mormyrus*, *Umbrina cirrosa*, *Sparus aurata*, *Diplodus* spp., and *Ariosoma balearicum*. The main species caught from boats near the bottom are: on *Posidonia oceanica* beds, *Serranus scriba*, *D. annularis*, and *Coris julis*; on sandy bottoms *Bothus podas*, *Trachinus* spp., *Synodus saurus*, and *Xyrichthys novacula*, the last taken only in summer and autumn; and on hard bottoms *Serranus cabrilla*, *Pagellus* spp., *Pagrus pagrus*, *Diplodus vulgaris*, and *Spondyliosoma cantharus*. Boat-fishing also harvests other species that are markedly pelagic, such as *Trachurus* spp. and young of the year *Coryphaena hippurus* and *Seriola dumerili*, taken mainly by trolling near the surface. Finally, the main species caught by spearfishers are *Epinephelus marginatus*, *Sciaena umbra*, *Diplodus sargus*, and *Octopus vulgaris*. The results for species share in the catches obtained in this study may be biased by the more-intensive sampling in summer. For this reason, the importance of *Xyrichthys novacula* in the boat-fishing catches may well have been overestimated. On the other hand, fishing activity targeting *Xyrichthys novacula* has increased in recent years, i.e. since the closed season was established.

The degree of exploitation of these target species is suggested by the length composition of the landings (Figure 7). Table 8 gives the available information on length at maturity and maximum length for some of the species, showing that there are differing degrees of exploitation, but that in any case the lengths in general tend to be short. This may well be due to the size

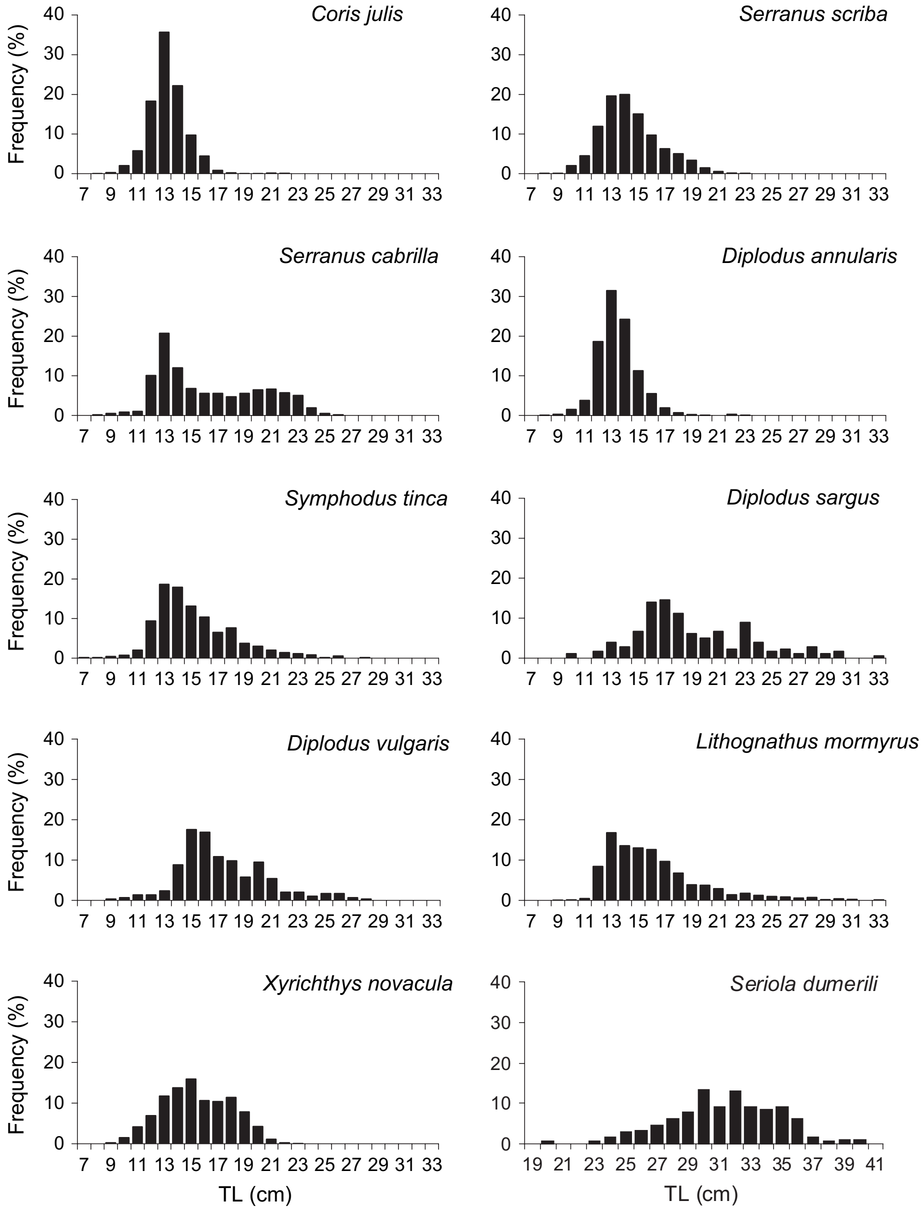


Figure 7. Size distribution of the 10 most abundant species in the catches taken during fishing competitions. Note that the scale of the x-axis differs for *S. dumerili*.

distribution of the species with depth (fishing activity is concentrated between 0 and 30 m) and to the non-regulation of hook size.

There have been few studies on exploitation of the coastal marine fauna in the Mediterranean, but available information seems to indicate that species are heavily exploited (Tserpes and Tsimenides, 2001; Voulgaridou and Stergiou, 2003; Coll *et al.*, 2004). Because of the size of these coastal resources and the relative absence of direct economic value to recreational anglers, ordinarily there is a tendency to overlook recreational fisheries as input for proper management, and to disregard the need for scientific research. Although the lack of earlier data and the study's own limitations preclude evaluating the available biomass and the degree of overexploitation, it is clear that recreational fishing must be taken into account for management purposes. Moreover, regulations such as those in place in Majorca might not be enough to keep fishing mortality at rates that are sustainable at sufficiently high levels of effort (Post *et al.*, 2003). Compliance with regulations in Majorca is low. Depending on the information source, from 25% (number of infractions

Table 7. Estimates of annual yield (t) based on the mean yield per fishing outing by fishing method, monthly fishing outing frequency, and seasonality in fishing activity.

Season and method	Annual yield (t) Telephone survey	Logbook	Competition
Spring	633.25	289.07	311.52
Summer	935.08	419.80	455.42
Autumn	656.59	295.30	320.30
Winter	453.89	205.07	221.93
Total	2 678.81	1 209.25	1 309.15
Boat-fishing	1 733.76	924.93	948.15
Shore-fishing	855.10	224.05	308.33
Spearfishing	89.95	60.26	52.67
Total	2 678.81	1 209.25	1 309.15

reported by fishing inspectors, DG Pesca, Govern de les Illes Balears, unpublished data) to 59% (data from our interviews) of anglers do not have a fishing licence. In practice, therefore, the recreational fishery is an open resource. Typical regulations like the bag limits and closed seasons used in the Mediterranean are not rigorous enough to affect total exploitation levels in open-access sport fisheries (Cox *et al.*, 2002). Therefore, management of recreational fishing requires stronger enforcement of regulatory measures and/or additional regulations such as the restricted and closed areas that are being enforced around Majorca.

The considerable diversity of species caught, with some differences between fishing methods, reflects highly varied exploitation of the littoral fauna. Most effort is concentrated in water shallower than 30 m, from the shore to 3.21 ± 1.23 km offshore. Besides the biomass extracted (1209.25 t year^{-1}), the disturbance caused by 614 872.5 fishing outings annually (nearly 2.5 million h fished) must be far from negligible given the small size of the island. In fact, relating the biomass removed to the 3663.76 km^2 of estimated shelf area exploited by recreational fishing (the

Table 8. Length at which 50% of the population is mature, and maximum length for some of the target species in the recreational fishery (FL, fork length; SL, standard length; TL, total length). Data from different areas (denoted by /) and sources.

Species	TL 50% maturity (cm)	TL max (cm)	Reference
Coris julis		18	Gordoa *et al.* (2000)
Diplodus annularis	Females, 13.4 Portugal/ Males, 10.3; Females, 12.8 Canary Islands	24/11.2/20	Gordoa and Molí (1997), Santos *et al.* (1998), Pajuelo and Lorenzo (2001), Deudero *et al.* (2004)
Diplodus vulgaris	Males, 17.27; Females, 17.65	28.2/28	Gordoa and Molí (1997), Gonçalves *et al.* (2003), Deudero *et al.* (2004)
Serranus cabrilla	15.2 SL		Garcia Diaz *et al.* (1997)
Serranus scriba		24.8	Deudero *et al.* (2004)
Symphodus tinca	Males: 13.1; Females: 13	44	Gordoa *et al.* (2000), Ghorbel *et al.* (2002)
Diplodus sargus	21.1*	42.1/39/39	Man-Wai and Quignard (1984), Gordoa and Molí (1997), Mann and Buxton (1998), Deudero *et al.* (2004)
Lithognathus mormyrus	13	55	Fishbase
Thalassoma pavo		20	Guidetti *et al.* (2002)
Labrus merula		36.3/42	Deudero *et al.* (2004)/Gordoa *et al.* (2000)
Labrus viridis		42	Deudero *et al.* (2004)
Sciaena umbra		44.5	Deudero *et al.* (2004)
Scorpaena scrofa		38.3	Deudero *et al.* (2004)
Xyrichthys novacula	10	Females, 15; Males, 20	Candi *et al.* (2004)
Seriola dumerili	60	190/134.67 (SL)	Tachihara *et al.* (1993), Marino *et al.* (1995)

**D. sargus capensis*.

surface area from the coastline to the 100-m isobath) results in direct removal of 330.06 kg km^{-2} year^{-1}. Putting the carbon content of fish at 41.61% (Sterner and George, 2000; Cabral *et al.*, 2002), the amount extracted comes to 137.34 kg C km^{-2} year^{-1}. Littoral Majorcan fish occupy a high trophic level (TL) of between 3 and 4 (Jennings *et al.*, 1997; Deudero *et al.*, 2004), although they do exhibit a certain degree of omnivory and undergo changes in diet with ontogeny. Mediterranean waters are oligotrophic (Estrada *et al.*, 1985), and littoral Mediterranean *Posidonia oceanica* meadows are important net organic carbon burial sites (García *et al.*, 2002). It follows, then, that shallow-water Mediterranean foodwebs should be benthic-based rather than plankton-based. Primary production of *Posidonia oceanica* meadows has been estimated at 445 883 kg C km^{-2} year^{-1} (Gazeau *et al.*, 2004). Taking this value as an indicator of production in the littoral zone and 10% as the transfer between trophic levels, production by fish ranges between 446 (TL 4) and 4458 kg C km^{-2} year^{-1} (TL 3). Accordingly, the recreational fishery is removing 31% of production at TL 4. Although these are gross estimates, the values do point to the pressure exerted by recreational fishing on coastal fish communities. Our estimates are consistent with the reported overexploitation of fishing resources (Pauly and Christensen, 1995).

Recreational and competitive spearfishing has a sizeable impact on serial depletion of large rocky-bottom littoral fish, and contributes to the non-profitability of some gears used by the small-scale fleet (Coll *et al.*, 2004), and commercial and recreational fishing have similar demographic and ecological effects on exploited populations (Coleman *et al.*, 2004). If the goal of fisheries management is to sustain viable populations and ecosystems, recreational and commercial fishing require effective regulation.

Existing management programmes in the Mediterranean are based on effort regulation, but this does not include recreational fishing. Considering that both the effort expended and the biomass extracted by this leisure activity are quite high, planning and implementing a comprehensive coastal management strategy must include recreational fishing. Additionally, recreational fishing activity has major social repercussions, and the benefits of the activity need to be weighed against investments in resource protection.

The historical sequence of human disturbances that affect coastal ecosystems shows that temporally fishing is always first and is thus essential in any coastal management strategy (Jackson *et al.*, 2001). In the Mediterranean exploitation started early, with evidence of systematic exploitation of fish stocks in southern Spain in the upper Pleistocene (19000 BC; Pellicer and Morales, 1995). This exploitation dating back to ancient times and the recent symptoms of overexploitation, together with economic development and increased use of coastal resources in the past 100 years, make improving the management of fishery resources an urgent priority, and management programmes will have to take recreational fisheries into account.

Acknowledgements

We thank Jaume Bibiloni for his help in designing the questionnaire and calculating the proportion of required responses, and the interviewers, samplers, volunteer recreational anglers, and respondents for their support. The work was supported by a DG Pesca, Govern de les Illes Balears grant and co-funded by EU Project IFOP ES.R.BAL.5.1.3. Russell Sacks is thanked for his review of the English text, and Colin Attwood and an anonymous reviewer for their valued comments on the submitted draft.

References

Cabral, H. N., Teixeira, C. M., Gamito, R., and Costa, J. 2002. Importance of discards of a beam trawl fishery as input of organic matter into nursery areas within the Tagus estuary. Hydrobiologia, 475/476: 449–455.

Candi, G., Castriota, L., Andaloro, F., Fiona, M. G., and Marino, G. 2004. Reproductive cycle and sex inversion in razor fish, a protogynous labrid in the southern Mediterranean Sea. Journal of Fish Biology, 64: 1498–1513.

Coleman, F., Figueira, W. F., Ueland, J. S., and Crowder, L. B. 2004. The impact of United States recreational fisheries on marine fish populations. Science, 305: 1958–1959.

Coll, J., García-Rubies, A., Moranta, J., Stefanni, S., and Morales-Nin, B. 1999. Sport-fishing prohibition effects on the population structure of *Epinephelus marginatus* (Lowe, 1834) (Pisces, Serranidae) in the Cabrera Archipelago National Park (Majorca, W. Mediterranean). Bolletí de la Societat d'Història Natural de les Illes Balears, 42: 125–138.

Coll, J., Linde, M., García-Rubies, A., Riera, F., and Grau, A. M. 2004. Spear fishing in the Balearic Islands (west central Mediterranean): species affected and catch evolution during the period 1975–2001. Fisheries Research, 70: 97–111.

Cox, S. P., Beard, T. D., and Walters, C. 2002. Harvest control in open-access sport fisheries: hot rod or asleep at the reel? Bulletin of Marine Science, 70: 749–761.

Deudero, S., Pinnegar, J. K., Polunin, N. V. C., Morey, G., and Morales-Nin, B. 2004. Spatial variation and ontogenic shifts in the isotopic composition of Mediterranean littoral fishes. Marine Biology, 145: 971–981.

Dillman, D. A. 1978. Mail and Telephone Surveys: the Total Design Method. John Wiley, New York. 325 pp.

Dunn, M., Potten, S., Radford, A., and Whitmarsh, D. 1989. An economic appraisal of the fishery for bass *Dicentrarchus labrax* L. in England and Wales. Report of the Centre for the Economics and Management of Aquatic Resources (CEMARE), University of Portsmouth, UK, 14. 720 pp.

Estrada, M., Vives, F., and Alcaraz, M. 1985. Life and the productivity of the open ocean. *In* Western Mediterranean, pp. 148–197. Ed. by R. Margalef. Pergamon Press, Oxford. 361 pp.

EU. 2004. Mediterranean: guaranteeing sustainable fisheries. Fishing in Europe, 21: 12 pp.

García, C., and Servera, J. 2003. Impacts of tourism development on water demand and beach degradation on the island of Majorca (Spain). Geografiska Annaler, 85A: 287–300.

García, E., Duarte, C. M., and Middelburg, J. J. 2002. Carbon and nutrient deposition in a Mediterranean seagrass (*Posidonia oceanica*). Limnology and Oceanography, 47: 23–32.

Garcia Diaz, M. M., Tuset, V. M., Gonzalez, J. A., and Socorro, J. 1997. Sex and reproductive aspects in *Serranus cabrilla* (Osteichthyes: Serranidae): macroscopic and histological approaches. Marine Biology, 127: 379–386.

Gartside, D. F., Harrison, B., and Ryan, B. L. 1999. An evaluation of the use of fishing club records in the management of marine recreational fisheries. Fisheries Research, 41: 47−61.

Gazeau, F., Smith, S. V., Gentili, B., Frankignoulle, M., and Gattuso, J-P. 2004. The European coastal zone: characterization and first assessment of ecosystem metabolism. Estuarine, Coastal and Shelf Science, 60: 673−694.

Ghorbel, A. O., Bradai, M. N., and Bouain, A. 2002. Spawning period and sexual maturity of *Symphodus* (*Crenilabrus*) *tinca* (Labridae) in Sfax coasts (Tunisia). Cybium, 26: 89−92.

Gonçalves, J. M. S., Bentes, L., Coelho, R., Correia, C., Lino, P. G., Monteiro, C. C., Ribeiro, J., and Erzini, K. 2003. Age and growth, maturity, mortality and yield-per-recruit for two banded bream (*Diplodus vulgaris* Geoffr.) from the south coast of Portugal. Fisheries Research, 62: 349−359.

Gordoa, A., and Molí, B. 1997. Age and growth of the sparids *Diplodus vulgaris*, *D. sargus* and *D. annularis* in adult populations and the differences in their juvenile growth patterns in the north-western Mediterranean Sea. Fisheries Research, 33: 123−129.

Gordoa, A., Molí, B., and Raventós, N. 2000. Growth performance of four wrasse species on the north-western Mediterranean coast. Fisheries Research, 45: 43−50.

Guidetti, P., Bianchi, C. N., La Mesa, G., Modena, M., Morri, C., Sara, G., and Vacchi, M. 2002. Abundance and size structure of *Thalassoma pavo* (Pisces: Labridae) in the western Mediterranean Sea: variability at different spatial scales. Journal of the Marine Biological Association of the UK, 82: 495−500.

Jackson, J. B. C., Kirby, M. X., Berger, W. H., Bjorndal, K. A., Botsford, L. W., Bourque, B. J., Bradbury, R. H., Cooke, R., Erlandson, J., Estes, J. A., Hughes, T. P., Kidwell, S., Lange, C. B., Lenihan, H. S., Pandolfi, J. M., Peterson, C. H., Steneck, R. S., Tegner, M. J., and Warner, R. R. 2001. Historical overfishing and the recent collapse of coastal ecosystems. Science, 293(5530): 629−638.

Jennings, S., Reñones, O., Morales-Nin, B., Polunin, N. V., Moranta, J., and Coll, J. 1997. Spatial variation in the ^{15}N and ^{13}C stable isotope composition of plants, invertebrates and fishes on Mediterranean reefs: implications for the study of trophic pathways. Marine Ecology Progress Series, 146: 109−116.

Kearney, R. E., Andrew, N. L., and West, R. J. 1996. Some issues in the management of Australia's marine and coastal fisheries resources. Ocean and Coastal Management, 33: 133−146.

Mann, B. Q., and Buxton, C. D. 1998. The reproductive biology of *Diplodus sargus capensis* and *D. cervinus hottentotus* (Sparidae) off the south-east Cape coast, South Africa. Cybium, 22: 31−47.

Man-Wai, R., and Quignard, J-P. 1984. Les sars *Diplodus sargus* (Linne, 1758) du Golfe du Lion: croissance et caractéristiques des débarquements aux criées de Sète et du Grau-du Roi. Revue des Travaux de l'Institut des Peches Maritimes, 46: 173−194.

Marino, G., Mandich, A., Massari, A., Andaloro, F., and Porrello, S. 1995. Aspects of reproductive biology of the Mediterranean amberjack (*Seriola dumerili* Risso) during the spawning period. Journal of Applied Ichthyology, 11: 9−24.

Morales-Nin, B., Moranta, J., García, C., Tugores, M. P., and Grau, A. M. Evaluation of the importance of recreational fisheries in a Mediterranean Island. Fourth World Fisheries Congress. Reconciling Fisheries with Conservation: The Challenge of Managing Aquatic Ecosystems. 2−6 May, 2004. Vancouver, British Columbia, Canada (submitted).

Morey, G., Moranta, J., Massutí, E., Grau, A. M., Linde, M., Riera, F., and Morales-Nin, B. 2003. Weight−length relationships of littoral to lower slope fishes from the western Mediterranean. Fisheries Research, 62: 89−96.

Morey, M., Bover, M. J., and Casas, J. A. 1992. Change in environmental stability and the use of resources on small islands: the case of Formentera, Balearic Islands, Spain. Environmental Management, 16: 575−583.

Özhan, E. 1996. Coastal zone management in Turkey. Ocean and Coastal Management, 30: 153−176.

Pajuelo, J. G., and Lorenzo, J. M. 2001. Biology of the annular seabream, *Diplodus annularis* (Sparidae), in coastal waters of the Canary Islands. Journal of Applied Ichthyology, 17: 121−125.

Pauly, D., and Christensen, V. 1995. Primary production required to sustain global fisheries. Nature, 374: 255−257.

Pellicer, M., and Morales, A. 1995. Fauna de la Cueva de Nerja. Estudios Gráficos y de Imagen, S.L. Patronato de la Cueva de Nerja.

Pollock, B. 1980. Surprises in Queensland angling study. Australian Fisheries, 39(4): 17−19.

Post, J. R., Mushens, C., Paul, A., and Sullivan, M. 2003. Assessment of alternative harvest regulations for sustaining recreational fisheries: model development and application to bull trout. North American Journal of Fisheries Management, 23: 22−34.

Riera, X., and Linde, M. 2001. El raor i la cirviola. Conèixer per preservar. Govern de les Illes Balears, Cuaderns de Pesca, 6. 81 pp.

Rullan-Salamanca, O. 1998. De la cova de Canet al tercer boom turístic. Una primera aproximació històrica de Mallorca. *In* El Medi Ambient a les Illes Balears: Qui és Qui? pp. 171−213. Caixa de les Balears, Palma de Majorca. 500 pp.

Santos, M. N., Monteiro, C. C., Erzini, K., and Lasserre, G. 1998. Maturation and gill-net selectivity of two small sea breams (genus *Diplodus*) from the Algarve coast (south Portugal). Fisheries Research, 36: 185−194.

Sterner, R. W., and George, N. B. 2000. Carbon, nitrogen, and phosphorus stoichiometry of cyprinid fishes. Ecology, 81: 127−140.

Sutinen, J. G., and Johnston, R. J. 2003. Angling management organizations: integrating the recreational sector into fishery management. Marine Policy, 27: 471−487.

Tachihara, K., Ebisu, R., and Tukashima, Y. 1993. Spawning, eggs, larvae and juveniles of the purplish amberjack *Seriola dumerili*. Nippon Suisan Gakkaishi, 59: 1479−1488.

Tserpes, G., and Tsimenides, N. 2001. Age, growth and mortality of *Serranus cabrilla* (Linnaeus, 1758) on the Cretan shelf. Fisheries Research, 51: 27−34.

Van der Meulen, F., and Salman, A. H. P. M. 1996. Management of Mediterranean coastal dunes. Ocean and Coastal Management, 30: 177−195.

Voulgaridou, P., and Stergiou, K. I. 2003. Trends in various parameters of the European sardine, *Sardina pilchardus* (Walbaum, 1792), in the eastern Mediterranean Sea. Scientia Marina, 67(Suppl 1): 269−280.

Annex II: Fishery-based sampling: implementation test on the Portuguese Trawl Fleet operating off Matosinhos, Portugal

Working Document to the 2007 ICES Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS) (26 Feb.-2 March)

Feijó, Diana <dfeijo@ipimar.pt>; Gonçalves, Marta <mgoncalves@ipimar.pt>; Jardim, Ernesto <ernesto@ipimar.pt>

IPIMAR – Instituto Nacional de Investigação Agrária e das Pescas

INTRODUCTION

The Biological Sampling Programme (PNAB), integrated in the Eu Data Collection Regulation (DCR) allows the collecting of data on the activity of the continental Portuguese coast fishing fleet, in particular the length composition of landings and captures, growth data, sex and maturation of the most important commercial species. This information is destined to the assessment of biological resources.

PNAB is implemented in several portuguese fishing harbours throughout the country: Póvoa de Varzim, Matosinhos, Aveiro, Figueira da Foz, Peniche, Setúbal, Sesimbra, Sines, Portimão, Armação de Pêra, Olhão and Vila Real de Santo António.

In Matosinhos (the harbour considered in this study), as in other harbours, the First Sale Fish Market is divided in three auctions, according to the fleet; "*Cerco*" (purse seiners); "A*rrasto*" (trawlers); and "Artesanal" (nets and small scale fisheries). The sampling programme is organized on a weekly basis, during which a certain number of length frequency samples are requested for the target species (Table 1).

Table 1 – Number of samples to be collected on each species for the three auction markets.

Common Name	Scientifical Name	Artisanal	Trawl	*Cerco*
Angler	*Lophius piscatorius*	3	3	-
Atlantic horse mackerel	*Trachurus trachurus*	2	4	2
Atlantic mackerel(1)	*Scombrus scombrus*	1	1	-
Axillary seabream	*Pagellus acarne*	1	1	-
Black-bellied angler	*Lophius budegassa*	3	3	-
Blue whiting	*Micromesistius poutassou*	-	2	-
Chub mackerel(1)	*Scombrus japonicus*	-	1	-
Common sole	*Solea vulgaris*	3	-	-
European hake	*Merluccius merluccius*	4	3	-
European pilchard	*Sardina pilcharus*	-	1	4
Fourspotted megrim	*Lepidorhombus boscii*	1	1	-
Pouting	*Trisopterus luscus*	1	1	-
Rays	*Raja spp.*	1	1	-
Sand sole	*Solea lascaris*	3	-	-
Senegalese sole	*Solea senegalensis*	3	-	-
Norway lobster	*Nephrops novergicus*	-	1	-
Common cuttlefish	*Sepia officinalis*	1	-	-
Common octopus	*Octopus vulgaris*	1	1	-
Common european squid	*Loligo vulgaris*	-	1	-
Flying squid	*Illex coindetii*	2	-	-

(1)Every fortnight

With the foreseen introduction of new rules to the EU DCR in 2009, shifting the sample unit from single species to fishing activities, an experiment was conducted to test the implementation of length frequency sampling of trips. The experiment was carried out between January and February 2007 in the trawl auction market.

METHODOLOGY

During the months of January and February 2007 length frequency sampling was carried out on a trip basis, collecting length frequency samples of all the species landed by one trawl vessel, randomly chosen among those landing on that day. The number of species sampled, the number of technicians performing the work and the duration of the sampling period were recorded.

RESULTS AND DISCUSSION

The results obtained throughout this study are presented on Tables 2 (January) and 3 (February).

Table 2 – Results obtained during the month of January 2007.

Week day	Day	Arrival Order	Vessel	Fish Origin	Total Capture (Kg)	Nr. Landed Species	Nr. Sampled Species	Nr Teams /Nr Technicians	Motive
MON	1								
TUE	2	1	Deneb	PT	1644,7	22	0	2/4	Late Landing
		2	Península	PT	3110,0	13	0		
WED	3	1	**Cruz de Malta**	PT	2542,16	25	12	2/4	Sale
		2	Deneb	PT	1323,2	19	-		
		3	Península	PT	2081,4	15	-		
		4	Juvenilia	PT	1824,7	13	-		
THU	4	1	**Península**	PT	3462,2	12	10	2/4	Sale
		2	Cruz de Malta	PT	1887,2	8	-		
		3	Deneb	PT	786,4	16	-		
FRI	5	1	**Deneb**	PT	1325,3	15	15	2/4	-
		2	Península	PT	2162,4	6	-		
		3	Juvenilia	PT	1292,8	20	-		
		4	Cruz de Malta	PT	541,0	8	-		
SAT	6								
SUN	7								
MON	8	1	Juvenilia	PT	3489,2	14	-	2/4	Sale
		2	Rosamar	SP	1920,0	3	-		
		3	**Cruz de Malta**	PT	2488,9	14	13		
		4	Deneb	PT	1575,2	18	-		
		5	Península	PT	1730,2	13	-		
TUE	9	1	**Cruz de Malta**	PT	1693,3	20	18	2/4	Sale
		2	Deneb	PT	1355,8	15	-		
		3	Península	PT	2370,3	10	-		
WED	10	1	**Deneb**	PT	705,65	20	19	2/4	Sale
		2	Zenite	PT	1303,3	15	-		
		3	Pássaro	PT	262,8	16	-		
		4	Cruz de Malta	PT	1069,3	17	-		
		5	Península	PT	1062,1	11	-		
THU	11	1	Península	PT	2518,9	21	-	2/4	Late Landing
		2	Juvenilia	PT	529,0	15	-		
FRI	12	1	**Deneb**	PT	999,65	16	16	2/4	-
		2	Península	PT	1376,5	12	-		
SAT	13								

SUN	14								
MON	15	1	**Juvenilia**	PT	3975,4	18	18	2/4	-
		2	Deneb	PT	1493,5	17	-		
		3	Foz da Nazaré	SP	2100,0	2	-		
TUE	16	1	Península	PT	2034,0	13	-	2/4	Late Landing
		2	Deneb	PT	1197,6	16	-		
WED	17	1	Península	PT	3141,1	18	-	2/4	Late Landing/ Rapid Sale
		2	Deneb	PT	800,4	17	-		
		3	Rosamar	SP	1632,0	2	-		
THU	18	1	Justino Ramalheira	PT	867,8	13	-	2/4	Late Landing/ Rapid Sale
		2	Deneb	PT	766,7	20	-		
		3	Península	PT	2782,1	17	-		
		4	Rosamar	SP	732,0	2	-		
FRI	19	1	Deneb	PT	1040,8	19	-	2/4	Rapid Sale
		2	Península	PT	1496,3	11	-		
		3	Mar de Lagos	PT	559,6	22	-		
SAT	20								
SUN	21								
MON	22	1	Deneb	PT	1238,2	17	-	2/4	Otoliths Workshop
		2	Juvenilia	PT	4068,6	16	-		
		3	Justino Ramalheira	PT	2779,4	15	-		
		4	Península	PT	7253,3	16	-		
		5	Rosamar	SP	2464,0	4	-		
TUE	23	1	Rosamar	SP	2528,0	2	-	2/4	-
		2	**Deneb**	PT	2245,3	16	16		
		3	Península	PT	3346,1	14	-		
WED	24	1	Deneb	PT	1361,3	16	-	2/4	Rapid Sale
		2	Península	PT	1722,0	10	-		
		4	Foz da Nazaré	PT	2600,6	2	-		
		3	Rosamar	SP	1080,0	1	-		
THU	25	1	**Deneb**	PT	1011,8	13	12	2/4	Sale
		2	Justino Ramalheira	PT	1396,5	15	-		
		3	Juvenília	PT	417,2	20	-		
		4	Península	PT	1621,3	10	-		
		5	Foz da Nazaré	SP	2544,0	2	-		
		6	Rosamar	SP	1308,0	2	-		
FRI	26	1	Deneb	PT	310,8	11	-	2/4	Late Landing/ Rapid Sale
		2	Santa Mãe Laura	PT	672,9	11	-		
		3	Juvenília	PT	2524,4	21	-		
SAT	27								
SUN	28								
MON	29	1	**Justino Ramalheira**	PT	1983,5	17	17	1/3	-
		2	Península	PT	4073,0	17	-		
		3	Juvenília	PT	2991,1	16	-		
		4	Deneb	PT	1537,4	16			
		5	Foz da Nazaré	SP	5025,1	3	-		
TUE	30	1	**Península**	PT	4583,9	13	12	1/3	Sale
		2	Deneb	PT	736,6	12	-		
		3	Rosamar	SP	1404,0	2	-		
WED	31	1	Santa Mãe Laura	PT	1631,4	11	-	1/3	-
		2	**Deneb**	PT	533,9	11	11		
		3	Península	PT	3095,0	15	-		
		4	Foz da Nazaré	SP	397,3	2	-		

In January, in 22 week days, there were only performed samplings in 13 days (59,1%). Of the nine days in which there were no sampling, 66,7% of the times it was due to the very late landings, 22,2% to the rapid sale of the fish which does not allow the sampling procedure and 11,1% (1 day) to an workshop on otoliths attended by all the sampling technicians. In the 13 days in which there were samplings, all the species landed by the vessel were sampled in only 53,8% of those. When they were not complete it was due to the fish sale that interrupted the sampling.

Of the 208 samplings that could be performed to the different species, there were only made 189 (90,9%).

Table 3 – Results obtained during the month of February 2007.

Week day	Day	Arrival Order	Vessel	Fish Origin	Total Capture (Kg)	Nr. Landed Species	Nr. Sampled Species	Nr. Teams /Nr. Technicians	Sampling Duration	Motive
THU	1	1	Península	PT	2994,4	13	-	1/3	-	Late Landing/ Rapid Sale
		2	Deneb	PT	1024,0	13	-			
FRI	2	1	**Deneb**	PT	591,55	14	14	2/4	-	-
		2	Península	PT	2926,1	11	-			
SAT	3									
SUN	4									
MON	5	1	**Deneb**	PT	1545,3	21	12	2/4	-	Late Landing/ Rapid Sale
		2	Península	SP	8296,4	18	-			
		3	Rosamar	SP	10583,0	14	-			
TUE	6	1	Deneb	PT	1155,7	12	-	2/4	-	Bad Weather/ Rapid Sale
		3	Foz da Nazaré	PT	1728,0	2	-			
		2	Península	PT	3320,3	12	-			
WED	7	1	**Deneb**	PT	335,9	12	12	1/3	20min	-
		2	Juvenília	PT	1921,0	25	-			
		3	Península	PT	3418,3	9	-			
THU	8	1	Juvenília	PT	737,7	26	-	2/4	-	Bad Weather/ Rapid Sale
		2	Península	PT	2272,9	11	-			
		3	Deneb	PT	1287,0	11	-			
FRI	9	1	Juvenília	PT	76,8	11	-	2/4	-	Late Landing
SAT	10									
SUN	11									
MON	12	1	**Mar de Nazaré**	PT	2335,45	33	15	1/3	1h10min	Sale
		2	Foz da Nazaré	SP	4246,3	4	-			
		3	Deneb	PT	754,9	15	-			
		4	Península	PT	4419,2	13	-			
TUE	13	1	Juvenília	PT	984,3	24	-	2/4	-	Bad Weather/ Rapid Sale
		2	Península	PT	3144,3	10	-			
		3	Nadir	PT	3415,1	17	-			
		4	Deneb	PT	1355,2	10	-			
		5	Rio Águeda	PT	1384,5	25	-			
WED	14	1	Península	PT	2331,7	10	-	2/4	-	Late Landing
THU	15	1	**Ria de Aveiro**	PT	3564,3	25	21	2/4	1h30min	Sale
		2	Beira Litoral	PT	2093,6	25	-			
		3	Juvenília	PT	2059,6	28	-			
		4	Deneb	PT	1239,3	11	-			
		5	Rio Águeda	PT	612,3	24	-			
FRI	16	1	Deneb	PT	323,6	12	-	1/3	20min	Bad Weather/ Rapid Sale
		2	**Juvenília**	PT	344,5	19	10			
SAT	17									
SUN	18									
MON	19	1	Península	SP	5380,9	4	-	2/4	2h00min	-
		2	Deneb	PT	4233,5	35	-			
		3	**Justino Ramalheira**	PT	4208,4	19	19			
		4	Juvenília	PT	3034,2	16	-			
TUE	20									
WED	21	1	Península	SP	2607,2	2	-	2/5	1h40min	-
		2	**Deneb**	PT	3780,4	19	19			
		3	Justino Ramalheira	PT	1607,0	21	-			
		4	Juvenília	PT	2202,1	24	-			
THU	22	1	Aster	PT	1759,6	27	-	2/4	-	Bad Weather/ Rapid Sale
		2	Deneb	PT	2262,9	9	-			
FRI	23	1	Justino Ramalheira	PT	925,0	22	-	1/3	-	Bad Weather/ Rapid Sale
		2	Rosamar	SP	1752,0	1	-			
SAT	24									
SUN	25									
MON	26	1	Roaz	SP	4875,9	27	-	3/7	1h50min	-
		2	**Juvenília**	PT	3669,4	17	17			
		3	Deneb	PT	2795,0	9	-			
TUE	27	27	Península	SP	1918,0	2	-	2/3	-	Bad Weather/Rapid Sale
		2	Mar Nosso	PT	1482,2	12	-			
		3	Deneb	PT	2120,4	13	-			
WED	28	1	Roaz	PT	3913,0	21	-	2/3	-	Late Landing/ Rapid Sale
		2	Juvenília	PT	1391,6	12	-			
		3	Deneb	PT	2026,5	25	-			

In February there were 19 week days and on those there were only performed samplings on eight days (47,4%). On the days where there were no samplings, 60,0% of the times it was due to the bad weather observed during this month and 40,0% to the very late landings. In both cases the samplings were not conducted because the fish landed was immediately sold after it was weighed.
In the days in which there were samplings performed, in 55,6% of the times all the species landed were sampled. On the other days the samplings were interrupted by the fish sale.
Of the 179 samplings that could be performed to the different species, there were only made 139 (77,7%).

The vessels sampled were almost always the first to arrive on port (76,9% of the times in January and 55,6% in February). The second vessel to arrive was sampled on two days in January (15,4%) and on three days in February (33,3%). The third vessel to arrive was sampled just in one day in both months (7,7% in January and 11,1% in February). The vessels sampled were not randomly chosen. As the sale of the fish is almost immediately done after the fish is weighed, the vessel to be sampled was chosen on the basis of the assessment of the technicians in which that it would be the vessel that had the best chance to be completely sampled.

In January, the “Deneb” was sampled 6 times (46,2%), the “Cruz de Malta” 3 times (23,1%), the “Península” 2 times (15,4%), and “Justino Ramalheira” and “Juvenília” 1 time each (7,7%). In February, the “Deneb” was sampled 4 times (44,4%), the “Juvenília” 2 times (22,2%), “Justino Ramalheira”, “Mar da Nazaré” and “Ria de Aveiro” 1 time each (11,1%). There was no much variability on the vessels sampled because, in this port, the vessels that land fish more frequently are part of one small group. There is also a group of Portuguese vessels operating in Spain (SP), whose captures are then transported to Portugal by land, from Vigo, to be sold at the Matosinhos’s First Sale Fish Market.

In January the samplings were performed by 4 technicians on 76,9% of the days and by 3 technicians on 23,1% of the days. In February the samplings were performed by 4 technicians on 44,4% of the days, by 3 technicians on 33,3% of the days, by 5 technicians on 11,1% of the days and by 7 technicians on 11,1% of the days.

In January the sampling period was not recorded, but in February it varied between 20 minutes and two hours.

In January and February there were sampled 45 species on each month. In the total period of the study there were sampled 53 species (Table 4).

Table 4 – Samples performed during the period of the study.

			January		February	
Scientific Name	**Portuguese Name**	**English Name**	**Nr Samples**	**%**	**Nr Samples**	**%**
-	Bodiões spp.	Wrasse	0	0,00	3	3
-	Longueirão	**Unidentified fish**	2	1,06	1	1
Boops boops	Boga-do-mar	Bogue	0	0,00	1	1
Chelidonichthys cuculus (Aspitrigla cuculus)	Cabra-Vermelha	Red gurnard	2	1,06	2	2
Chelidonichtys lastoviza (Trigloporus lastoviza)	Cabra-Riscada	Streak gurnard	1	0,53	0	0
Chelidonichtys lucerna (Trigla lucerna)	Cabra-Cabaço	Tub gurnard	5	2,65	3	3
Chelidonichtys lyra	Cabra-Lyra		0	0,00	1	1
Chelidonichtys obscurus (Aspitrigla obscura)	Cabra-da-Bandeira	Long fin gurnard	1	0,53	1	1
Conger conger	Congro	European conger	10	5,29	6	6
Decapterus punctatus	Carapau-Negrão	Blue jack mackerel	8	4,23	1	1
Dicentrarchus labrax	Robalo-Legítimo	European seabass	0	0,00	2	2
Diplodus sargus sargus	Sargo-Legítimo	White seabream	7	3,70	2	2
Eledone cirrosa	Polvo-Cabeçudo	Horned octopus	1	0,53	2	2
Eutrigla gurnardus	Cabra-Morena	Grey gurnard	1	0,53	0	0
Helicolenus dactylopterus dactylopterus	Serrão	Blackbelly rosefish	2	1,06	6	6
Lepidorhombus boscii	Areeiro-4-Manchas	Four-spot megrim	2	1,06	0	0
Loligo vulgaris	Lula	Common european squid	2	1,06	3	3
Lophius budegassa	Tamboril	Black-bellied angler	0	0,00	1	1
Lophius piscatorius	Penadeira	Angler	0	0,00	1	1
Merlangius merlangus	Badejo	Whiting	2	1,06	3	3
Merluccius merluccius	Pescada	European Hake	2	1,06	5	5
Microchirus variegatus	Azevia-Raiada	Thickback sole	2	1,06	2	2
Micromesistius poutassou	Verdinho	Blue whiting	5	2,65	3	3
Mullus surmuletus	Salmonete	Red mullet	9	4,76	4	4
Mustelus mustelus	Cação-Liso	Smooth-hound	2	1,06	8	8

Octopus vulgaris	Polvo	Common octopus	6	3,17	4	4
Pagellus acarne	Besugo	Axillary seabream	7	3,70	4	4
Pagellus bogaraveo	Goraz	Blackspot seabream	3	1,59	5	5
Pagrus pagrus	Pargo-Legítimo	Red porgy	1	0,53	1	1
Phycis phycis	Abrótea-da-costa	Forkbeard	1	0,53	1	1
Platichtlys flexus	Solha-Legítima	Flounder	3	1,59	0	0
Pleuronectes platessa	Solhão	European plaice	3	1,59	1	1
Raja brachyura	Raia-Pontuada	Blonde ray	8	4,23	2	2
Raja clavata	Raia-Lenga	Thornback ray	8	4,23	8	8
Raja microocellata	Raia-Zimbreira	Small-eyed ray	0	0,00	1	1
Raja montagui	Raia-Manchada	Spotted ray	3	1,59	4	4
Raja naerus	Raia-São-Pedro	Sandy ray	1	0,53	3	3
Raja undulata	Raia-Curva	Undulate ray	6	3,17	3	3
Sardina pilcharus	Sardinha	European pilchard (=Sardine)	1	0,53	0	0
Scombrus japonicus	Cavala	Chub mackerel	1	0,53	1	1
Scombrus scombrus	Sarda	Atlantic mackerel	11	5,82	7	7
Scophthalmus maximus	Rodovalho	Turbot	1	0,53	1	1
Scyliorhinus stellaris	Pata-Roxa	Nursehound	6	3,17	5	5
Sepia officinalis	Choco	Common cuttlefish	1	0,53	1	1
Solea lascaris	Linguado-Areia	Sand sole	1	0,53	0	0
Solea senegalensis	Linguado-Branco	Senegalese sole	3	1,59	0	0
Solea vulgaris	Linguado-Legítimo	Common sole	4	2,12	0	0
Spondyliosoma cantharus	Choupa	Black seabream	8	4,23	1	1
Torpedo torpedo	Tremelga	Common torpedo	0	0,00	1	1
Trachurus trachurus	Carapau	Atlantic horse mackerel	13	6,88	5	5
Trigla spp.	Cabras (Mistura)	Gurnards nei	7	3,70	4	4
Trisopterus luscus	Faneca	Pouting	11	5,82	9	9
Zeus faber	Galo-Negro	John dory	5	2,65	6	6
Total Number of Samples			**189**	100	**139**	100

The ten most frequently sampled species during the period of the study were: Pouting (6,1%), Atlantic mackerel (5,5%), Atlantic horse mackerel (5,5%), European conger (4,9%), Thornback ray (4,9%), Red mullet (4,0%), Axillary seabream (3,4%), Small-spotted catshark (3,4%), John dory (3,4%), Smooth-hound (3,0%), Common octopus (3,0%) (Figure 1).

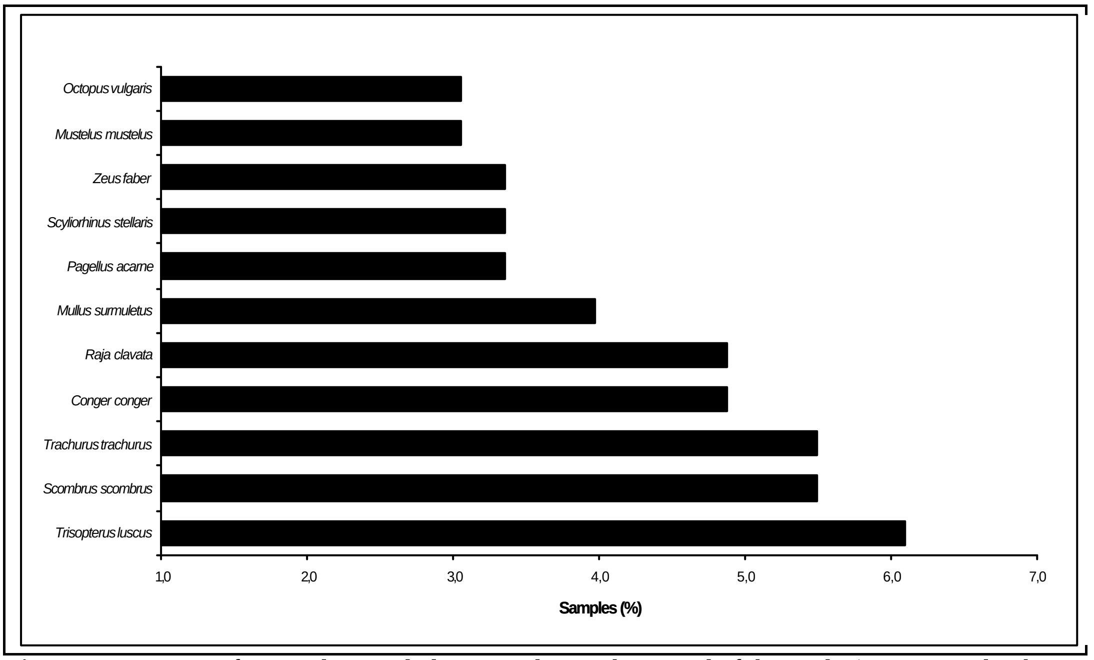


Figure 1 – Ten most frequently sampled species during the period of the study (January and February 2007).

CONCLUSION

- How many species can we sample from trip and what are the factors affecting it ?
- How to set priorities, what are the “species driving the fishery” ?

Annex III: Red mullet *Mullus barbatus* and Striped mullet *Mullus surmuletus* ageing workshop

Introduction

This workshop will take place in Greece during 2008. Place and chair must be defined during the forthcoming RCM Med.

An otolith exchange exercise for both *Mullus* species (i.e. *Mullus barbatus* and *Mullus surmuletus*) started during 2007 aimed to deal with possible problems of *Mullus* ageing. Following the outcome of this exercise Greece is going too organize a workshop in 2008.

Up to now France, Spain, Italy, Greece and Cyprus are participating in the otolith exchange exercise.

Terms of Reference

a) Review information on age determination, and validation work on these species;
b) Compare different otolith-based age determination methods;
c) Identify sources of age determination error in terms of bias and precision: i.e. analyse different validation techniques and describe the corresponding interpretational differences between readers and laboratories, and agree on a common ageing criteria;
d) Analyse growth increment patterns and provide specific guidelines for the interpretation of growth structures in otoliths;
e) Create a reference collection of otoliths and start the development of a data base of otolith images;

PRIORITY:	Age determination is an essential feature in fish stock assessment to estimate the rates of moralities and growth. In order to arrive at appropriate management advice ageing procedures must be reliable. Otolith processing methods and age reading methods might differ considerably between countries. Therefore, otolith exchanges should be carried out on a regular basis, and if serious problems exist age reading workshops should be organised to solve these problems.
Scientific justification and relation to action plan:	The aim of the workshop is to identify the present problems in *Mullus* spp. age determination, improve the accuracy and precision of age determinations and spread information of the methods and procedures used in different ageing laboratories. A number of samples of otoliths is circulating (2007) among

	different laboratories to assess the precision of age readers. At the workshop, in 2008, results from the otoliths circulation will be presented and discussed.
Resource requirements	
Participants:	In view of its relevance to the DCR, the Workshop is expected to attract wide interest from both Mediterranean EU and ICES Member States.
Secretariat facilities:	
Financial:	Additional funding will be required for facilitate the attendance of the scientists. The workshop will be eligible under the E.U. - DCR.
Linkages to advisory committees:	.
Linkages to other committees or groups:	
Linkages to other organizations:	There is a direct link with the EU DCR and outcomes from this Workshop will be of interest to several RFOs
Secretariat marginal cost share:	

Annex IV: Common pandora *(Pagellus erythrinus)* ageing workshop

Introduction

This workshop will be held in Greece during 2008. Place and chair must be defined during the forthcoming RCM Med.

Terms of Reference

a) Review information on age determination, and validation work on this species;
b) Compare different otolith-based age determination methods;
c) Identify sources of age determination error in terms of bias and precision: i.e. analyse different validation techniques and describe the corresponding interpretational differences between readers and laboratories, and agree on a common ageing criteria;
d) Analyse growth increment patterns and provide specific guidelines for the interpretation of growth structures in otoliths;
e) Create a reference collection of otoliths and start the development of a data base of otolith images;

PRIORITY:	Age determination is an essential feature in fish stock assessment to estimate the rates of moralities and growth. In order to arrive at appropriate management advice ageing procedures must be reliable. Otolith processing methods and age reading methods might differ considerably between countries. Therefore, otolith exchanges should be carried out on a regular basis, and if serious problems exist age reading workshops should be organised to solve these problems.
Scientific justification and relation to action plan:	The aim of the workshop is to identify the present problems in common pandora age determination, improve the accuracy and precision of age determinations and spread information of the methods and procedures used in different ageing laboratories. A number of samples of otoliths is going to circulate (2007) among different laboratories to assess the precision of age readers. At the workshop, in 2008, results from the otoliths circulation will be presented and discussed
Resource requirements:	

Participants:	In view of its relevance to the DCR, the Workshop is expected to attract wide interest from both Mediterranean EU and ICES Member States.
Secretariat facilities:	
Financial:	Additional funding will be required for facilitate the attendance of the scientists. The workshop will be eligible under the E.U. - DCR.
Linkages to advisory committees:	.
Linkages to other committees or groups:	
Linkages to other organizations:	There is a direct link with the EU DCR and outcomes from this Workshop will be of interest to several RFOs
Secretariat marginal cost share:	

Annex V: Workshop on small pelagics (*Engraulis encrasicolus, Sardina pilcardus, Trachurus mediterraneus*) maturity stages

Introduction

This workshop will take place in Italy (to be confirmed). Place and chair would be defined during the forthcoming RCM Med.

The expectation of the Workshop is that it will produce a comparative description of the scales used in the different labs and set of f standard operational procedures and methodologies to facilitate the validation and classification of the different maturity stages at EU level.

Terms of Reference

a) Compare the macroscopic maturity scales for small pelagic species (*Engraulis encrasicolus*, *Sardina pilcardus*, *Trachurus mediterraneus*) already used in the different laboratories.

b) Standardizes the criteria to classify each maturity stages to be used for DCR and discuss on the existing maturity scales;

c) Formulate conversion rules to make possible the correspondence between the locally used scales and the common ones;

d) Validate the macroscopic maturity stages according to the common standardized scales eventually using histological confirmation;

e) Standardise the criteria to classify each maturity stage;

f) Propose a common scale, with common classification criteria, to be used by all laboratories;

g) Use of digital photos to identify the maturity stages for the different species and try to organize a maturity photo database available on the web;

This group should be aware the recommendation of the 2005 ICES workshop on small pelagics (http://www.ices.dk/reports/acfm/pgccdbs/pil.agewk2005.pdf).

Supporting Information

PRIORITY:	Maturity-at-age is a crucial parameter in the estimation of Spawning Stock Biomass and there is an urgent need for reliable and up-to-date information on the maturity parameters for all formally assessed fish and shellfish species to improve the quality of these estimates.
Scientific justification and relation to action plan:	Actually, in the frame of DCR the Mediterranean fish maturity stages are collected according to different macroscopic scales used locally in the scientific Institutions. The need of a common and standardized system for identification and classification of maturity stages in fish resources have to be considered as an important priority for the best application of DCR. The expectation of the TORs is that the Workshop produces a comparative description of the scales used in the different labs and set off standard operational procedures and methodologies to facilitate the validation and classification of the different maturity stages.
Resource requirements	Before the Workshop each scientific Institution should collect digital photos of maturity stages as much is possible.
Participants:	In view of its relevance to the DCR, the Workshop is expected to attract wide interest from both Mediterranean EU and ICES Member States.
Secretariat facilities: Financial:	 Additional funding will be required for facilitate the attendance of the scientists. The workshop will be eligible under the E.U. - DCR.
Linkages to advisory committees:	.
Linkages to other committees or groups:	
Linkages to other organizations Secretariat marginal cost share:	There is a direct link with the EU DCR and outcomes from this Workshop will be of interest to several RFOs

Annex VI : Workshop on crustaceans (*Aristeus antennatus, Aristaeomorpha foliacea, Parapenaeus longirostris, Nephrops norvegicus*) maturity stages

Introduction

This workshop will take place in Italy (to be confirmed). Place and chair would be defined during the forthcoming RCM Med.

Terms of Reference

a) Compare the macroscopic maturity scales for Crustaceans used in the different laboratories.

b) Standardizes the criteria to classify each maturity stages to be used for DCR and discuss on the existing maturity scales;

c) Formulate conversion rules to make possible the correspondence between the locally used scales and the common ones;

d) Validate the macroscopic maturity stages according to the common standardized scales eventually using histological confirmation;

e) Standardise the criteria to classify each maturity stage;

f) Propose a common scale, with common classification criteria, to be used by all laboratories

g) Use of digital photos to identify the maturity stages for the different species and try to organize a maturity photo database available on the web;

Supporting Information

PRIORITY:	Maturity-at-age is a crucial parameter in the estimation of Spawning Stock Biomass and there is an urgent need for reliable and up-to-date information on the maturity parameters for all formally assessed fish and shellfish species to improve the quality of these estimates.
Scientific justification and relation to action plan:	Actually, in the frame of DCR the Mediterranean fish maturity stages are collected according to different macroscopic scales used locally in the scientific Institutions. The need of a common and standardized system for identification and classification of maturity stages in fish resources have to be considered as an important priority for the best application of DCR.

	In order to get this aim, several Mediterranean countries already made an effort to build up a *Maturity Photo database* (Report of the DCR MEDITS Working group, Nantes, France, 15-18 March 2005: *wgmedits2005-wgreport-final.doc*) and developed standard operational procedure to calibrate and classify the description of the maturity stages per fishery resources (fish, crustaceans and cephalopods). This group should be aware the recommendation of the Medits workshop. The expectation of the TORs is that the Workshop produces a comparative description of the scales used in the different labs and set off standard operational procedures and methodologies to facilitate the validation and classification of the different maturity stages.
Resource requirements :	Before the Workshop each scientific Institution should collect digital photos of maturity stages as much is possible.
Participants:	In view of its relevance to the DCR, the Workshop is expected to attract wide interest from both Mediterranean EU and ICES Member States.
Secretariat facilities:	
Financial:	Additional funding will be required for facilitate the attendance of the scientists. The workshop will be eligible under the E.U. - DCR.
Linkages to advisory committees:	.
Linkages to other committees or groups:	
Linkages to other organizations :	There is a direct link with the EU DCR and outcomes from this Workshop will be of interest to several RFOs
Secretariat marginal cost share:	

Annex VII: TACADAR Concerted Action 2002 – 2006. Towards Accreditation and Certification of Age Determination of Aquatic Resources.

Quality Control can develop a range of operational definitions. It is particularly important to identify and respond to the end-users' needs. Timeliness, for example may be more critical for the customer than the highest level of quality control. The key components in the application of QA and QC are the prevention of errors through training and documentation, the detection of errors by inspection and analysis of outputs, and correction by adjustments to procedures to improve results. Methods must be documented before they can be evaluated and it is essential to do both. The aim is to enable age readers to move towards a position where they know they are doing it right and can prove it. It is essential to match effort on the implementation of quality management to the importance of the customer's need and to take into consideration the diversity of the community of age readers, as well as the diversity of the customers for fish age data. The costs of implementing QA and QC are considerable and ongoing and there must be a long-term commitment to the programme.

It is important to understand age estimation as a skill. The best practitioners are found among those who have practised extensively and performance will decline over time without practice. The effectiveness of the network will decrease over time if the working relationships are not supported and strengthened by an appropriate structure. Changing attitudes and behaviour are more important than enforcing standards and the aim is to enhance performance, not criticise. If done well it will build confidence and improve the morale of staff. The complexities of this process increase with scale and social and cultural issues become more important. Therefore it is important to pay attention to the development of shared goals and the maintenance of good communication. Database edits should be controlled and traceable, while the data should be readily accessible to all users. Reports and presentations from workshops and exchanges should be made public and circulated within the age reading laboratories, to make everyone aware of problems and new techniques.

TACADAR recommends

(1) The EFAN-Homepage should be maintained for the existing network as an information source and exchange platform.

(2) Currently, different programmes for the use in otolith image analysis are developed in different labs. The recommendations of projects to develop (or agree upon) an image analysis programme for routine age reading and output formats, should be taken into consideration in the future.

(3) To define age reading standards as prerequisites for the submission of data in the context of the DCR, similar to the minimum sampling requirements defined for the DCR.

(4) Full implementation of the Accreditation and Certification of the age readings in the national labs is premature and not appropriate. More input should be directed towards quality assurance within the national labs to define and meet pan-European standards.

(5) TACADAR has now produced a guideline for quality assessment and quality control for fish aging. It is recommended that PGCCDBS continues refining these guidelines.

(6) It is recommended to support initiatives (projects) for validating age structures, which include the underlying research on the biological basis of formation of age structures. It is also recommended to support training of staff by networks and by exchange workshops.

(7) With regard to deciding on lab methods and equipment for age determination, it is recommended to refer to EFAN/TACADAR-procedures as elaborated in several reports (e.g. EFAN Reports 3-2000, EFAN Reports 4-2000 and EFAN Reports 5-2000). National labs should establish a quality assurance section on their homepages. Here method descriptions for each species dealt with should be made public. These homepages should be linked to the EFAN-homepage.

(8) Quality assurance and control are not static but a process that requires continuous development. It is recommended that there be support for relevant research and active links between researchers and age readers to communicate and exchange development needs and research results.