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28 February–3 March 2006

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International Council for the Exploration of the Sea
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Executive summary

PGCCDBS met in Rostock (Germany) with the aim of discussing several issues related with coordination of biological sampling in Europe, in particular within the scope of the EU Data Collection Regulation (DCR) (see ToR in Section 2). It was recognized that the ToRs were very extensive to be addressed during the 4 days of the meeting and the PG decided to focus on: clarifying the way PGCCDBS can be operationalized within the ICES system; develop on tasks that were clearly identified as problematic and for which the PG had the expertise to provide useful advice and actions; answering requests addressed by other groups. In general there was a strong attempt to provide full developed proposals on the tasks addressed, avoiding recommendations when it was felt the PG could develop further on the specific problem. There was also an effort on using web tools for cooperative work by implementing an unofficial website for the PG (<http://pnab.ipimar.pt/pgccdbbs>) using a wiki system, and scheduling work online whenever it looked like it was the best way to proceed.

On the issue of data quality the discussion focused on the compilation of information, improvement of communication within the biological sampling system and the development of software tools for data analysis. The compilation of manuals and standard operational procedures was considered important for future work and the PG proposed its development online using the PGCCDBS unofficial website. The communication within the several bodies involved in DCR was addressed has a central problem where there is still a long path to achieve an efficient level of coordination. The PG discussed the information flow and develops a two step procedure for the flow of the information from data-providers to data-users: (i) provide a detailed description of the sampling scheme/raising procedures etc.; (ii) provide a yearly report with information about the achieved sampling by stock. Within this system the PG considered there is also the urgent need to develop a procedure for ensuring that Assessment WGs are more actively involved in both requesting information that they need and communicating back their assessment of the data quality. The development of software for data analysis was considered crucial for efficient assessment of the data quality.

Several issues on the organization of workshops for biological parameters, in particular on ageing calibration and maturity sampling, were discussed. It was considered that age readings and, in particular, maturity staging calibrations are required for several species. Workshops to deal with these were proposed for 2007. For these, digital images of otoliths and gonads must be collected and a website was required to collect all this information and make it available for quality assessment and training purposes. The PG proposed to act as advisor to ICES or DGFISH on the development of such tool. It was also considered of major importance that comparisons between readers in ageing workshops be planned from the start of the exchange and carried out using the principles of designed experiments. A strong request for the publication of these reports was made to avoid losing all the information and experience build in each of these meetings.

The PG supported the development of the project proposal “Discard Atlas” and is of the firm opinion that this would serve as a suitable tool to further develop on the revision of the discard data collected during the first three years of sampling and develop methodologies for estimate discard rates.

Besides the biological parameters workshops proposed a set of methodological workshops were also proposed dealing with specific issues considered of major relevance, those are: Workshop on the Use of UWTV Surveys for Determining Abundance in Nephrops Stocks throughout European Waters; Workshop on Sexual Maturity Sampling; Workshop on Discard Raising Procedures; and Workshop on Using Fishermen to Sample Catches.

1 Introduction

1.1 Terms of Reference

The Planning Group on Commercial Catch, Discards and Biological Sampling [PGCCDBS] met in Rostock, Germany, 28 February – 3 March 2006 to:

- a) Collate national Standard Operation Procedures for sampling of commercial fisheries. Further, collate survey manuals and Standard Operation Procedures for abundance surveys that provide input to fish stock assessments. These collations shall apply to all assessments and all types of data used for assessments of fish stocks and fisheries in the ICES area. Highlight differences between national programs;
- b) Initiate work on international protocols to be used for evaluation of the quality of data submitted for use in fish stock assessments;
- c) Review the recommendations of ICES assessment Working Groups, Regional Coordination Meetings, SGRN and STECF Workshops dealing with DCR relevant for stock assessment and implement appropriate actions;
- d) Assess data quality of, inter alia catch at age estimates, ALKs, age-reading based on exchanges, and maturity sampling, and propose actions leading to quality improvement;
- e) Review and assess the 3 years of experience of sampling discard data under the Data Collection Regulation with special reference to how representative these data are;
- f) Define raising procedures for discards;
- g) Identify emerging problems resulting from changes on the data collection procedures and propose actions to be taken in order to address their impacts on stock assessment input data;

1.2 Background

This PG has aimed to be the forum for planning and co-ordination of collection of data for stock assessment purposes. The PG has served as a forum for development of methods for and guidelines to sampling and analysis of precision of the basic fish stocks assessment data. Recently, EC DG Fish and Maritime Affairs have set up regional fisheries data collection coordination groups in 1) Northwest Atlantic (NAFO), 2) Mediterranean, 3) Baltic Sea, 4) North Sea and 5) Western Approaches. Data from non-EC countries are also important and the collection of data from these countries should be coordinated with data generated under the EC Data Collection Regulation (DCR). In this PG non-EC countries can liaise with EC countries in planning sampling. ICES will remain to play the major role for coordination at the Northeast Atlantic level, i.e. the Baltic Sea, North Sea and Western Approaches groups. PGCCDBS will continue to take initiatives on coordination and cooperation on the collection of biological data for fish stock assessment focusing at the Northeast Atlantic level. In particular PGCCDBS will work on maintaining and developing the quality of science/data collection. The RCMs are forums where EU member countries discuss how best to implement their national programmes. PGCCDBS is restricted to biological issues and deals with coordination on a technical level. As part of this coordination PGCCDBS forms the linkage on technical issues between RCMs and ICES Assessment WGs and oversees that sampling programmes meet agreed standards, i.e. a platform for communication and exchange of expertise as well as analyze and discuss on a technical level how recommendations made by RCMs can be implemented.

Fisheries advice critically depends on the quality of data from the commercial fisheries. Data sampling should be closely linked to the use of the data and the prime users of the biological data collected under DCR are the ICES assessment groups. These groups should be

represented among the members of PGCCDBS. It is apparent that work needs to be continued to encourage standardisation of sampling of commercial catches, discards and biological information. Furthermore, previous meetings have highlighted many important subjects where co-ordination is needed for securing adequate basic assessment data and this co-ordination needs to ensure adequate spatial and temporal sampling coverage. It is among the prime aims of PGCCDBS to establish regional centres that allow efficient data analysis and meeting state-of-the-art standards. As a first priority PGCCDBS shall consider standardization and the quality of age determination of fish with a view to define regional centres which are specialised in particular species. Also, PGCCDBS shall act as the forum where standardization of sampling methodology and methods for raising samples to population estimates are discussed and agreed.

As a new action for 2006 the Chair of PGCCDBS will have authority, with the agreement of the group, the ICES General Secretary and the Chair of MCAP, to call at short notice workshops and ad-hoc meetings to deal with specific issues of common interest among the regions, e.g. on ageing and precision of collected data. Issues raised by RCMs can therefore be considered and action taken in a shorter time-frame than has been possible before. In addition, from 2006 the Chair of PGCCDBS shall participate in AMAWGC in order to provide an opportunity for dialogue between data-providers and data-users.

1.3 General introductory remarks and work plan

For the past 5 years the PGCCDBS ToRs were quite unstable reflecting the unclear role of ICES within the EU/Data Collection Regulation (DCR) system.

However, in autumn 2005 a process started with the aim to improve the coordination and communication between EC and ICES groups and bodies such as RCM, SGRN, STECF workshops, ICES PGCCDBS and ICES WGs concerning these issues. The intent is a formal arrangement between EC and ICES in which ICES as part of the Memorandum of Understanding with EC will undertake certain functions in relation with the DCR.

To be able to provide good advice it must be based on good quality assessments. Further, the assessment quality is closely linked to the quality of the data as an assessment is a chain process starting from the definition of the sampling programme, design of the abundance survey, via data collection and compilation, to data analysis and conclusions. High quality assessments can only be achieved if each individual link in this chain is in itself of high quality.

It has been recognized that ICES is in an ideal position to undertake tasks including definitions of sampling protocols, summaries of data submitted for fish stock assessment, quality evaluation of these data and assessment of their usefulness for fish stock assessment. ICES is also to play a role with regards to specification of standards and protocols that can be used to evaluate the performance of sampling or surveys and the establishment of a quality assurance programme of the ISO type. ICES has already initiated this work for the fish stock assessment groups and Standard Operating Procedures are being developed; ICES has therefore been given a role with the development of the DCR by monitoring the process seen from the ICES Assessment WGs position. In particular a peer review procedure similar to what is done with stock assessment is being developed, which will provide MS with clear scientific evaluation of the quality of the biological data and promote methodological developments to improve it.

It was recognized that the ToRs were very extensive to be addressed during the 4 days of the meeting and the PG decided to focus on:

- 1) clarifying the way it can be operationalized within the ICES system;
- 2) develop on tasks that were clearly identified as problematic and for which the PG had the expertise to provide useful advice and actions;

3) answering requests addressed by other groups.

The meeting was organized in four subgroups dealing with the ToR:

- Subgroup on Future Issues (ToR a and g)
- Subgroup on Reviews (ToR c)
- Subgroup on Data Quality (ToR b and d)
- Subgroup on Discards (ToR e and f)

In general there was a strong attempt to provide full developed proposals on the tasks addressed, avoiding recommendations when it was felt the PG could develop further on the specific problem.

There was also a big effort on using web tools for cooperative work by implementing an unofficial website for the PG (<http://pnab.ipimar.pt/pgccdbbs>) using a wiki system, and scheduling work online whenever it looked like it was the best way to proceed.

As in previous PG non-ICES members from the Mediterranean area were present invited by EC and ICES and their presence considered important by the group as they contribute with added value for the discussions.

1.4 Organization of the Report

Section 2 deals with the compilation of sampling manuals and make a proposal to carry out this task. In Section 3 a small discussion about international protocols is included and some draft proposals on protocols to submit data to the working groups is presented. Also in this section is presented a proposal on experimental design of age reading workshops. In Section 4 a discussion about information flow within DCR/ICES focused mainly on PGCCDBS is developed and proposals of 2 workshops (Nephrops TV Surveys and Maturity Sampling) are presented as requested by RCMs. Section 5 presents summary information about 2005 ageing workshops and otoliths exchanges, a discussion on developments for age reading workshops and a discussion on maturity staging workshops, together with proposals on how to proceed on these issues. Also, a discussion on software development is presented. Section 6 deals with the review of the discard sampling carried out recently and its liaison with the “Discard Atlas” project proposal. Section 7 focuses on raising procedures for discards and proposes a pathway to proceed with the analysis of discard data. Section 8 discusses issues that were considered relevant for the future implementation of sampling programmes and proposes a workshop on self-sampling. Section 9 summarizes the meeting conclusions.

Several Annexes are presented with list of participants (1), agenda (2), forms proposals (3 and 4), software description (5), working documents on discards estimation by Joel Vigneau (6), workshop proposals (7) and recommendations (8).

2 National sampling manuals and standard operations procedures (ToR a)

The group discussed the possibility of compiling Standard Operation Procedures and sampling manuals used in each Institute. It was recognized that these information would help on a future comparison analysis and eventually on standardization of procedures over European countries, although it was not clear how the analysis would proceed. One of the main drawbacks is the need to translate the documents into a common language (English) and the resources needed to carry out this task.

It was agreed that this collection must cover data collection protocols for landings, discards, age and length, other biological parameters and scientific surveys.

The PG proposed to carry on this task online using the PG wiki (<http://pnab.ipimar.pt/pgccdb>) to develop the structure and when it will be finalised it can be uploaded to a common and open site, like the Data Collection website or an ICES website.

It was agreed that all ICES members should submit their protocols and strongly recommends that also EU member states involved in DCR do so.

The group agreed upon this structure inside the wiki where each protocol has to be located in order to facilitate the overview:

- Landings, length and age
- Discards volume, length and age
- Other biological parameters
- Surveys, national and international

The group identifies some existing protocols or manuals: IBTS (ICES, 2002), IBSSP (Anon. 1998b, 2000a), MEDITS (Anon., 1998a, 2005b; Medits, 2002), FIEFA (Anon., 2000b), EMAS (Anon., 2001a), Workshop on Discard Sampling Methodology and Raising Procedures (ICES, 2004a). In the National programmes of most countries there is no specification of the protocols used to collect the data. There were specifications in previous years but the Commission asked for simplification of the Programmes.

A team formed by Jørgen Dalskov, Christian Dintheer, Ulrich Berth and Costas Papaconstantinou will coordinate the protocols collection, starting by:

- 1) developing the webpage structure and,
- 2) managing the files submitted.

3 International protocols (ToR b)

The process of data quality evaluation must be based on a set of International Protocols that will define how the information flows between data-providers and data-users and which standards it must comply with. Under this ToR the PG focused on the flow of the information from data-providers to data-users. Notice that data-users are mainly ICES Assessment WG and that stock coordinators play a major role on this system.

A 2 step procedure was proposed. The first step to ensuring a good quality control system for data being used for the purpose of stock assessment is to provide a detailed description of the sampling scheme/raising procedures etc. to stock coordinators and those tasked with carrying out stock assessments. A draft questionnaire based on the work done by FIEFA (Anon., 2000b) and EMAS (Anon., 2001a) is presented in Annex 3, which shall be done once and kept updated. The second step is to provide a yearly report with information about the achieved sampling by stock. This would lead to a greater transparency in the formulation of the stock assessment data. The document can be used to carry out a primary exploration on issues such as bias, e.g. the document would immediately highlight whether all the aged data provided is based on only one sample in a quarter or from only one area etc. and is therefore not representative of the fishery it is trying to sample. The document should include the following:

- Sampling Coverage in Time/Space/Fishing Activity
- Maps depicting landings distributions by fleets/area
- Possibly maps presenting the sampling achieved also by fleets/area.

A draft proposal is presented in Annex 4.

It was recognized that further developments are required to improve these documents and how they can fit into the overall system of data quality evaluation.

3.1 Experimental Design in Age Reading Workshops

Several of the 2005 age workshop reports made comparisons between different methods and comparisons in reading ability between the start and end of the workshop. PGCCDBS advise that these comparisons need to be planned from the start of the exchange and carried out using the principles of designed experiments (see for example, Heath (1995)). We draw attention to the large amount of work on age reading available from the concerted actions EFAN (Anon. 2001b) and TACADAR (<http://www.efan.no/tacadar/>). PGCCDBS aims to contribute to this work by promoting the current protocols and providing further developments on how to incorporate experimental design into the age reading workshops.

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. This comparison could show increased agreement in ageing due to increased ability gained at the workshop or due to the 2nd area being easier to read and it will be impossible to separate the two effects. Similarly, avoid running the before and after comparisons on exactly the same set of otoliths. This is necessary if there are small numbers of otoliths but otherwise is undesirable as improvements seen in agreement may be from remembering specific cases and not apply in general.

Exchange organisers should ensure they have read EFAN Report 3-2000 (Eltink *et al.*, 2000) particularly Section 3.9 “Comparison of sets of different preparation techniques” or of different calcified structures, Section 3.13 “Age reading comparisons” and Section 4.7.2.12 “Age reading of the last set for estimating improvement in age reading”.

Building on the guidance in the EFAN report we suggest the procedure for generating two sets of otoliths for comparison should be:

- 1) Exclude otoliths you know are poorly prepared or have other obvious reasons why they are different from the rest of the otoliths in the exchange.
- 2) Identify variables that you suspect influence ability to age.
- 3) For variables that are not of interest control their effect by standardising them, for example, keep laboratory procedures consistent.
- 4) For variables that are of interest or cannot be fixed, define strata based on these variables, for example: month and fish length group. (We suggest strata based on fish length group to help balance the age distributions in the first and second set.)
- 5) Then for each group defined by the strata, randomly assign otoliths 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.

4 Review of recommendations from other groups and the role of PGCCDBS (ToR c)

4.1 Data and information flow between data-providers and data-users, and possible role of PGCCDBS in the system

PGCCDBS discussed the relationship between the Assessment Framework (be it under ICES, GFCM or any other RFO), and the organisational framework which supports the Data Collection Regulation (DCR), including SGRN, STECF, the Regional Coordination Meetings (RCMs) and the data providers (be it EU Member States or other countries) themselves.

Although the DCR has been set up to provide biological data for the Assessment and Advisory framework (the end-users), it was felt that the flow of both information and data from the DCR to the Assessment WGs was not working satisfactorily. Under the current model (Figure 4.1), data collected by MS are to be reported to the Assessment WGs. The extent to which EU-MS fulfil this obligation is monitored by SGRN and STECF, who therefore act primarily in the role of compliance monitors. Under this system however, the Assessment WGs have little influence on the collection or delivery of data and appear to be somewhat removed from the process. In addition, the feedback on data quality issues from the data users to the data providers is very poor. PGCCDBS considered that there was a need to develop a procedure for ensuring that WGs are more actively involved in both requesting information that they need (the data input part in Figure 4.1) and communicating back to the data collection system (the feedback part in Figure 4.1).

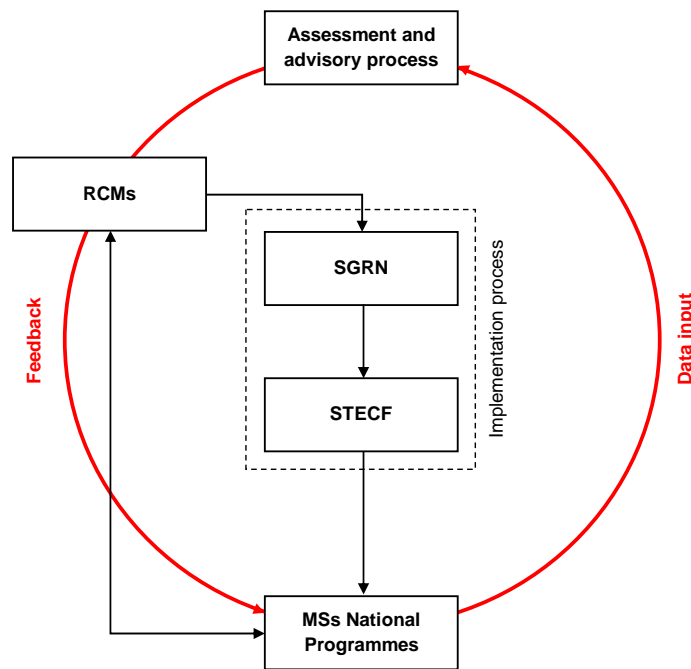


Figure 4.1: Information flow on DCR system

A model of data flow and feedback is needed which allows direct communication between the Assessment Framework and the primary collectors but also ensures that there is compliance with the requirements and the general philosophy of the DCR. A possible model for this, applicable to the ICES assessment and advisory framework, is shown in Figure 4.2.

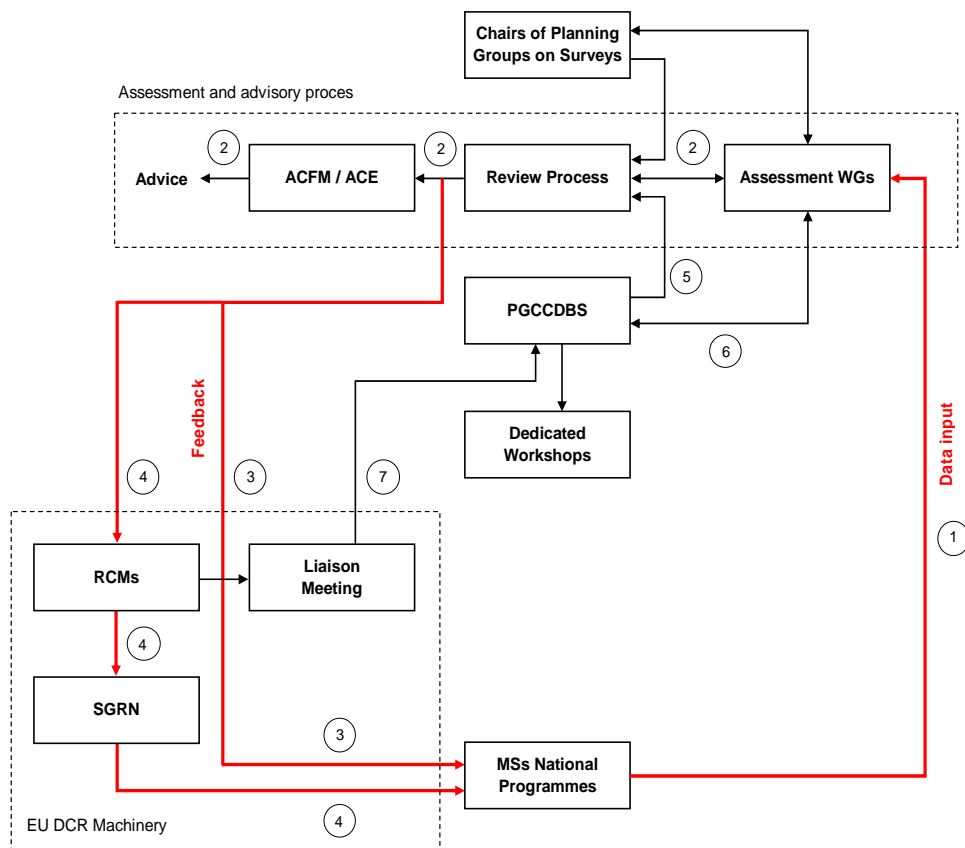


Figure 4.2: Information flow model for ICES framework.

4.1.1 Data input part of the model

In this model, data is received by the relevant Assessment WGs (arrow 1), where it is used to make the assessment. The assessment then goes through a review process and is eventually passed to ACFM and/or ACE (arrow 2) where the actual advice formulation is taking place.

Under this system, a key function is taken up by the stock coordinators, who currently request data from MS, aggregate the national data and feed it into the assessment models. In ICES, the data typically collected by stock coordinators are the national landings, CPUEs, age and length compositions, and recruitment indices. The stock coordinators, the Assessment WGs and the review groups between them have a direct responsibility for reviewing the quality of the data received. It is proposed that the stock coordinators extend their role to requesting other data sets required for improving the assessments, such as maturity and growth data, discard volume and age compositions. PGCCDBS sees this as a direct interactive role of communication between the data providers and ICES. In order to formalise this, ICES will need to develop clear guidelines for the stock coordinators on how to address the data providers. In addition, there should be a formal obligation for data providers to inform the stock coordinators on the types of data that are available in order to give them a complete overview on data availability, regardless of whether the data will readily be used on the assessment or not (also see section 3). ICES and the Commission in cooperation will also need to expand existing enquiry forms which indicate what data ICES WGs requested from the EU-MS and what was actually received and also to include what data are needed in addition to data already being delivered. Furthermore, the assessment WGs will be asked to explain why some data were not used if this was the case. The data enquire forms shall become the basis for reviewing compliance by EU-MS with the data requests by ICES WGs, although it would not be the responsibility of ICES but of SGRN to check compliance and if necessary deal with any problems.

In Figure 4.2, "Data input" should not be read in a restrictive way. In PGCCDBS' opinion, it covers not only the data transmission "as such" but also the full process of quality control on semi-aggregated and aggregated data.

4.1.2 Feedback part of the model

PGCCDBS considers that the feedback on data availability and data quality to the data providers could best be scheduled after the Review Process, since this would ensure that the comments from both the Assessment WGs themselves and the reviewers be included in the feedback.

After completion of the assessment and review process, ICES would communicate to the MS, either directly (arrow 3) or through the EU/RCMs (arrow 4), to indicate whether the data received is appropriate or whether revisions are needed. The pathway through the RCMs ensures that the latter have the possibility of being involved with any adjustments made to the data collection programmes when there is a regional dimension to the required changes. For the feedback to be efficient, it is necessary that the requests to MS for adjustment of their data collection programmes be concise and to the point, highlighting where the shortfalls are and how these should be remedied. The implementation of standard forms for the feedback is therefore highly recommended.

Sensible statements on the quality of the data used by the Assessment WGs can only be made if the quality of the data can be evaluated relative to agreed "norms". This is where the PGCCDBS has an important role to play. Groups such as the PGCCDBS should contribute to the data quality evaluation by laying down norms to which the different types of data should comply and Standard Operational Procedures (SOP) for their collection, which could then be fed into the review process (arrow 5). These norms should be developed in close co-operation with the Assessment WG and all other parties involved in the quality control of the inputs to the assessment and advisory process. In addition, the PGCCDBS would also address particular issues in relation to data quality, SOPs, etc., upon request of the Assessment WGs (arrow 6).

To deal with specific methodological issues related to its tasks, the PGCCDBS would have the possibility to call for / make proposals for the organisation of Dedicated Workshops, either on its own initiative, upon request of the Assessment and Advisory groups in the system, or upon request of the EU DCR-related coordination groups (RCMs, SGRN, Liaison Meeting) (arrow 7).

In the proposed system, the Planning Groups on Surveys could play a role similar to that of the PGCCDBS, but with particular focus on survey design, the quality of survey data, etc. (top part of Figure 4.2). The topic of improving the linkages between survey groups and assessment groups was discussed at the AMAWGC meeting (ICES, 2006). At that meeting, there was an agreement for suggestions for improving the interactions by asking the survey chairs to attend the relevant Assessment WGs, and in the same way as proposed in this report to ask Assessment WGs to provide relevant feedback to survey groups on what information the group require.

At the AMAWGC meeting (ICES, 2006), it was also recommended to organise a joint session at the 2006 Annual Science Conference (ASC) with AMAWGC, Living Resources Committee (LRC) and Resource Management Committee (RMC) on survey assessment interactions. Given the many problems with landings data, the integration with PGCCDBS in this session would be very beneficial. In those way data-providers, survey people and assessment scientists can be brought together.

Further ways of improving communication include having the PGCCDBS Chair participate in the AMAWGC meeting in the beginning of the year and at the ASC and to encourage the participation of assessment scientists in the PGCCDBS.

4.2 Recommendations on workshops received from the Liaison Meeting (Anon. 2006)

The PGCCDBS received four recommendations on workshops from the Liaison Meeting (Anon., 2006), viz. one for a workshop on Under Water TV (UWTV) surveys for Nephrops, and three for workshops on sexual maturity.

4.2.1 WK on UWTV for Nephrops

The PGCCDBS agrees with the proposal for a Workshop on UWTV Surveys for Nephrops. The proposed TOR for this Workshop and their justification are given in Annex 7 to the present report.

4.2.2 WK on sampling for sexual maturity

PGCCDBS received similar requests from three RCMs to consider setting up species-specific workshops to give guidance on collecting and analysing maturity data. PGCCDBS considered that these requests covered two separate issues in relation to maturity sampling, viz. (i) the methodological approach to setting up the most effective sampling programme for maturity, and (ii) problems related to standardisation of maturity staging, and proposes that dedicated thematic workshops be convened on these issues instead of a potentially large number of species-specific workshops that would deal with essentially similar topics. The standardisation of staging is already being addressed under Section 5 and so will not be considered further here.

Under the DCR, maturity samples are collected for a wide range of species on a tri-annual basis. There has been some attempt to coordinate the collections by RCMs on a rolling basis but the underlying strategy of the sampling programmes and the utilisation of aggregated data collected from different areas at potentially different times of the year have not been addressed yet. The PGCCDBS therefore considers that a workshop should be convened to look into sampling design and aggregation of maturity data. Rather than focussing on individual species or stocks, the workshop should look at the possibility of stratifying species into a number of groups depending on life history traits, and consider whether different approaches to sampling could be applied to each group. Possible distinctive features of these groups could include:

- Spatial distribution: wide/local
- Growth: fast/slow
- Spawning duration: short/long
- Accessibility to sampling: affected/not affected by spawning condition

On the basis of these groupings, a sampling design could be specified to optimise the collection of material for species within each grouping. For instance, fast maturing species may need to be sampled on a more frequent timescale than slow growing; the timing of the collection of samples may be more critical for species with short spawning periods than for those with long spawning periods; etc.

In addition, the Workshop could address other methodological issues in relation to maturity sampling such as the optimisation of spatial coverage of sampling for widely distributed stocks and for stocks with differential distribution patterns between spawners and non-spawners, the optimisation of sampling at length, and the calculation of aggregated maturity-at-length-keys for species/stocks where maturity shows spatial variation.

The proposed TOR for this Workshop and their justification are given in Annex 7 to the present report.

For this Workshop to be effective, it is essential that data be collated and some preliminary analysis of the data be done before the meeting. One of the WK chair's tasks will be to organise this work, amongst others with reference to the work that has already been done by the SGGROMAT (ICES, 2003b, 2004b).

5 Data quality evaluation (ToR d)

The evaluation of the data quality was not carried out due to the lack of time, resources and standards to compare the results. However several issues related with data quality were discussed and proposals made in order to improve the quality of the data collected and submitted to the Assessment Working Groups.

Also the reports from ageing workshops and otoliths exchanges were presented to the PG and extended abstracts and recommendations included on this report.

5.1 2005 Age Reading Workshops

5.1.1 Herring

5.1.1.1 Extended abstract

34 participants from 15 European countries attended the herring age reading workshop. The aim of the workshop was to identify present problems in herring age determination, improve the accuracy and precision of age determinations and spread information of the methods and procedures used in different ageing laboratories working with herring.

In the workshop, two groups of age determination laboratories that have had co-operation inside each group before, those at the Atlantic coastal areas and those at Baltic Sea coastal areas were working together. The common meeting benefited both groups by changing experience of different practices and spreading knowledge of herring growth and otoliths in different conditions from those populations and areas each one was familiar with.

Before the workshop, four different samples of otoliths were circulated among different laboratories to assess the precision of age readers. Preliminary results from the circulation were presented in the workshop and discussed together.

In the workshop, several presentations were held, subjects being:

- age determination of herring in Atlantic stocks
- work of Baltic Herring Age Reading Study Group (BHARSG) 2001-2005
- ageing of slowly grown herring: experience from sawing and staining technique compared with ageing from whole otoliths
- the ageing of Bothnian Sea herring from whole otoliths and otolith slices
- age determination alternatives in Baltic herring from the Gulf of Riga
- presentation of results from otolith exchange and discussion

Otoliths were examined together by projecting their images on the wall with data projectors from two microscopes: one used for examining whole otoliths and one for examining thin slices.

There were two main groups of otoliths examined:

- 1) Otoliths that had been included in the exchange of otolith samples and thus had been read by a number of readers
- 2) Otoliths from specimens from which both otoliths had been taken for the examination: one as whole and one as sliced and stained with neutral red.

In the exchange of otolith samples, clear differences were found in the precision between different samples and different readers: mostly 40–90% of the age estimates were identical, the lowest precision being 12% of identical readings to the mode, the highest 100%. The comparison did not give an answer to whether modal ages or the ages determined by the most experienced reader with the sample in question, are closest to the real ages of the fish. However, the readers most familiar with the sampled fish had high levels of agreement with each other, even though their results could differ more from the other readers. This can express a better knowledge on the characters of a particular population or just higher agreement among the experienced readers, based on common experience in learning the interpretation.

Despite the differences in the age determination results of the otolith exchange, the interpretation of rings was fairly unanimous when observing the otoliths projected on the wall together. The participants agreed fairly easily on the interpretation on annual rings, this for all population samples. However, there were differences in the interpretation of age from the rings. Some variation was found in the definition of birthday, especially in autumn spawning herring that do not have a full year of life behind in the general birthday of fish, 1 January (see 4.1.1 in the report).

When whole otoliths and otolith slices were projected on the wall, it was seen that in slowly grown herring, all rings could not always be identified in the whole otolith, whereas they could be seen at the edge of the stained otolith cross sections. A special example was the Gulf of Riga (Baltic Sea), where a modification of counting rings from whole otoliths is in use (G. Kornilovs): in addition to the number of rings, the width and structure of the visible growth zones are included in the determination. This resulted in high precision with ages from stained otolith slices, determined from the same specimens.

5.1.1.2 Recommendations

Because of the differences between the practices with Atlantic and Baltic herring populations, the conclusions and recommendations were written separately for these groups of populations. The recommendations concerned three main subjects:

- 1) All the phases of otolith preparation,
- 2) Age estimation,
- 3) Quality assurance and quality control.

Generally, it was found that there were still different practices of interpretation that need to be standardized to ensure that in assessments, the age estimates from different laboratories are based on similar definitions on things like birthday of fish. The recommendations of this report are a step to this direction. It was also found that especially in the Baltic Sea where herring differ significantly from area to area, more work is needed to see which methodologies give adequate results in each area.

5.1.1.3 Atlantic Herring Stocks

Few disagreements on the interpretation of annual translucent zones exist between experienced readers, including the position of the first translucent zone, split translucent zones and the resolution of the otolith edge. However otolith readers are much more confident when reading their own stocks. Differing interpretations of the relationship between assigned age and year class caused significant variation in the assigned age for some otoliths.

There is no direct validation of otoliths from Atlantic herring stocks at this time.

Some readers were unaware that a birthday of 01 April had been retained for the Celtic Sea Spring spawning herring stock.

It should be noted that in certain autumn spawning stocks e.g. Irish Sea (VIIa), some '0' and '1' group herring can complete the annual translucent zone for the current year before 01 January. If the date of capture is before 01 January these translucent zones should not be counted when assigning ages. In some herring older than age group '8', the translucent zone for the current year may not be clearly visible until after 01 January. If the date of capture is before 01 January these translucent zones should be counted when assigning ages.

Written procedures should be produced for all otolith preparation and age estimation methods where the age data are used for stock assessment purposes.

Written procedures must be supported by an effective training programme (a TACADAR CA recommendation). Particular attention should be paid to the need to preserve accumulated experience at each institute and adequate provision should be made to maintain succession of experienced readers.

For Quality Control it is recommended that a proportion of all herring ages used for stock assessment purposes, should be estimated by more than one reader at each institute.

It is recommended that regular otolith exchanges take place between institutes in order to detect precision drift in the age estimations.

It is recommended that workshops take place when inter-calibration exercises indicate that may be a potential problem with the assigned ages.

5.1.1.3.1 Baltic Sea Herring Stocks

The typical problems in age determination have been described in the report of BHARSG (ICES, 1998). Since the growth of Baltic herring and respective formation of otoliths in the Baltic Sea could be significantly influenced by the hydro-meteorological conditions it was recommended to have regular monthly sampling and collection of Baltic herring otoliths.

Dissagreements on the interpretation of annual translucent zones could exist between experienced readers, including the position of the first translucent zone and the resolution of the otolith edge. However otolith readers are much more confident when reading their own stocks (Kornilovs, 2005). When interpreting stained otolith slices, the familiarity of the stock is not as important as with whole otoliths.

Several populations of Baltic herring are distinguished in the Baltic Sea differing by spawning place and time, migration pattern, growth rate and mean size at age. During the feeding season (summer-autumn) different populations are mixing thus causing additional problems in age determination. Otoliths of some fast growing and early spawning herring populations have large and wide first summer zone (L1) while other later spawning populations have relatively small first summer zone. This could lead to wrong assignation of the first hyaline ring.

At present the quality assurance and control is provided at the national level and is not internationally postulated. The analysis of age determination exercises performed by BHARSG and the age determination results from otolith sample exchanges gives necessary indications where additional training or cooperation would be desirable. Since 1997 regular otolith exchanges (in total 6) took place between institutes in order to detect the changes in agreement in the age estimations of the national experts. It was recommended by BHARSG to have regular workshops at least once in three years, however, the last workshop was held in 2000.

5.1.2 Whiting

5.1.2.1 Extended abstract

PGCCDBS (ICES, 2003a) identified whiting (*Merlangius merlangus*, L) as one species requiring confirmation of ages being assigned by Fisheries Institutes. The previous international workshop on whiting otoliths was held in Hirtshals, Denmark in 1998.

The PG indicated that FRS, Marine Laboratory, Aberdeen would be responsible for the organisation and analysis of the exchange and that CEFAS, Lowestoft would be responsible for the workshop to be held in 2005.

Whiting is generally regarded as one of the most difficult gadoid species to age due to problems in distinguishing true annual rings from other rings.

Different methods of sample preparation and reading technique are used by Institutes engaged in ageing whiting. Some break otoliths and embed them in a soft medium prior to examining them under transmitted light. Others section their otoliths and embed them in resin before examining them with transmitted light.

The objectives of the exchange were:

- 1) to investigate the levels of agreement on age readings;
- 2) to analyse the relative differences between reader ages;
- 3) to compare readings by otolith processing method.

Due to time constraints, only samples obtained in March and April 2004 from various areas around the British Isles were used. They were obtained from commercial fishing vessels and from research vessel. The length range of the fish sampled was between 16 and 54 centimetres. A total of 200 pairs of otoliths formed the collection with one otolith of each pair being broken and mounted in modelling clay by FRS while the other otolith of each pair was mounted on a slide by CEFAS. CEFAS digitised all the images and compiled a CD of them. Thus the whole collection can be thought of as three sets:

- 1) broken otolith set
- 2) sectioned otolith set
- 3) digitised image set on CD.

The set of broken otoliths was read by 11 readers from six Institutes - 8 experienced and 3 intermediate. The spreadsheet was completed according to the instructions contained in Guidelines and Tools for Age Reading Comparisons by Eltink *et al.* (2000). Modal ages were calculated for each otolith read, along with percentage agreement, mean age and precision coefficient of variation. Percentage agreement ranged from 27% to 100% with an average of 72.6%. The average precision coefficient of variation was 16.3%.

From sectioned otoliths, the age estimates of 19 non-novice readers were included in the analysis. The readings of 2 novices were excluded from the analysis after scrutiny of their readings. A total of 120 otoliths were read with at least 80% agreement. The maximum precision coefficient of variation was 51%.

Readers at the workshop who contribute regularly to age compositions at ICES Assessment Working Groups, achieved agreements exceeding 80%.

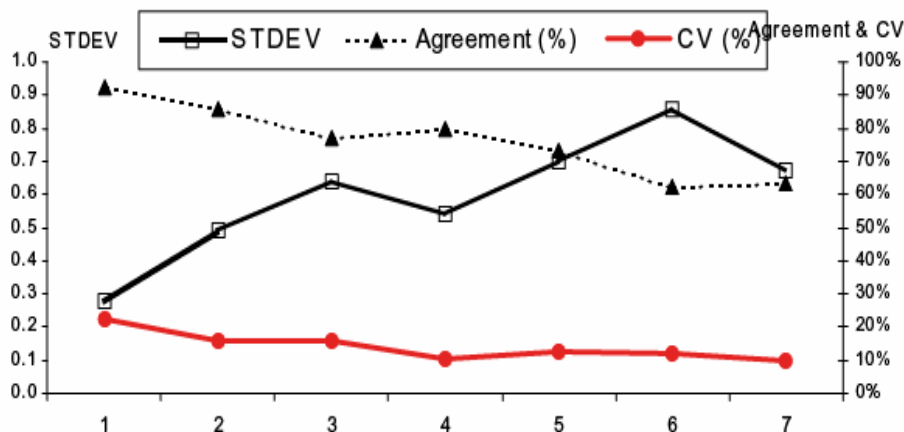


Figure 5.1: Main results of the comparisons on age readings for Herring.

5.1.2.2 Recommendations

- 1) The Workshop noted that institutes where readers showed a low agreement with the other participants in the exchange may require further training, particularly if some of these readers contribute age compositions to ICES Assessment WGs.
- 2) As reported in the initial analysis there was no significant difference in the results between the two ageing methods of broken otoliths or sections. Each method has its own advantages and disadvantages. The Workshop therefore concluded that both ageing method were acceptable for whiting.

The Workshop also made a number of general recommendations on methodology for achieving the best results in ageing whiting:

- 3) Magnification should be limited to x10-20. Too high a magnification will result in splits being counted as rings.
- 4) When ageing sections both transmitted and reflected light should always be used to look at each otolith. Whiting often show low contrast between the opaque and translucent zones and transmitted light can show the ring structure more clearly. Reflected light, however can be particularly useful in interpreting the edge. At times an apparent translucent edge when read under transmitted light is simply the effect of too much light coming through since the edge of the otolith can be thinner than the rest of the structure, there could be a small gap in the resin or a translucent split could be forming on the edge. Also, the black resin under the slanting edge of an otolith can make a translucent edge appear to be opaque. Reflected light will always identify the true material.
- 5) When ageing, the most reliable part of the otolith is the rostrum or dorsal edge and this should be given preference although other parts of the otolith can also be useful.
- 6) ‘Humphries shadow’ is a feature that is present on most otoliths although not in every year and as such has only limited use in the interpretation of the ring structure.
- 7) Image analysis packages can be used to measure ring growth and construct an annual growth curve as an aid in verifying the age. This method is utilised by France. Care would have to be taken not to discount rings just because they do not follow a normal growth pattern.
- 8) Further efforts should be made to obtain otoliths from whiting of validated age although it is accepted that this will be very difficult to achieve.
- 9) There was considerable discussion after the workshop about the protocols for preparing images for an exchange. Some participants were in favour of marking all otoliths with the position of the annual rings and retaining copies for discussion at the workshop. This can be very useful for identifying problems between Institutes or readers. However, the method is very time consuming and

can result in many hundreds of marked images which cannot be discussed in any detail within the limited time available. The Workshop could not resolve this issue and Recommended that ICES PGCCDBS should consider this and propose a protocol for use in future exchanges.

5.1.3 Blue whiting

5.1.3.1 Extended abstract

The overall result of the Workshop was that there is a general high agreement between readers, though otoliths of younger fish achieved better precision than older fish illustrating the continuing problem of age determination of older fish. The status of the consistency of the readings between labs is illustrated in Figure 5.2.

The image analysis exercise clarified that the lack of agreement can be referred to two reasons, the first being the position of the first ring where the Bower zone is clear. This is often seen in the younger individuals as the otolith is thinner and thus the structures more clear. The second reason to 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.

The workshop achieved quite a lot in terms of ironing out, through discussion and calibration, some of the major problems in ageing otoliths of blue whiting. The group reached agreement on a definition of an ageing protocol/guidelines and the group strongly recommends that all ageing laboratories processing blue whiting should include the guidelines developed during the workshop in their ageing manuals. All labs are recommended to use measurement scales (e.p.u) and note down distances between age-structures in 'typical' individuals specific for their stock. It is the intention to compile a dataset consisting of measurements on distances between age-structures from all stocks and areas from which samples of blue whiting are taken. This will be the basis of an international reference collection and is intended to be used in future workshops.

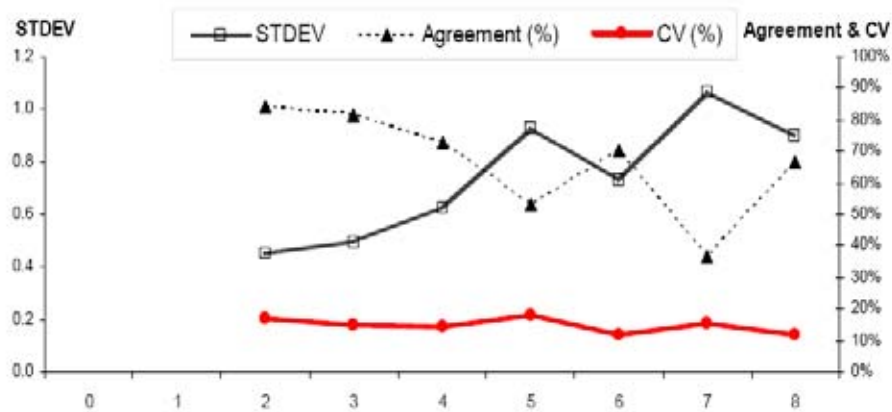


Figure 5.2: A set of otoliths was circulated prior to the workshop and the overall agreement was 86.5 % with a precision of 12.2% CV and in 57% of the otoliths the agreement was larger than 90%.

5.1.3.2 Recommendations

- 1) An exchange to be established during 2006 followed by a workshop in 2007
- 2) That a reference otolith collection is established in order to support less experienced as well as experienced readers.
- 3) All labs use measurement scales (e.p.u) and note down distances between age-structures in 'typical' individuals specific for their stock

5.1.4 Sardine

5.1.4.1 Extended abstract

The current exchange and workshop aimed to evaluate readers agreement and aging precision, to assess the extent of aging difficulties previously identified (identification of the first annual ring and aging of older individuals) and to propose guidelines for their minimization. The consistency of age readings in time (comparison of the 1980's, 1990's and the present time) and in space (comparison with Mediterranean and northwest African areas) was also explored and the consequences of the assumed birthdates for the estimation of growth were discussed. In addition, profiting from the experience of the workshop attendants, biological sampling methodologies (assignment of sexual maturity stages, visceral fat and stomach condition) were listed and discussed and standard protocols are recommended.

A total of 555 otolith pairs, grouped into 10 sets according to the different objectives and areas, were read by thirteen readers (from seven Institutes across five countries) following a common age reading protocol. For each otolith, the number of hyaline rings, the type of edge (hyaline/opaque), the age group (years) and the readability level (1-good, 2-medium, 3-difficult) were recorded. The modal age of each otolith, based on readings of five experienced readers, was assumed as the true age.

Otolith readability declined from the northern to the southern areas in the Atlantic and was intermediate in the north-western Mediterranean samples. The exclusion of difficult otoliths did not affect the estimates of the mean length-at-age but improved considerably their precision. Within the Atlantic Iberian area, both the agreement among experienced readers and the CV by age group declined in comparison to the last Workshop. Two possible explanations are the shorter experience of some current readers and the fact that most samples were collected when the edge type classification is more uncertain (transition between winter/summer). Difficulties in the identification of the first annual ring and aging of older fish still persist while the identification of the otolith edge and whether to decide to account it for age assignment are additional problems. To minimize these problems, the workshop recommends that readers use either the anterior or posterior margin of the otolith to identify the edge type and follow its seasonal evolution in each area.

Overall, agreement with age readings from the 1980s and the 1990s was lower than current levels of between-reader agreement in samples from similar areas. The small sample sizes prevent firm conclusions about bias but the observed systematic differences in some ages/periods advise a more thorough evaluation of this issue.

Otoliths from the Mediterranean area showed generally low agreement levels (comparable to otoliths from southern Portugal) mainly due to the identification of the first annual ring. The workshop recommended the use of the diameter of the opaque core measured in juvenile fish otoliths as a gauge to help aging older individuals. Agreement between readers from the Atlantic Iberian and the NW African areas was considerably low. Iberian readers assign older ages to otoliths from the NW African areas while Moroccan readers assign younger ages to the otoliths from the Iberian areas, indicating different age reading criteria. The high opacity of otoliths from the NW African areas raises serious difficulties to aging. The use of alternative preparation techniques, such as soaking in water/alcohol, was recommended to enhance ring visibility in these otoliths.

The age reading protocol for sardine was updated and a standard sheet for the recording of age reading results was prepared. The organization of reference collections of otoliths (>80% agreement) within each area is recommended.

5.1.4.2 Recommendations

- 1) Set up of alternative otolith preparation techniques (e.g. burning/polishing, soaking in water/alcohol) in order to enhance the otoliths structure in more problematic areas (southern);
- 2) To help the identification of the 1st annual ring, the otolith opaque zone in juvenile sardines (less than 1 year old) must be measured and used as a gauge for ageing older individuals;
- 3) Readers should use either the anterior or posterior margin of the otolith to identify the edge type and follow its seasonal evolution in each area/age.

In addition, the workshop recommends:

- 4) Record of relevant otolith characteristics (e.g. number of true hyaline rings, edge type, false rings, etc.);
- 5) Only clearly defined rings must be considered for age assignment purposes. When a faint ring occurs at a distance where a true ring should be expected (based on the diameter of the 1st annual ring) it must be also considered as a true ring;
- 6) Implementation of otoliths reference collections in each area and of regular age readings calibration based on these collections;
- 7) Decision on eventual change of birthdates criterion in sardine age assignment and its consequences in the stock assessment must be preceded by a more detailed analysis of juvenile fish otoliths and a broader discussion in other Working Groups.
- 8) Differences in sardine growth patterns and otolith structures among the areas raise different age reading problems in each area (promotion of local workshops, periodic workshops joining readers from the 3 areas)

Regarding biological sampling:

- 9) Organization of an intercalibration exercise of biological properties among Institutes
- 10) Standardization of biological sampling procedures, mainly:
- 11) The reduction of the macroscopic sexual maturation scale from 6 to 5 stages supported by the results of a calibration study of macroscopic-microscopic stages (submitted);
- 12) Application of a visceral fat condition scale (4 stages in the Atlantic Iberian area);
- 13) Use of a stomach colour scale (Cunha *et al.*, 2005);
- 14) Use of a stomach fullness scale (Cunha *et al.*, 2005).

5.2 2005 Otolith exchanges

5.2.1 Sandeel

No information was provided.

5.2.2 Roundnose Grenadier

A roundnose grenadier exchange had to take place in 2005 but very few institutes expressed their interest in participating. At the moment, the set of otoliths has been prepared by Ifremer (France), is about to be sent to IEO (Spain) and will circulate in FRS (UK - Scotland) for a training purpose. Any other institute willing to be included in the loop may still express their interest by contacting the Ifremer contact person (Joel.Vigneau@ifremer.fr).

5.2.3 Anchovy

Considering the recommendation of PELASSES project and PGCCDBS (ICES, 2005) an exchange programme of anchovy otoliths was organized in 2005 between AZTI, IEO, IFREMER, coordinated by the former institute. The results of this exchange programme will be discussed and serve as a starting point for the organisation of a small workshop on anchovy age determination in this year 2006.

The exchange will have the following objectives for the Subarea VIII (Bay of Biscay):

- 1) Evaluate current precision in otolith age reading of anchovy among readers from fishery and survey samples throughout the year with otoliths mainly from 2004 and a few of 2003.
- 2) Identify major difficulties in anchovy otolith interpretation for age determinations concerning observed disagreements (otolith edge recognition and/or identification of true rings or checks).
- 3) Report results to the Working Group on the Assessment of Mackerel, Horse Mackerel, Sardine and Anchovy (WGMHSA) meeting in September and/or potentially to a subsequent workshop on anchovy age determination that may take place subsequently to facilitate the discussions and progress of work.

6 readers with different levels of experience participated in the exchange of otoliths, they read a total of 510 otoliths coming from different periods (April to November), areas (VIIIb North, VIIIb South and VIIIc) and origin (commercial and scientific survey).

As agreed in previous exchanges and directly among readers of anchovy otoliths, these otoliths were mounted entire within Eukit on black slides of 10 pairs of otoliths each. Otoliths were mounted with the sulkus facing down.

During the 2002 workshop the validation and methodology of age reading defined in AZTI was presented and adopted. So people are believed to follow in general terms the guidelines collected in the WD reporting that workshop (Uriarte *et al.*, 2002)

All data were analysed using the Workbook Age Reading comparisons of Eltink (2000) and following the recommendations of the Guidelines and tools for age reading comparisons (Eltink *et al.*, 2000)

The sets of otoliths examined in the exercise were otoliths arising from the most recent monitoring of the fishery landings and from recent surveys mostly during 2004. Therefore they are indicative of the common troubles encountered in these years.

The average percentage of agreement across all ages and readers (90.9 %) and the average CV (13.9%) is quite good in comparison with the results of the last exchange carried out in 2001, when average percentage of agreement was 83 % and the average CV was 30% (Uriarte 2001). They are quite similar to (a bit worse than) the results achieved after the last workshop held in 2002 (Uriarte *et al.*, 2002) when an agreement among readers of 92% with a CV of about 10% was managed.

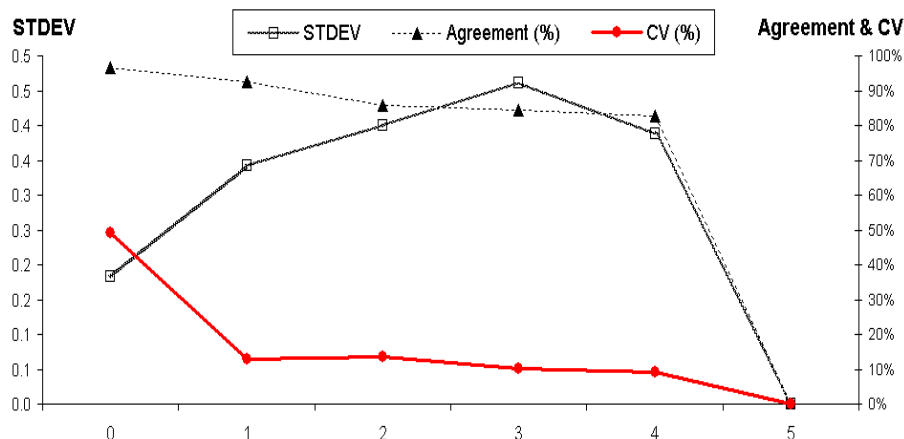


Figure 5.3: The coefficient of variation (CV%), percent agreement and the standard deviation (STDEV) are plotted against MODAL age. CV is much less age dependent than the standard deviation (STDEV) and the percent agreement. CV is therefore a better index for the precision in age reading. Problems in age reading are indicated by relatively high CV's at age.

5.2.4 Cod

PGCCDBS (ICES, 2005) identified cod as one of the species requiring confirmation of the ages being assigned by Fisheries Institutes.

The PG indicated that the Marine Institute, Ireland should be responsible for organising a cod otolith exchange encompassing all areas in 2005/2006, to evaluate if there is a need for a cod age reading workshop.

The objective of the exchange was to examine as broad an example of cod otoliths from the various regions involved in cod age reading. It was decided, however, that rather than operate one large, very extensive exchange, which contained samples from various regions, that a number of exchanges would be run which each covered a specific area.

Given the countries that voiced an interest in participating in one or more exchanges (19 countries in all) and the areas in which they sample cod, four regions were chosen and an exchange set up for each. The areas covered include

- North Sea Cod Exchange
- Baltic Sea Cod Exchange (SD 25-32),
- Irish Sea/Celtic Sea Cod Exchange (ICES Divisions VIIafg)
- Area II Cod Exchange (Norwegian cod).

In all but the North Sea, broken otoliths were used for the exchange. In the North Sea broken and sectioned otoliths were used.

The objectives of the exchanges are:

- 1) To investigate the levels of agreement on age readings
- 2) To analyse the relative differences between reader ages
- 3) To compare readings by otolith processing method

Progress of the exchanges is slow given the number of countries and age readers involved, but it is anticipated that the results of the exchanges will be available for presentation at the PGCCDBS meeting in early 2007.

It is hoped that a CD will be produced of images of otoliths with agreed ages, which will be circulated to all the participants as a valuable training and resource tool.

5.2.4.1 Progress to date

- Area II – 2 out of 5 countries have read.
- Baltic Sea – 7 countries participating, circulating in May.
- Irish Sea/Celtic Sea – 2 out of 5 countries have read.
- North Sea - 4 out of 9 countries have read.

5.2.5 Saithe

The saithe otolith exchange in 2005 has been postponed to 2006. Ifremer (France) will prepare the set of otoliths for ICES areas IV and VI and request by correspondence the interest over Europe to participate to the exchange.

5.2.6 Turbot

The exchange took place but the data were not analysed yet. The presentation of the results was postponed to 2007.

5.2.7 Brill

The exchange took place but the data were not analysed yet. The presentation of the results was postponed to 2007.

5.2.8 Redfishes

There was no exchange in 2005. The last series of exchanges was carried out in 2000–2003 (Stransky *et al.*, 2005).

5.2.9 Sole

No information was provided.

5.2.10 Horse mackerel

This exchange was postponed to 2006.

5.3 Planning for 2006 and 2007

Several ageing and maturity staging workshops are planned for 2006 and 2007. Also the methodological workshops proposed, Maturity Sampling, UWTV Surveys for Nephrops and Self-sampling are scheduled to 2007. Eventually the “Hands-on” Discards workshop will also be scheduled under the PGCCDBS umbrella. Tables 5.1, 5.2 and 5.3 present the proposed workshops for the next 2 years and should be used by each EU-MS to be included in their national budgets for 2007 (to be submitted until 31st of May).

Table 5.1: Ageing Workshops planning

SPECIES		LATEST	LATEST	RESPONSIBLE COUNTRY	
		Exchange	Workshop	2006	2007
Sandeel	<i>Ammodytidae</i>			Denmark (wk)	
Scabbardfishes	<i>Aphanopus spp</i>	1999	2000		
Alfonsinos	<i>Beryx spp</i>				
Herring	<i>Clupea harengus</i>	2004 (?)	2005		
Atlanto-Scandian Herring	<i>Clupea harengus</i>		1999		
Conger	<i>Conger conger</i>				

Roundnose Grenadier	<i>Coryphaenoides rupestris</i>			France (wk)	
Seabass	<i>Dicentrarchus labrax</i>				
Anchovy	<i>Engraulis encrasicolus</i>	2005	2002	Spain (wk)	
Cod	<i>Gadus morhua</i>	2005	2001		
Witch	<i>Glyptocephalus cynoglossus</i>				
Bluemouth rockfish	<i>Helicolenus dactylopterus</i>				
Four-spot Megrin	<i>Lepidorhombus boscii</i>				
Megrin	<i>Lepidorhombus whiffiagonis</i>	2003(?)	2004		
Black-bellied Angler	<i>Lophius budegassa</i>	2001	2004		
Anglerfish	<i>Lophius piscatorius</i>		2004		
Haddock	<i>Melanogrammus aeglefinus</i>				
Whiting	<i>Merlangius merlangus</i>	2004	2005		
Hake	<i>Merluccius merluccius</i>	2003	2004		
Blue whiting	<i>Micromesistius poutassou</i>	2003 (?)	2005		
Lemon sole	<i>Microstomus kitt</i>				
Blue ling	<i>Molva dypterygia</i>				
Red Mullet	<i>Mullus sp</i>			Greece	Greece (wk)
Forkbeard	<i>Phycis phycis</i>				
Flounder	<i>Platichthys flesus</i>	2006	2006	Germany	Sweden (wk)
Plaice	<i>Pleuronectes platessa</i>	2003	2003		
Saithe	<i>Pollachius virens</i>			France	France
Turbot	<i>Psetta maxima</i>				Netherlands
Salmon	<i>Salmo salar</i>	2002-03	2002-03		
Sea trout	<i>Salmo trutta</i>				
Sardine	<i>Sardina pilchardus</i>	2004	2005		
Spanish mackerel	<i>Scomber japonicus</i>				
Mackerel	<i>Scomber scombrus</i>	2001	1995		
Brill	<i>Scophthalmus rhombus</i>				Netherlands
Redfishes	<i>Sebastes spp</i>	2000-03	1995	Spain (wk)	
Sole	<i>Solea solea</i>	2001	2002		
Seabreams	<i>Sparidae</i>				
Sprat	<i>Sprattus sprattus</i>	2004	2004		
Blue jack mackerel	<i>Trachurus picturatus</i>				
Horse mackerel	<i>Trachurus trachurus</i>		1999	Netherlands	
Norway pout	<i>Trisopterus esmarki</i>				
Pouting	<i>Trisopterus luscus</i>				
Red stripe mullet				Greece	
Red mullet				Greece	
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	2005	1996	Canada (wk)	

Table 5.2: Maturity Staging Workshops planning

SPECIES	RESPONSIBLE COUNTRY	
	2006	2007
Mackerel/Horse Mackerel		Portugal
Cod, Haddock, Whiting & Saithe		Denmark
Hake and Monk		Portugal

Table 5.3: Methodological Workshops planning

SPECIES	ISSUE	RESPONSIBLE COUNTRY	
		2006	2007
All	<i>Self-sampling</i>		Norway
Nephrops	<i>TV Surveys</i>		Crete
All	<i>Hands-on Discards</i>	(*)	
All	<i>Statistics for Discards</i>		(*)
All	<i>Maturity Sampling Design</i>	To Be Defined	

(*) - Only in case the Discard Atlas does not include this WK

5.4 Developments for Age Reading Workshops

The workshops carried out in 2005 are clearly fulfilling the objectives of training, discussion of methods and evaluating agreement. However, there are differences occurring in the approaches and reporting of the workshops. Also the use that is made of these works was considered far from optimal, whether because it remains unpublished and difficult to find or because the experiment design is poor and it becomes impossible to fully understand the effect of the training (see Section 3 on the last subject). Additionally to these subjects the PG considered that reader anonymity, collections of digitised and annotated otoliths, and monitoring of readers consistency are important and further developed proposals on these issues.

With relation to publishing there was a general agreement that all workshop reports must be made easily available to avoid losing the knowledge gained. At present, age workshop coordinators need to submit their reports to the PGCCDBS that will make them available on the ICES webpage (or the PGCCDBS wiki). However this is not a good solution as the ICES page does not have a good documentation repository fully indexed and searchable. The PG will investigate web tools for storage and indexing the reports and provide advice on this subject to ICES, TACADAR and JRC in order to find a solution for hosting the system.

The performance of each age reader, in terms of bias and precision, is very important when deciding which weight to give to each set of age readings, or even to decide to use or not a given age-length key. Therefore, the performance measured in an exchange/workshop must be known by the person in charge of taking that decision. However, the readers identification must not be publicly available, to avoid embarrassment in the case of poor performance, which could lead to non-participation or pressure to cheat in future exchanges/workshops.

PGCCDBS also suggests that each workshop prepares a digitised set of agreed age otoliths with and without annotations. This can be used as a basic training set and will further increase the value obtained from the workshops.

There was also brief discussion of the idea of annual exchanges to maintain standards and monitor the readers' performance but this topic requires further development. The group supported the example of Baltic Sea herring where there is an exchange of around 300–400 otoliths a year but felt exchanges of this scale were too large a task to be practical to recommend that they happen for all species, annually.

5.5 Maturity Staging workshops

The group recognised that arrangements for maturity staging workshops are far less common and more ad-hoc than age reading workshops. The idea that maturity staging should be introduced into ageing workshops was discussed. It was decided this could only be carried out where the same people read the otoliths and carry out the maturity staging. Although this does happen (e.g. in FRS, Scotland, or IPIMAR, Portugal), in many institutes it is not the case. To combine ageing and maturity staging in one workshop would result in the meetings being too large and of limited interest/use to some participants.

It is suggested that holding separate maturity staging workshops where a group of species is considered is a more efficient way forward. These species groups will be defined based on biology, for example by grouping gadoids or by grouping pelagic. These maturity staging workshops will focus on the practical task of staging and will compliment the workshop on maturity sampling which will study sampling design (see Section 4 and Annex III). Maturity staging workshops will be based on data for all regions - unlike ageing. The workshops need to be scheduled during the spawning period when the gonad changes are open to a difference in interpretation.

To conduct such a work with a high probability of success the group identified a set of tasks that needs to be carried out before the workshop. This should be carried out by each participant and the workshop Chair must assure that all participants accomplish their part of the work:

- Review any available information,
- Collect digital images of maturity stages and post images on a shared website,
- Look at number of stages used. Consider if reducing the number of stages will help agreement. Define mappings from national stages: if for example the IBTS four-stage maturity is adopted then MS' must produce mappings to it.

There was a proposal from the Commission to contact JRC/ISPRA in order to explore the possibility of having an image collection of maturity stages in their website and the PG nominated Ulrich Berth (Germany) to act as advisor on the development of such website.

Some maturity staging workshops were already planned and added to the list of workshops for 2007.

5.6 Software

PGCCDBS could not resolve the issue of an integrated approach during its meeting in Rostock. In view of the importance of the issue, the group was of the opinion that more time is needed to explore the possibilities and the technical requirements of integrated systems (even if they start from existing technologies such as FishFrame and COST; see next paragraph and Annex 5), and to elaborate a cohesive and widely supported project along the terms outlined above.

PGCCDBS also identified a number of issues that need to be clarified - and resolved where needed - in order to make an integrated system based on the existing FishFrame and COST technologies, generally acceptable and applicable. Problem areas identified relate, amongst others, to:

- The necessity to upload all raw data into a physically separate database held in a central location or, as an alternative, the possibility of accessing the data through a network of databases with a central gateway.
- The confidentiality and user rights of data stored in a central data warehouse, and the proper identification of the (potential) user-groups.

- The access to and transfer of data that have different formats than the ones used by the central data warehouse or the central gateway.
- The overlaps between FishFrame and COST in the assortment of evaluation tools already provided and/or to be developed in the near future.
- The optimum way to integrate FishFrame and COST, in order to ensure maximum compatibility, complementarity, versatility, and connectivity with end-user data management and processing tools such as InterCatch and FLR-applications (1).
- The maintenance of the integrated system, once it has been developed and declared operational.

Most of these problems however, are of a strictly technical or financial nature, and their solution should rather be seen as a challenge than as an argument against the general principle of an integrated approach.

PGCCDBS was informed that it is the intention to further discuss the integration of FishFrame and COST within a meeting of dedicated experts, including IT and end-users experts. This meeting should elaborate on a solution including a steering committee, with the task to co-ordinate the future development of complementary and hopefully converging initiatives aiming at the development of an integrated data storage and quality evaluation system.

6 Review of discards sampling programmes (ToR e)

PGCCDBS considered the report of the 2006 Liaison Meeting (Anon., 2006) in relation to discard sampling and was encouraged by the current progress, and proposals for future cooperation. It is the view of this PG that the continuing review and assessment of task sharing and cooperation within the discard sampling is best served at RCM level.

The PG was informed about a proposal development for a “Discard Atlas” (Anon., 2005a) and are of the firm opinion that this would serve as a suitable tool to address such matters. However, we note that the current proposal relates to a specific task, ending in 2007. In finalising the project we feel consideration must be given to a means of being able to extend or build on the series.

7 Raising procedures for discards (ToR f)

The PG recognised that each country apply their own raising procedures, but also try and incorporate the outcomes of the Workshop on Discard Sampling Methodology and Raising Procedures (ICES, 2004a) as well as any previous work that may have been done. The presentation of a working document by Joel Vigneau (Annex 6), in support of PGCCDBS (Raising procedures for discards: sampling Theory) was appreciated by this PG and the interest shown in this subject has highlighted the need for a common approach in incorporating new initiatives into raising procedures.

In summary, this working document proposes three raising procedures strictly based on Cochran’s sampling theory (Cochran, 1977). The purpose of the working document is to define common procedures for raising discard sampling independently of research being done on the optimum raising procedures for particular stocks. In other words, all the innovative raising procedures aiming to improve the precision of the estimates or modelling of discarding

(1) FLR is a generic software framework aiming at the development and evaluation of management strategies for a broad range of objectives. Currently, the framework is being used to develop bio-economic models, multi-annual management plans and fishery-independent assessment methods within a variety of EU Projects (website: <http://flr-project.org>).

behaviour in a purpose of improving knowledge are very much welcome. The basic raising procedures presented in working document are meant to be easily implemented for any stock by any institute and be the referential to which innovative raising procedures should be compared to. The PG noted that this work was to go through a revision progress and should be presented at the Annual Science Conference (Theme session on discards) later this year.

The “Discard Atlas” project proposal is also supposed to cover methodological issues of raising procedures for discards. It is the PG view that it would be beneficial if guidelines in how to define standard protocols for raising of discards, including how to incorporate recent and future initiatives, should be addressed within this project. We see this developing along the lines of a “hands on“ type workshop followed up by a meeting consisting of a small number of statistical experts, addressing the issues raised at the “hand on” workshop. In case the “Discard Atlas” does not address the methodological subjects we recommend that the chair of PGCCDBS convene such a workshop with the following terms of reference:

- a) To identify and summarise the concerns countries have in relation to raising procedures.
- b) To provide an expert statistical group with the information and data needed to provide guidelines for standard protocols for raising discards.

In order to be successful some tasks were identified that needed to be carried out before the workshop.

- 1) Each country should provide study cases analysing the difference between the use of differing raising procedures, possibly taking into account current initiatives.
- 2) Each country to provide details of sampling intensities (e.g. number of trips sampled against total number of trips) for all sampled fleets (defined according to the Nantes meetings).
- 3) Where possible, countries should complete the Discard Sampling Review Form (ICES, 2004a) 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.
- 4) Each country to provide a description of variables that are available to them for raising procedures.

The workshop proposal is presented in Annex 7.

8 Emerging problems with expected impact on assessment input data (ToR g)

The group identified 3 subjects that could have impact on the future design of sampling plans: fleet based stratification, self-sampling and sampling directly for ages.

Fleet based stratification can have an impact on the stability of the strata and lead to over stratification problems. However the fact that the sampling schemes will be in agreement with management units was considered more important and the PG considered that it was not necessary to further develop on this subject for the moment.

Sampling directly for ages was also considered not relevant in terms of sampling programmes implementation and estimation procedures.

Self-sampling was considered problematic due to problems with bias identification and a workshop on this subject was proposed to be carried out. The workshop proposal is presented in Annex 7.

9 Conclusions and Recommendations

9.1 On national sampling manuals and standard operations procedures (ToR a)

- 1) It was recognized that these information would help on a future comparison analysis and eventually on standardization of procedures over European countries, although it was not clear how the analysis would proceed.
- 2) The PG proposed to carry on this task online using the wiki (<http://pnab.ipimar.pt/pgccdbbs>).
- 3) A team formed by Jørgen Dalskov, Christian Dintheer, Ulrich Berth and Costas Papaconstantinou will coordinate the protocols collection, starting by:
 - developing the webpage structure,
 - managing the files submitted.

9.2 On international protocols (ToR b)

- 1) The process of data quality evaluation must be based on a set of International Protocols that will define how the information flows between data-providers and data-users and which standards it must comply with.
- 2) Under this ToR the PG focused on the flow of the information from data-providers to data-users and a two step procedure was proposed (draft proposals of forms were presented for further development in Annex 3 and 4):
 - 2.1) provide a detailed description of the sampling scheme/raising procedures etc.
 - 2.2) provide a yearly report with information about the achieved sampling by stock.
- 3) PGCCDBS advise that comparisons between readers in ageing workshops need to be planned from the start of the exchange and carried out using the principles of designed experiments (see for example, Heath 1995).
- 4) PGCCDBS aims to contribute to the work done by EFAN and TACADAR projects on protocols for ageing workshops, providing guidelines on how to incorporate experimental design into the age reading workshops, so that statistically sound analyses be carried out on comparisons between different methods and comparisons in readability between the start and end of the workshop.

9.3 On the review of recommendations from other groups and the role of PGCCDBS (ToR c)

- 1) PGCCDBS considered that there was a need to develop a procedure for ensuring that Assessment WGs are more actively involved in both requesting information that they need and communicating back to the data collection system. In order to formalise this, ICES will need to develop clear guidelines for the stock coordinators on how to address the data-providers. On this issue PGCCDBS recommends that:
 - 1.1) ICES provide guidelines and procedural rules to the Stock Coordinators on how to address data-providers.
 - 1.2) ICES and the EC jointly develop standard enquiry forms which indicate what data Assessment WGs requested from the MS and what was actually received from the MS.
 - 1.3) ICES develop standard forms for the feedback from the Assessment and Advisory Groups to the data-providers.
- 2) PGCCDBS should contribute by developing standards and Standard Operational Procedures (SOP) for data collection in close co-operation with Assessment WGs and other data-users.

- 3) PGCCDBS would also address particular issues in relation to data quality, SOPs, etc., upon request, and would have the possibility to call for or make proposals for, the organisation of dedicated Workshops to deal with specific methodological issues.
- 4) Further ways of improving communication include having the PGCCDBS Chair participate in the AMAWGC meeting in the beginning of the year and at the ASC and to encourage the participation of assessment scientists in the PGCCDBS.

9.4 On recommendation on workshops received from the DCR Liaison Meeting

- 1) PGCCDBS agrees with the proposal for a Workshop on UWTV Surveys for Nephrops.
- 2) PGCCDBS considered that the requests for species-specific workshops on maturity data covered two separate issues, viz.
 - 2.1) the methodological approach to setting up the most effective sampling programme for maturity,
 - 2.2) problems related to standardisation of maturity staging,
- 3) PGCCDBS proposes that dedicated thematic workshops be convened on these issues instead of a potentially large number of species-specific workshops that would deal with essentially similar topics.
- 4) PGCCDBS therefore proposes that a workshop to look into sampling design and aggregation of maturity data be carried out and developed ToR and major tasks for it.

9.5 On data quality (ToR d)

- 1) Tables 5.1, 5.2 and 5.3 present the proposed workshops for the next 2 years and should be used by each EU-MS to be included in their national programmes.
- 2) The workshops carried out in 2005 are clearly fulfilling the objectives of training, discussion of methods and evaluating agreement. These workshops made several specific recommendations on how to improve age readings and other biological parameters analysis.
- 3) However, there are differences occurring in the approaches and reporting of the workshops and the use that is made of these work was considered far from optimal, in particular due to:
 - 3.1) reports remain unpublished and difficult to find;
 - 3.2) the experiment design is poor and it becomes impossible to fully understand the effect of the training.
- 4) PGCCDBS will investigate web tools for storage and indexing the reports.
- 5) PGCCDBS also suggests that each workshop prepares a digitised set of agreed age otoliths with and without annotations.
- 6) PGCCDBS supported the example of Baltic Sea herring where there is an exchange of around 300–400 otoliths a year, to monitor readers agreement.
- 7) PGCCDBS recognised that arrangements for maturity staging workshops are far less common and more ad-hoc than age reading workshops.
- 8) PGCCDBS suggested that maturity staging workshops by groups of species should be organized.
- 9) PGCCDBS considered that a website to store an image collection of maturity stages needed to be developed and nominated Ulrich Berth (Germany) to act as advisor on the development.

9.6 On review of discards sampling programmes (ToR e)

- 1) PGCCDBS considers that the continuing review and assessment of task sharing and cooperation within the discard sampling is best served at RCM level.

- 2) PGCCDBS 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.

9.7 On raising procedures for discards (ToR f)

- 1) PGCCDBS appreciated the presentation of a working document by Joel Vigneau on raising procedures for discards.
- 2) The interest shown in this subject has highlighted the need for a common approach in incorporating new initiatives into raising procedures.
- 3) PGCCDBS proposed a “hands on” type workshop followed up by a meeting consisting of a small number of statistical experts addressing the issues raised at the workshop, with the aim of providing clear guidelines and protocols for discard analysis and estimation.
- 4) PGCCDBS expects this proposal to be included on the “Discard Atlas” project proposal, otherwise the Chair of PGCCDBS should convene such a workshop.

9.8 On emerging problems with expected impact on assessment input data (ToR g)

- 1) The group identified 3 subjects that could have impact on the future design of sampling plans: fleet based stratification, self-sampling and sampling directly for ages.
- 2) Self-sampling was considered problematic due to problems with bias identification and a workshop on this subject was proposed.

10 References

- Anon. 1998a. Campagne internationale de chalutage démersal en Méditerranée (MEDITS) : manuel des protocoles. *Biol. Mar. Medit.* 5(2): 515–572.
- Anon. 1998b. Report of the International Baltic Sea Sampling Programme I. EU Study project 96/002.
- Anon. 2000a Report of the International Baltic Sea Sampling Programme I. EU Study project 98/024.
- Anon. 2000b. Final Report of Study Contract 97-059, Framework for Improved European Fisheries Assessment (FIEFA)., pp.172.
- Anon. 2001a. Final Report of CFP Study Project 98/075, Evaluation of market sampling strategies for a number of commercially exploited stocks in the North Sea and development of procedures for consistent data storage and retrieval (EMAS).
- Anon. 2001b. Final Report of FAIR-CT 96/1304, European Fish Ageing Network (EFAN), Final Report, 38 pp.
- Anon. 2005a. Commission Staff Working Paper: Evaluation of 2004 National Data Collection Programmes undertaken under Commission Regulation (EC) No 1639/2001. 62 pp.
- Anon. 2005b. Commission Staff Working Paper: Report of the DCR Medits Working group. Nantes, France, 15–18 March 2005. 30 pp.
- Anon. 2006. Commission Staff Working paper: Report of the 2nd Liaison Meeting between the Chairs of the RCMs, the Chair of SGRN and the European Commission. Brussels, 6–7 February 2006, 37 pp.
- Cochran, W.G. 1977. *Sampling Techniques*. John Wiley & Sons, New York, 330 pp.
- Cunha, M.E., Garrido, S., Pissarra, J. 2005. The use of stomach fullness and colour indices to Access *Sardina pilchardus* feeding. *Journal of the Marine Biological Association of the United Kingdom*, 85: 425–431.

- Eltink, A.T.G.W., Newton, A.W., Morgado, C., Santamaria, M.T.G. and Modin, J. 2000. EFAN Report 3-2000: Guidelines and Tools for Age Reading Comparisons. Version 1 October 2000, 75 pp. [[<http://www.efan.no>]]
- Eltink, A.T.G.W. 2000. Age reading comparisons. (MS Excel workbook version 1.0 October 2000) Internet: <http://www.efan.no>
- Heath, D. 1995. An Introduction to Experimental Design and Statistics for Biology. CRC Press LLC, Boca Raton.
- ICES. 1998. Report of the Baltic Herring Age-Reading Study Group, Riga, Latvia, 23–27 February 1998. ICES CM 1998/H:2.
- ICES. 2002. Report of the International Bottom Trawl Survey Working Group, Dublin, Ireland, 8–11 April 2002. ICES CM 2002/D:03, 59 pp.
- ICES. 2003a. Report of the Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS). 4–7 March 2003, Rome, Italy, ICES CM 2003/ACFM:16, 40 pp.
- ICES. 2003b. Report of the Study Group on Growth, Maturity and Condition in Stock Projections, ICES Headquarters, 5–10 December 2002, ICES CM 2003/D:01, 103 pp.
- ICES. 2004a. Report of the Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS), 2–5 March 2004, Mallorca, Spain, ICES CM 2004/ACFM:13, 75 pp.
- ICES. 2004b. Report of the Study Group on Growth, Maturity and Condition in Stock Projections, 19–23 January 2004, Aberdeen, UK, ICES CM 2004/D:02, 70 pp.
- ICES. 2005. Report of the Planning Group on Commercial Catch, Discards and Biological Sampling (PGCCDBS), 1–4 March 2005, Oostende, Belgium, ICES CM 2005/ACFM:15, 153 pp.
- ICES. 2006. Report of the Annual Meeting of Assessment Working Groups Chairs (AMAWGC), 30 January – 03 February, Copenhagen, Denmark, ICES CM 2006/ACFM:17.
- Kornilovs, G. 2005. Age determination alternatives in Baltic herring from the Gulf of Riga. Working Document presented to the Herring Age Reading Workshop, Island of Seili, Finland, 6–9 June, 2005.
- Meditis. 2002. The Medits survey 2000 and 2001 data analysis. Volume 2. Instruction manual, version 4. Ifremer, IEO, SIBM & NCMR, EC project 99/026-014-046-038. 37 pp.
- Stransky, C., Gudmundsdottir, S., Sigurdsson, T., Lemvig, S., Nedreaas, K., and Saborido-Rey, F. 2005. Age determination and growth of Atlantic redfish (*Sebastes marinus* and *S. mentella*): bias and precision of age readers and otolith preparation methods. ICES Journal of Marine Science, 62: 655–670.
- Uriarte, A. 2001. Report of the 2001 Anchovy otolith exchange programme from Sub-area VIII and division IXa. (Annex to PELASSES report- EU study Project -EC DG XIV Contract n°99/010).
- Uriarte, A.; Blanco, M.; Cendrero, O.; Grellier, P.; Millán, M.; Morais, A.; Rico, I. 2002. Report of the Workshop on anchovy otoliths from subarea VIII and division Ixa (Annex to PELASSES report EU study Project -EC DG XIV Contract n°99/010 and Working Document to the ICES Working Group on the assessment of Mackerel, Horse Mackerel, Sardine and Anchovy. Copenhagen, 10–19 September 2002.).

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Annex 2: Agenda

The working period was between 09:00H and 18:00H.

- Day 01 (28/02)
 - Morning
 - Welcome & Co
 - Plenary:
 - Introduction & local info (max 15')
 - Chair presentation (15' presentation, max 60' discussion)
 - Discard Atlas by Katja (10' presentation, max 30' discussion)
 - Afternoon
 - Plenary:
 - working documents (10' presentation, max 10' discussion)
 - reports presentation (10' workshops, 5' exchanges)
 - Software
 - Common Tool Project by Joel (10' presentation)
 - other software presentations (10' each)
 - discussion (max 60')
- Day 02 (01/03)
 - Morning
 - Subgroups: work
 - Afternoon
 - Plenary: update the ongoing work (max 30')
 - Subgroups: work
- Day 03 (02/03)
 - Morning
 - Subgroups: work
 - Afternoon
 - Plenary: discussion on subgroups results
 - Subgroups: work
- Day 04 (03/03)
 - Morning
 - Plenary: final discussion and review report

Annex 3: Questionnaire on sampling programmes and procedures

The questionnaire below is meant to be used by experts in stock assessment Working Group. The information only relates to data which are used as input for calculation of Catch at Age in NUMbers (CANUM), mean Weight at Age in Catch (WECA), tuning FLEET (FLEET) and PROPortion MATure at age (MATPROP). The content of the *infra* input tables are figures which come from sampling process. The sampling intensity and, more and more, the precision achieved are available to working group experts but a good precision does not certify the good quality of the data. In order to improve the quality of the data, a way has to be found to track all the steps followed from the collection of the data to the final estimates used as input of stock assessment models, viz. the sampling procedure, the quality control and the raising procedures. The purpose of the following tables is to provide an overview of the operating process 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 following questionnaire can be seen has the link between the statistical description of the samples (intensity, precision) and the precise written manuals.

The questionnaire below must be provided by the responsible of the sampling to the stock coordinator, and the latter does the compilation at an international level for the stock assessment expert. The filling of the following tables may be considered as time consuming at the beginning but, at a stock level, the process are not meant to change every year once it has been commonly agreed, so that year after year only small changes are tracked.

It is possible that inside a defined *stratum*, sub-divisions are made for task sharing or avoidance of bias. This stratification is considered as part of the sampling design and must be described in the sampling manual. Only the information concerning the stratification used for raising purpose is requested here.

Due to the consideration demanded to elaborate the questionnaire below, only one part of it has been developed, viz. the sea-sampling table. The completion of all the tables will use the same philosophy and should be finalised intersessionally using the wiki internet opportunity. Once this has been done, the questionnaire should be reviewed by a group of experts on quality assessment and should be promoted for use as metadata of the figures used in stock assessment.

TABLE A. SEA-SAMPLING

This table is valid for the following stock/fishing activities/area:

SEA-SAMPLING	COUNTRY 1	COUNTRY 2		COUNTRY N
A1. Purpose of at-sea sampling programme Discards information [D], Landings information [L] or Both Discards and landings [CL]				
A2. Is your estimate based on: Sea sampling program by observers [O], Self sampling [S] or Other methods [O] <i>in this case name the method used</i> _____				
A3. Stratification used for raising purpose Temporal (year (Y), Quarter (Q), Month (M), Other (O)) Spatial (None (N), Sub-division (S), Harbour or sets of harbours (H), Bathymetry (B), Other (O)) Technical (Métier/fishing activity (M), fleet (F), Other (O))				
Existence of a descriptive written manual [Y/N]				
A4. Information collected at a trip level Landings Effort in hours (fishing time, soaked time) Effort in number of catching operations, (e.g. hauls, sets of gillnets, ...)				
Existence of a descriptive written manual [Y/N]				
A5. Haul sorting strategy Unsorted catch (U), Discards and retained part sorted by the crew (S) Retained part sorted by commercial category [Y/N]				
Existence of a descriptive written manual [Y/N]				
A6. Information collected at a haul level Estimations of all commercial and non commercial species, (A), commercial species only (C) or Short list of commercial species (S) Effort in hours (fishing time, soaked time) [Y/N] Length measurements [Y/N] Collection of calcified items (otoliths, scales, ...) [Y/N] Collection of biological parameters (Maturity (M), sex (S), individual weights (W))				
Existence of a descriptive written manual [Y/N]				

TABLE B. SAMPLING OF THE LANDINGS FOR LENGTH
This table is valid for the following stock/fishing activitys/area:

SAMPLING OF THE LANDINGS FOR LENGTH	COUNTRY 1	COUNTRY 2		COUNTRY N
B1. Stratification used for raising purpose Temporal (year [Y], Quarter [Q], Month [M], Other [O]) Spatial (None [N], Sub-division [S], Harbour or sets of harbours [H], Bathymetry [B], Other [O]) Technical (Métier/fishing activity [M], fleet [F], Commercial categories [C], Other [O])				
Existence of a descriptive written manual [Y/N]				
B2. Information collected				
Existence of a descriptive written manual [Y/N]				

TABLE C. SAMPLING OF THE LANDINGS FOR AGE
This table is valid for the following stock/fishing activitys/area:

SAMPLING OF THE LANDINGS FOR AGE	COUNTRY 1	COUNTRY 2		COUNTRY N
C1. Stratification used for raising purpose Temporal (year [Y], Quarter [Q], Month [M], Other [O]) Spatial (None [N], Sub-division [S], Harbour or sets of harbours [H], Bathymetry [B], Other [O]) Technical (Métier/fishing activity [M], fleet [F], Commercial categories [C], Other [O])				
Existence of a descriptive written manual [Y/N]				
C2. Information collected				
Existence of a descriptive written manual [Y/N]				

TABLE D. RAISING TO NATIONAL CANUM AND WECA
This table is valid for the following stock/fishing activitys/area:

RAISING TO NATIONAL CANUM AND WECA (INCLUDES ALL KIND OF SAMPLING ACTIVITIES)	COUNTRY 1	COUNTRY 2	COUNTRY N

TABLE E SAMPLING FOR ESTIMATING WEIGHT AT LENGTH/AGE
This table is valid for the following stock/fishing activitys/area:

SAMPLING FOR ESTIMATING WEIGHT AT LENGTH/AGE	COUNTRY 1	COUNTRY 2	COUNTRY N

TABLE F SAMPLING FOR ESTIMATING MATURITY AT LENGTH/AGE
This table is valid for the following stock/fishing activitys/area:

SAMPLING FOR ESTIMATING WEIGHT AT LENGTH/AGE	COUNTRY 1	COUNTRY 2	COUNTRY N

TABLE G SAMPLING FOR ESTIMATING SEX-RATIO
This table is valid for the following stock/fishing activities/areas:

SAMPLING FOR ESTIMATING SEX-RATIO	COUNTRY 1	COUNTRY 2		

Annex 4: Yearly sampling report to WG

Table 1: Total Landings/Stock/Gear

GEAR TYPE	TOTAL LANDINGS (T)
X	
Y	
Z	

Table 2: Landings and commercial sampling detail

Year:

Stock:

GEAR TYPE	XXX	Landings(t)	Fishing Effort	LENGTH		AGE	
	Quarter			Sample(n)	Fish(n)	Sample(n)	Fish(n)
	1						
	2						
	3						
	4						
	Total						

Table 3: Discard sampling detail

Year:

Stock:

FLEETS/METIERS	AREA	N TRIPS	N HAULS	N LENGTH	N AGE
XXX					
XXX					

Annex 5: Description of software (Common Tool and FishFrame)

Details on FishFrame.

General

FishFrame is an existing web-based data warehouse application that can be accessed on www.FishFrame.org.

FishFrame makes the link between primary, national datasets and the aggregated data used in the assessment process. The main information flow in FishFrame brings data through successive steps of data checking, raising, extrapolation and export to the assessment tools. Data status is tracked along this path, and relevant information is available to the user through interactive analysis and reports. Data confidentiality and access to the data manipulation tools is handled under a tight, role-based security system.

FishFrame is an open source project. The free licensing policy is described in the License Document, which can be found on the documentation page of the FishFrame website. A full set of source codes for the latest version of FishFrame can be obtained by contacting the FishFrame team.

Data

FishFrame contains all data relevant to fisheries assessment, except data for establishing commercial tunings fleets. The relevant data sets include:

- Biological information on the landings obtained by market sampling.
- Biological information on the catches (discarded and retained parts of the catch, compiled separately) obtained by sea-going observers or collected by fishermen (self-sampling).
- Official effort and landings statistics by two different aggregation levels.
- Data from acoustic surveys (integrated scrutinized NASCs, biological information from the catch).
- Scientific demersal trawl survey data on exchange format.

All biological information is basically in disaggregated format, i.e. by haul/set for sea and harbour sampling, and by single sample for marked samples. Results from scientific demersal trawl surveys (not acoustic surveys) are copies of the data uploaded to the ICES database, DATRAS.

The variables included in FishFrame should satisfy the data needs for most assessment models, including fishery based assessment models. For a complete list of variables included in FishFrame, see the exchange format specifications under "Info & Help" on the FishFrame website.

Functionality

- Data storage of:
 - Raw or hardly aggregated data.
 - Highly aggregated data.
- Data exploration.
- Data quality checking.
- Data status tracking.
- Raising and extrapolation.

- Central reports and analysis, like CPUEs and discard rates.
- Export.

Project notes

It is very important for the FishFrame team that all developments are made in a bottom-up process, i.e. through close co-operation between developers, architects and end-users. This is considered to be the most effective approach to add true value to the end-users.

So far, the FishFrame project has been managed by DIFRES and all software has been written by software developers in DIFRES. The FishFrame team would like to widen the management and design group, and to formalize it. Furthermore, non-DIFRES software developers are most welcome to join the team. The modular software architecture provides the basis for an "allotted" development.

For the time being, hosting of the FishFrame servers has been done by DIFRES. This could continue as long as participating institutes are satisfied with DIFRES' role in the process. However, hosting could also be done by any other institute, should there be a need/wish to do so.

Details on the Common Open Source Tool (COST) project

Objectives

The objective of the COST-project is to provide a common tool for assessing the accuracy of parameter estimates collected within the framework of the DCR (EC Regulations 1639/2001 and 1581/2004).

The Common Tool is a logical follow-up of the two Precision Workshops held in 2004 (ICES WKSCMFD) and 2005 (ICES WKSDFD), where clear demonstration has been made of the need to quantify the quality of the data used in fish stock assessments. One of the aims of precision calculation should be to find the optimum intensity and sampling share between countries and/or métiers at the stock level, be it for estimating the length and age structure of the catches and/or landings, or for estimating biological parameters. So far however, there are no clear guidelines for the collection of data on sexual maturity, fecundity, sex-ratio and growth, and the Common Tool could be the place where agreement could be reached, at least, on the statistical methods to implement.

The development of the Common Tool would go hand-in-hand with user workshops, where participants of each country would come with their own data. The statistical outcomes could then be presented and discussed in plenary sessions, in the presence of statisticians. This approach would not only improve the quality and convergence of the collected data, but also the expertise of the participants.

Platform

The Common Tool will be developed with the "R" freeware, in an object-oriented language. The tool should consist of classes corresponding to the data by module of the DCR, and appropriate methods to work out these classes. All code should be open source, so that continuous development and improvement is encouraged. A formal description of the methods to be included in the Common Tool will be given following the first meeting of experts.

The development of the Common Tool will also take into account the linkage with other packages acting as interfaces for the data flow (where FishFrame could play a major role) or as recipients of the outcomes (like FLR).

Packages

The Common Tool will consist of packages that will develop similar methods to investigate and estimate sampling indicators for (i) discards, (ii) length and age structure of catches and landings, and (iii) biological parameters such as growth, maturity and sex-ratio. The estimates will be calculated according to one out of a fixed number of agreed raising procedures. The packages are:

- Data administration (which could be minimal in the case FishFrame is used as an interface).
- Exploratory data analysis.
- Parameter estimation and associated precision.
- Simulation.

For more details concerning the packages, see the description of the COST-project (<http://pnab.ipimar.pt/pgccdbbs/doku.php?id=meet06:ctp>).

Maintenance of the project

The Common Tool will be developed by a core team of statisticians, supported by software developers and others experts, who will give assistance on specific issues. The COST-project as such has a limited duration, but the open source philosophy of the Common Tool allows further development and implementation beyond the duration of the project itself. It is therefore recommended that the core team be installed on a long-term basis, to ensure the coherence of future developments, and to make sure that any modified or new methods receive the approval of the core team before being used by the wider scientific community.

Annex 6: Working Document on Raising Procedures for Discards by Joel Vigneau

Raising procedures for discards: Sampling theory

(Toward agreed methodologies for calculating precision in the discard programmes)

Working document in support of PGCCDBS (Rostock, 2006), term of reference f)

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Introduction

The “best” raising procedure for discards in fishery science is like “l’arlesienne”², everyone talks about it but nobody has ever seen it. The specific workshop on discards (Anon. 2003) proposes formulas that are too simplistic as they do not take into account the within trip variance. The literature is full of attempts and results but they are always specific to particular case studies (Stratoudakis *et al.*, 2001, Cotter *et al.*, 2001) or based on inconsistent hypothesis as demonstrated by Rochet and Trenkel (2005). When some generalities are finally found (Borges *et al.*, 2005), the formulas developed do not correspond to multistage sampling because of the unavailability of essential parameters and because the aim of the study is “*not to identify optimum raising procedures*”. The object here is not to discuss the accuracy of such or such document but to build step by step the reasoning for estimating the total volume of discards, in weight or in number, from the hypothesis to the associated variance. With the objective of clarity, the exact reference to the chapters of the two books always cited (Cochran, 1977 and Thomson, 1992) will be provided and when possible the reference to formulas specified in Cochran’s sampling theory.

The basis – ground implementation

The implementation of on-board observers for discards or for total catch estimates generally follows the same protocol. The stratification used is the quarter for the temporal dimension, and métier as defined by the *ad hoc* expert group (Anon., 2005) for the technical dimension. For an accurate discussion on the best stratification for discards purpose, see Tamsett *et al.* (1999). In each of the strata, observers stroll around harbours or contact captains by phone, and try to arrange an observation trip regarding the métier practised by the vessel, the weather forecast and the availability of the observer. In theory, it is then the choice of a vessel followed by the choice of a fishing trip. In theory then, the vessel should be drawn from a list of vessels practising a given métier at a given quarter, and the trip should be drawn from a list of trips operated by the given vessel. This approach has been developed by Tamsett *et al.* (1999) and formulas developed for a three-stage sampling can be found in Wang *et al.* (*in press*). The respect of random is extremely difficult in on-board observers programmes due to all sorts of impediments which description is not the subject of this paper. Cochran (1977)

² Alphonse Daudet (1866). Lettres de mon moulin.
http://en.wikipedia.org/wiki/L%27Ar%27Arl%C3%A9sienne_%28play%29

specifies that if the variable of interest, here the volume of discards of a given species, is randomly distributed in the population, the non-random status of the drawing is of less importance. It is hardly the case here if we believe that discarding conforms to some underlying hidden rules. Therefore, the respect of random drawing is the first step of a good discard sampling.

Here is a suggestion to approximate as much as possible the drawing of fishing trips at random in the population of fishing trips. First, create a list of vessels practising a given métier per month, based on information from preceding year. For a quarter, draw at random a list of vessel*month and contact the captains on the list to check (i) that they will practise the right métier that particular month of the quarter and (ii) whether they are willing to take an observer on board. Such a list should contain much more vessels*month than expected to allow impossibilities to sample. The next on the list would then be chosen in replacement. The population of fishing trips are considered independent (no vessel effect) and sample trips will be considered as the primary sampling units (Stratoudakis *et al.*, 1999).

Once on board, the observer will chose hauls to sample. In Cochran’s theory, the hauls should be taken randomly. Once again, there is no predefined list of hauls upon which one can base a random sample. The idea is then to make a kind of systematic sampling, spreading the samples equally during the day and the night and equally among the fishing days of the trip. The random hypothesis is ensured by the random distribution of the variable of interest in this particular case (same vessel, same trip, same geographical area, ...). The hauls are considered as the secondary units.

Once a haul is chosen, another sub-sampling may occur by dividing the catch into boxes, and when a box is chosen, a sub-sample of one species may occur for counting, weighing and/or measuring. These levels are not considered here as they would make this document too much complex. Moreover, it is known that these levels do not account for much in the total variance (Tamsett *et al.* 1999) if the on-board observer pays great attention in dividing into as much equal parts as possible.

By construction, the sampling for discards follows a multi-stage sampling with fishing trips chosen with equal probabilities. For educational purpose, this document will explain only the two-stage sampling.

In the following formulas, the correction of finite population will be used at the trip level and will not be used to estimate the variance between trips. The reason being that the proportion of hauls sampled during a trip is well over the theoretical threshold of 5% and the proportion of trips sampled is well below.

Notations

	POPULATION	SAMPLE
Number of trips	N	n
Volume of discards in a haul <i>j</i> of a trip <i>i</i>	Y_{ij}	y_{ij}
Reference to a trip	<i>i</i> (<i>i</i> = 1, ..., N)	<i>i</i> (<i>i</i> = 1, ..., n)
Number of hauls in a trip <i>i</i>	M_i	m_i
Reference to a haul	<i>j</i> (<i>j</i> = 1, ..., M_i)	<i>j</i> (<i>j</i> = 1, ..., m_i)
Haul level		
Mean volume of discards per haul in a trip <i>i</i>	$\bar{Y}_i = \frac{1}{M_i} \sum_{j=1}^{M_i} Y_{ij}$	$\bar{y}_i = \frac{1}{m_i} \sum_{j=1}^{m_i} y_{ij}$
Mean volume of discards per haul	$\bar{\bar{Y}} = \frac{1}{N} \sum_{i=1}^N \bar{Y}_i$	$\bar{\bar{y}} = \frac{1}{n} \sum_{i=1}^n \bar{y}_i$

Trip level		
Total volume of discards in a trip i	$Y_i = M_i \bar{Y}_i$	$\hat{y}_i = M_i \bar{y}_i$
Mean volume of discards per trip	$\bar{Y} = \frac{1}{N} \sum_{i=1}^N \bar{Y}_i$	$\bar{y} = \frac{1}{n} \sum_{i=1}^n \bar{y}_i$
Variance (between hauls and within trip i)	$S_{2i}^2 = \frac{\sum_{j=1}^{M_i} (Y_{ij} - \bar{Y}_i)^2}{M_i - 1}$	$s_{2i}^2 = \frac{\sum_{j=1}^{m_i} (y_{ij} - \bar{y}_i)^2}{m_i - 1}$

First alternative – Use of sampling theory

Assumptions

A1 : The trips are drawn at random with equal probability $p = 1/N$

Number of trips is known at the population level

Formulas can be found in Cochran (1977) chapter 11.7 and Thompson (2002) chapter 13.1

	POPULATION	SAMPLE
Total volume of discards (in a stratum)	$Y = \sum_{i=1}^N Y_i$	$\hat{y}_I = \frac{N}{n} \sum_{i=1}^n \hat{y}_i$

$$\hat{y}_I = \frac{N}{n} \sum_{i=1}^n \hat{y}_i = \frac{N}{n} \sum_{i=1}^n M_i \bar{y}_i = \frac{N}{n} \sum_{i=1}^n \left[M_i \sum_{j=1}^{m_i} \frac{y_{ij}}{m_i} \right] \quad (11.21)$$

the associated variance is

$$\text{Var}(\hat{y}_I) = \frac{N^2}{n} \frac{\sum_{i=1}^n (\hat{y}_i - \bar{y})^2}{n-1} + \frac{N}{n} \sum_{i=1}^n \frac{M_i^2 (1 - m_i / M_i) s_{2i}^2}{m_i} \quad (11.24)$$

An unbiased estimate of the total volume of discards at the level of one stratum is

$$\hat{y}_I = \frac{N}{n} \sum_{i=1}^n \hat{y}_i$$

and its associated variance is

$$\text{Var}(\hat{y}_I) = \frac{N^2}{n} \frac{\sum_{i=1}^n (\hat{y}_i - \bar{y})^2}{n-1} + \frac{N}{n} \sum_{i=1}^n \frac{M_i^2 (1 - m_i / M_i) s_{2i}^2}{m_i}$$

Number of hauls is known at the population level

Formulas can be found in Cochran (1977) chapter 11.8 and Thompson (2002) chapter 13.1

	POPULATION	SAMPLE
Total volume of discards (in a stratum)	$Y = M_0 \frac{\sum_{i=1}^N Y_i}{\sum_{i=1}^N M_i}$	$\hat{y}_{II} = M_0 \frac{\sum_{i=1}^n \hat{y}_i}{\sum_{i=1}^n M_i}$

$$\hat{y}_{II} = M_0 \frac{\sum_{i=1}^n \hat{y}_i}{\sum_{i=1}^n M_i} = M_0 \frac{\sum_{i=1}^n M_i \bar{y}_i}{\sum_{i=1}^n M_i} = M_0 \frac{\sum_{i=1}^n \frac{M_i}{m_i} \sum_{j=1}^{m_i} y_{ij}}{\sum_{i=1}^n M_i} \tag{11.25}$$

the associated variance is

$$Var(\hat{y}_{II}) = \frac{N^2}{n} \frac{\sum_{i=1}^n M_i^2 (\bar{y}_i - \bar{\bar{y}})^2}{n-1} + \frac{N}{n} \sum_{i=1}^n \frac{M_i^2 (1 - m_i / M_i)}{m_i} s_{2i}^2 \tag{11.30}$$

There is the possibility to avoid the need of knowing N, the total number of trips at the population level, if we make the assumption

A2: The proportion of subunits sampled at each trip is approximately constant:

$$\frac{m_i}{M_i} = cste = \frac{\bar{m}}{\bar{M}} = \frac{N\bar{m}}{M_0}$$

it comes then

$$Var(\hat{y}_{II}) = \frac{M_0^2}{n} \frac{\sum_{i=1}^n (\bar{y}_i - \bar{\bar{y}})^2}{n-1} + \frac{M_0^2 (1 - \bar{m} / \bar{M})}{n\bar{m}} \sum_{i=1}^n \frac{s_{2i}^2}{n} \tag{11.29}$$

An unbiased estimate of the total volume of discards at the level of one stratum is

$$\hat{y}_{II} = M_0 \frac{\sum_{i=1}^n M_i \bar{y}_i}{\sum_{i=1}^n M_i}$$

and its associated variance is

$$Var(\hat{y}_{II}) = \frac{N^2}{n} \frac{\sum_{i=1}^n M_i^2 (\bar{y}_i - \bar{\bar{y}})^2}{n-1} + \frac{N}{n} \sum_{i=1}^n \frac{M_i^2 (1 - m_i / M_i)}{m_i} s_{2i}^2$$

or, assuming $\forall i, m_i / M_i$ is constant

$$Var(\hat{y}_{II}) = \frac{M_0^2}{n} \frac{\sum_{i=1}^n (\bar{y}_i - \bar{\bar{y}})^2}{n-1} + \frac{M_0^2 (1 - \bar{m} / \bar{M})}{n\bar{m}} \sum_{i=1}^n \frac{s_{2i}^2}{n}$$

Second alternative – Volume of discards is proportional to an auxiliary variable

Formulas can be found in Cochran (1977) chapter 11.12 and Thompson (2002) chapter 14.1

Let X be the auxiliary variable. Auxiliary variables can be fishing time, landings of all the species or a component of the landings (small female nephrops,)

Auxiliary variable (X)	Population	Sample
Mean per haul in a trip <i>i</i>	$\bar{X}_i = \frac{1}{M_i} \sum_{j=1}^{M_i} X_{ij}$	$\bar{x}_i = \frac{1}{m_i} \sum_{j=1}^{m_i} x_{ij}$
Total in a trip <i>i</i>	$X_i = M_i \bar{X}_i$	$\hat{x}_i = M_i \bar{x}_i$
Trip level		
Variance (between hauls or within trip <i>i</i>)	$s_{2i}^2 = \frac{1}{m_i - 1} \sum_{j=1}^{m_i} [(y_{ij} - \hat{R}x_{ij}) - (\bar{y}_i - \hat{R}\bar{x}_i)]^2$	

Ratio estimates

	POPULATION	SAMPLE
Mean ratio	$R = \frac{\sum_{i=1}^N M_i \bar{Y}_i}{\sum_{i=1}^N M_i \bar{X}_i}$	$\hat{R} = \frac{\sum_{i=1}^n M_i \bar{y}_i}{\sum_{i=1}^n M_i \bar{x}_i}$

$$\hat{R} = \frac{\sum_{i=1}^n M_i \bar{y}_i}{\sum_{i=1}^n M_i \bar{x}_i} = \frac{\sum_{i=1}^n \frac{M_i}{m_i} \sum_{j=1}^{m_i} y_{ij}}{\sum_{i=1}^n \frac{M_i}{m_i} \sum_{j=1}^{m_i} x_{ij}}$$

the associated variance is

$$Var(\hat{R}) = \frac{N^2}{X^2 n} \frac{\sum_{i=1}^n (\hat{y}_i - \hat{R} \hat{x}_i)}{n-1} + \frac{N}{X^2 n} \sum_{i=1}^n \frac{M_i^2 (1 - m_i / M_i)}{m_i} s_{2i}^2$$

An unbiased estimate of the ratio between the volume of discards and an auxiliary variable at the level of one stratum is

$$\hat{R} = \frac{\sum_{i=1}^n M_i \bar{y}_i}{\sum_{i=1}^n M_i \bar{x}_i}$$

and its associated variance is

$$Var(\hat{R}) = \frac{N^2}{X^2 n} \frac{\sum_{i=1}^n (\hat{y}_i - \hat{R} \hat{x}_i)}{n-1} + \frac{N}{X^2 n} \sum_{i=1}^n \frac{M_i^2 (1 - m_i / M_i)}{m_i} s_{2i}^2$$

Total discards

	POPULATION	SAMPLE
Total volume of discards (in a stratum)	$Y = XR = X \frac{\sum_{i=1}^N Y_i}{\sum_{i=1}^N X_i}$	$\hat{y}_{III} = X\hat{R} = X \frac{\sum_{i=1}^n \hat{y}_i}{\sum_{i=1}^n \hat{x}_i}$

$$\hat{y}_{III} = X\hat{R} = X \frac{\sum_{i=1}^n \hat{y}_i}{\sum_{i=1}^n \hat{x}_i} = X \frac{\sum_{i=1}^n M_i \bar{y}_i}{\sum_{i=1}^n M_i \bar{x}_i} = X \frac{\sum_{i=1}^n \frac{M_i}{m_i} \sum_{j=1}^{m_i} y_{ij}}{\sum_{i=1}^n \frac{M_i}{m_i} \sum_{j=1}^{m_i} x_{ij}}$$

the associated variance is

$$Var(\hat{y}_{III}) = X^2 var(\hat{R}) = \frac{N^2}{n} \frac{\sum_{i=1}^n (\hat{y}_i - \hat{R} \hat{x}_i)}{n-1} + \frac{N}{n} \sum_{i=1}^n \frac{M_i^2 (1 - m_i / M_i)}{m_i} s_{2i}^2 \tag{11.51}$$

An unbiased estimate of the total volume of discards at the level of one stratum is

$$\hat{y}_{III} = X\hat{R} = X \frac{\sum_{i=1}^n M_i \bar{y}_i}{\sum_{i=1}^n M_i \bar{x}_i}$$

and its associated variance is

$$\text{Var}(\hat{y}_{III}) = X^2 \text{var}(\hat{R}) = \frac{N^2}{n} \frac{\sum_{i=1}^n (\hat{y}_i - \hat{R}\hat{x}_i)^2}{n-1} + \frac{N}{n} \sum_{i=1}^n \frac{M_i^2 (1 - m_i / M_i)}{m_i} s_{2i}^2$$

Discussion

The objective of the paper is to provide discard sampling users with recipes that are handy, practical and guarantee without bias. The statisticians who want to do more complex analysis should always compare their results to one of these methods.

One of the outcomes of this study has been to show

- the need to estimate the total number of trips as a measure of effort, within the DCR
- that the estimates of the total number of hauls at the population level would improve the accuracy of the discard estimates with the same sampling intensity. Moreover, the knowledge of the total number of hauls at the population levels takes into account the vessels practising more than one métier during their fishing trips.

Actually, what is operated on-board fishing vessels is a 5 stages sampling (vessels, trips, hauls, boxes, counting/measuring of one species). Considering that the box level has a very minor contribution to the overall variance (Tamsett *et al.* 1999), there is little chance that the counting level accounts for more. It remains then a three-stage sampling. Although, the complexity of statistical development increases, three-stage sampling remains workable (Wang *et al. in press*) but the problem is that there is on average one single trip per vessel sampled. If some experience of replication of trips by vessels sampled exists, it would be very relevant to investigate the importance of the vessel effect in discarding pattern (Allen *et al.* 2002).

The heterogeneity of fishing trip duration within a stratum is likely to have an impact on the achieved precision of the estimates. The formulas derived from the multi-stage sampling are all based on the mean of total discards per sampled trip, thus averaging different magnitude of discards. Any linear or non linear linkage between the volume of discards and fishing time would increase the variance if the heterogeneity of trip duration is too high, e.g. mixing one day trips and 15 days trips and only the respect of the random process guarantees the absence of bias. Knowing the difficulty to guarantee the random process in on-board sampling programmes, it is wise to avoid too much heterogeneity in the trip duration at the moment of designing the stratification. Moreover, *a posteriori* investigation of the data may give valuable information for designing optimum stratification, and this kind of analysis should always be carried out before applying any raising methodology.

At the moment of elaborating a sampling design, multi-stage sampling would give more precise result than simple random sampling only if variance within trip is big and variance

between trips is low, on a relative scale. For discard sampling, all the studies have shown the opposite pattern, but field implementation provides un-escapable constraints.

The use of the ratio to another variable does not request a formal linkage with the volume of discards. The higher the correlation will be between these two variables, the better will be the precision achieved. The correlation between the two variables should therefore always be estimated and the precision should be compared to the precision obtained using sampling theory.

If there is an agreement on the need of such a document, then we should think about the way to reach this agreement among statisticians involved in discard estimates. One solution would be to set the basis of such document in PGCCDBS and propose the writing of a paper for the next ICES ASC meeting. Extension of this approach to other fields requiring sampling procedures should be encouraged.

References

- Allen, M., Kilpatrick, D., Armstrong, M., Briggs, R., Course, G., Pérez, N. 2002. Multistage cluster sampling design and optimal sample sizes for estimation of fish discards from commercial trawlers. *Fish. Res.* 55: 11–24.
- Anon. 2003. Workshop on Discard Sampling Methodology and Raising Procedures. Charlottenlund, Denmark. 2–4 September, 28 pp.
- Anon. 2005. Report of the Ad Hoc Meeting of independent experts on Fleet-Fishery based sampling - Nantes, mai 2005, 34 pp. + annex.
- Borges L., A.F. Zuur, E. Rogan, R. Officer. 2005. Choosing the best sampling unit and auxiliary variable for discards estimations. *Fisheries Research*, 75: 29–39
- Cochran, W.G. 1977. *Sampling Techniques*. Third Edition. Ed. John Wiley & Sons
- Cotter, A.J.R., Course, G., Buckland, S.T., Garrod, C. 2002. A PPS sample survey of English fishing vessels to estimate discarding and retention of North Sea cod, haddock and whiting. *Fisheries Research*, 55: 25–35.
- Rochet, M.J., V.M. Trenkel. 2005. Factors for the variability of discards: assumptions and field evidence. *Canadian Journal of Fisheries and Aquatic Sciences*, 62: 224–235
- Stratoudakis, Y., Fryer, R.J., Cook, R.M. and Pierce, G.J. 1999. Fish discarded from Scottish demersal vessels: Estimators of total discards and annual estimates for targeted gadoids. *ICES Journal of Marine Science*, 56: 592–605.
- Stratoudakis, Y., Fryer, R.J., Cook, R.M., Pierce, G.J., and Coull, K.A. 2001. Fish bycatch and discarding in Nephrops trawlers in the Firth of Clyde (west of Scotland). *Aquatic Living Resources*, 14: 283–291.
- Tamsett D., and Janacek, G. 1999. Sampling trips for measuring discards in commercial fishing based on multilevel modelling of measurements in the North Sea from NE England. *Fisheries Research*, 42: 103–115.
- Tamsett D., Janacek, G., Emberton, M., Lart, B., and Course, G. 1999. Onboard sampling for measuring discards in commercial fishing based on multilevel modelling of measurements in the Irish Sea from NW England and N Wales. *Fisheries Research*, 42: 117–126
- Thompson, S. K. 1992. *Sampling*. Wiley, New York
- Wang, J., G. Gao, Y. Fan, L. Chen, S. Liu, Y. Jin and J. Yu. *In press*. The estimation of sample size in multi-stage sampling and its application in medical survey. *Applied Math. And Computation*

Annex 7: Workshop proposals

[WKNEPHTV] Workshop on the Use of UWTV Surveys for Determining Abundance in *Nephrops* Stocks throughout European Waters

Introduction

A Workshop on the Use of UWTV Surveys for Determining Abundance in *Nephrops* Stocks throughout European Waters [WKNEPHTV] (Chair: Colm Lordan) will take place in Heraklion, Crete, from XXX April 2007 to:

Terms of Reference

- c) Review and report technological developments used in underwater TV surveys for *Nephrops*.
- d) Compare survey designs employed in different areas and evaluate, where possible, the relative performance of these.
- e) Report on work addressing outstanding issues influencing the accuracy and precision of TV estimates of abundance *inter alia* burrow identification, occupancy rate, counting method, survey data analysis, raising procedures.
- f) Document the protocols used to conduct surveys across the range of European stocks, highlighting standard practices and 'norms' adopted in UWTV work.
- g) Investigate and make recommendations on procedures for inter-calibration, quality assurance and the reporting of precision from TV surveys.
- h) Report on developments in the translation of survey estimates into stock assessment information and catch forecast advice, recommending where additional work is most urgently required.
- i) Consider the wider utility of the techniques employed in *Nephrops* UWTV surveys for estimation of other benthic species and habitat assessment.

Supporting Information

Priority:	This Workshop will provide an opportunity for significant update and progress in the area of UWTV surveys for <i>Nephrops</i> . For a number of stocks, ICES WGs and ACFM indicated that UWTV results presently provide the most reliable indicator of stock status. Consequently, these activities are considered to have a very high priority.
Scientific justification and relation to action plan:	<p>Action Plan No: ??</p> <p>Given the recent use made of UWTV surveys in the <i>Nephrops</i> advisory process, the growing number of institutes making use of UWTV methodology and the continuing uncertain quality of fishery data available to proceed with other forms of assessment, this workshop is essential and timely.</p> <p>The Workshop will serve several purposes. For those embarking on the technique, it will give an up-to-date résumé of the state of play and give excellent technology transfer opportunities. It will provide an opportunity for several outstanding issues to be investigated and hopefully dealt with. It will enable progress to be made in a number of key developmental areas, especially the link between surveys and the provision of advice, and it will provide the stimulus to more formally collate a Europe wide synopsis of the application of UWTV.</p> <p>TOR 1 will enable the latest developments to be publicised and is expected to lead to more effective use being made of European ship-time in the collection of UWTV (and associated) data. TORs 2 and 3 are intended to progress resolution of important issues associated with the method, while TOR 4 provides an opportunity to document in a consistent form the various approaches being employed.</p> <p>The expectation for TOR 5 is that a process of inter-calibration work will be initiated with a view to addressing quality issues. TOR 6 is an important requirement, given the use now being made of UWTV to form the basis of catch advice. Surveys need to be conducted so as to best provide data in a form suitable for appropriate assessment and forecasting methods.</p> <p>The final TOR 7 involves a look at the broader use of UWTV and the great potential for collecting benthic information in an efficient and low impact way. With the likely increasing importance of monitoring for wider ecosystem considerations, developments in <i>Nephrops</i> UWTV technology have an important role to play.</p>

Resource requirements:	Several national labs and university departments are using the approach, and data and expertise can already be drawn on. It is expected that outcomes from the Workshop will be picked up by users of the technology and existing funding being focussed more effectively as a result. Additional resources may be required in the future, if the method is extended to other <i>Nephrops</i> stocks or to also cover benthic species / assemblages.
Participants:	The Workshop is expected to attract wide interest across the ICES <i>Nephrops</i> community and is also expected to involve other guest experts (e.g. from the Mediterranean) who can add value to the process. A participation of around 30 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 a range of funding opportunities including the EU DCR.
Linkages to advisory committees:	There is a direct link to ACFM through a number of regional assessment Working Groups with responsibilities for <i>Nephrops</i> assessment. Several of these in 2005 concluded that UWTV survey data provided the most reliable indicator of stock status for a number of <i>Nephrops</i> stocks. The Workshop is expected to develop the utility of the survey material and enhance the nature of the advice given. ToR 7 provides an opportunity to broaden the discussion of the technique into its adaptation for assessing other benthic organisms. The EU DCR is currently reviewing the requirement for RV surveys to collect a wider range of data so as to service the needs of the Ecosystem Approach. UWTV surveys offer an efficient and low impact approach, which should have important resonance in ACE.
Linkages to other committees or groups:	There will be important outcomes from this Workshop of interest to the Living Resources Committee and the Resource Management Committee.
Linkages to other organizations:	Outcomes from this Workshop will have relevance to a variety of groups involved in the use of UWTV and especially those assessing <i>Nephrops</i> . Mediterranean organisations have already expressed an interest for example, and offered facilities to host the meeting.
Secretariat marginal cost share:	??

[WKMAT] Workshop on Sexual Maturity Sampling

Introduction

A Workshop on Sexual Maturity Sampling [WKMAT] (Chair: XXX) will take place in XXX, from XXX 2007 to:

Terms of Reference

- a) Develop standard operational procedures on maturity sampling, with recommendations on the optimum time for sampling during the year or, alternatively, relative to the peak in the spawning period, for species groupings with different life history traits (slow vs. fast growth, short vs. long spawning period, etc.).
- b) Propose procedures for optimising spatial coverage of maturity sampling for widely distributed stocks and for stocks with differential distribution patterns between spawners and non-spawners.
- c) Provide guidance on how to organise sexual maturity sampling effort so that the DCR precision requirements with regards to sexual maturity estimates can be met.
- d) Develop methodologies for aggregating maturity-at-length-keys (MALKs) for species/stocks with spatially different maturity parameters and/or develop alternative models for estimating population maturity.

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
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	parameters for all formally assessed fish and shellfish species to improve the quality of these estimates.
Scientific justification and relation to action plan:	<p>Action Plan No: ??</p> <p>Many of the maturity parameters used in analytical assessments need to be updated, but there is doubt on the soundness of the maturity information available, amongst others because of doubts on the operational procedures that are applied to collect the information and on the optimum way of estimating average maturity-at-length-keys in species where maturity shows spatial variation. The Workshop should aim to develop a statistically sound approach to maturity sampling for the wide range of species included in the EU Data Collection Regulation (DCR), with focus on species groups with similar life history traits (slow vs. fast growing species, species with short vs. extended spawning periods, etc.) rather than on individual species.</p> <p>The expectation of TOR 1 is that the Workshop produces a set of standard operational procedures (SOPs) for maturity sampling that can be applied to any species, based on existing knowledge of its life history traits. For this to be productive, is it essential that the Workshop approaches its task with a comprehensive and generalizing view on groupings of species with similar life histories and reproduction strategies, rather than on the peculiarities of a wide range of individual species.</p> <p>TORs 2 and 3 address particular aspects of maturity sampling (sampling for maturity in species with differential distributional patterns between the spawning and non-spawning parts of the population, and optimisation of maturity sampling effort) and should equally result in proposals for standard procedures to tackle these issues. With regards to TOR 3, the Workshop is expected to produce clear guidelines on how sampling should be organised in order to ensure compliance with the precision requirements for maturity estimates in the DCR.</p> <p>TOR 4 addresses the problem on how to calculate "average" maturity ogives for species where maturity shows within-population spatial variation. As for the previous TORs, the Workshop is expected to propose standard methods to calculate such aggregated maturity ogives.</p> <p>In view of its urgency, it is recommended that the Workshop be organised in 2006.</p>
Resource requirements:	Expertise on sexual maturity sampling of DCR and other species is widely available in the scientific community. It is expected that outcomes from the Workshop will be picked up by all institutes involved in the DCR, both within and outside the ICES community, and that the proposed SOPs may be implemented throughout the EU as part of the new DCR data collection system.
Participants:	In view of its relevance to the DCR, the Workshop is expected to attract wide interest from both ICES Member States and Mediterranean EU Member States.
Secretariat facilities:	None.
Financial:	To ensure wide attendance of relevant experts, additional funding will be required, preferably through the EU, e.g. by making attendance to the Workshop eligible under the DCR.
Linkages to advisory committees:	There is a direct link to ACFM through virtually all regional assessment Working Groups.
Linkages to other committees or groups:	Outcomes from this Workshop will be of interest to the Living Resources Committee and the Resource Management Committee.
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, including GFCM and NAFO.
Secretariat marginal cost share:	??

[WKDRP] Workshop on Discard Raising Procedures

Introduction

A workshop on Discard Raising Procedures [WKDRP] (Chair: XXX) will take place in XXX from XXX 2007 to XXX.

Terms of Reference

- a) To identify and summarise the concerns countries have in relation to raising procedures.
- b) To provide an expert statistical group with the information and data needed to provide guidelines for standard protocols for raising discards.

Supporting Information

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

- 1) Each country should provide study cases analysing the difference between the use of differing raising procedures, possibly taking into account current initiatives.
- 2) 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).
- 3) 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.
- 4) Each country to provide a description of variables that are available to them for raising procedures.

Priority:	This workshop will provide an opportunity for countries to identify their concerns relating to the application of appropriate raising procedures for discards, taking into account recent initiatives addressing specific issues.
Scientific justification and relation to action plan:	Action Plan No: ?? Given the recent progress that has been made by member States in collecting discard data under the DCR, it is not surprising that several countries have indicated that further guidance is needed in defining raising procedures. The presentation of recent work on Raising Procedures (at PGCCDBS - 2006) highlighted the fact that while Member States have applied their own raising procedures to discard data, they have had difficulties incorporating recent initiatives into their procedures. As well as providing an opportunity for the concerns of member States to be addressed, this Workshop will also provide an up-to-date résumé of the state of play for countries embarking on collection of discard data for the first time. TOR 1 will enable each country to identify their specific concerns relating to raising procedures as well as provide an overview of important issues that may need to be taken into account in sampling design. TOR 2 will provide data and information so that a small group of statistical experts can produce guidelines for standard protocols in raising procedures for discards.
Resource requirements:	All Member States collect discard data under DCR and use appropriate raising procedures to produce National estimates. It is expected that expertise and data can be drawn from here. Participation of a few relevant statistical experts is envisaged. It is expected that outcomes from the Workshop will be picked up by all Member States EU and ICES) involved in DCR.
Participants:	The Workshop is expected to attract wide interest from both ICES and EU Member States.
Secretariat facilities:	None.
Financial:	Wide attendance of MS will be encouraged to attend by making the Workshop eligible

	for funding under the DCR. To ensure attendance of relevant experts, additional funding will be required
Linkages to advisory committees:	There is a direct link to ACFM through virtually all regional assessment Working Groups.
Linkages to other committees or groups:	Outcomes from this Workshop will be of interest to the Living Resources Committee and the Resource Management Committee.
Linkages to other organizations:	There is a direct link with the EU DCR in that Member States have commitments in collection of discard data. Regional Coordination Groups (who have responsibility for cooperation and task sharing) and PGCCDBS have identified the need for agreed methodologies for raising procedures and calculating precision in discard programmes.
Secretariat marginal cost share:	??

[WKUFS] Workshop on Using Fishermen to Sample Catches

Introduction

A Workshop on Using Fishers to Sample Catches [WUFS] (Co-chairs: Kjell Nedreaas, Michael Pennington) will take place in Bergen, Norway, during 5-6 June 2007.

Terms of Reference:

- a) Describe objectives of the data collection.
- b) Review existing systems for using fishers to sample catches (self sampling systems).
- c) Propose procedures for the design of self-sampling systems (training, survey design etc.).
- d) Recommend procedures for ongoing quality control of the information obtained and the design of self-sampling systems, in particular how to assess whether the objectives have been met.
- e) Discuss methods for analyzing these data; appropriate estimators and sources of variability.

Supporting Information

Priority:	To assess a fishery it is necessary to determine the biological characteristics, such as age and length distributions, of the commercial catch. In addition, estimates of the amount of discards will lead to more accurate assessments.
Scientific justification and relation to action plan:	Action Plan No: ?? Using scientists to collect information on commercial catches is usually not cost effective. Several institutions are now employing selected fishers (often called a 'reference fleet') to measure a subsample of their catches, extract otoliths, record the amount of discards, etc. This may be a cost efficient way to collect such data but care is needed to assure that these data are as useful as possible. The purpose of ToR 1 is that before a program is implemented the goals and purpose of self-sampling should be carefully considered. For example, will it replace other data collection programs or how will these data be used in an assessment? ToRs 2 through 4 will examine current self-sampling programs to determine their effectiveness, how they can be improved and their precision (standard errors, effective sample sizes, etc.). Finally ToR 5 will focus on whether these sampling schemes actually achieve their stated goals (ToR 1 revisited).
Resource requirements:	DCR data collection system.
Participants:	In view of its relevance to the DCR, the Workshop is expected to attract wide interest from both ICES Member States and Mediterranean EU Member States.
Secretariat facilities:	None.
Financial:	To ensure wide attendance of relevant experts, additional funding will be required, preferably through the EU, e.g. by making attendance to the Workshop eligible under the DCR.
Linkages to	There is a direct link to ACFM through virtually all regional assessment Working Groups.

advisory committees:	
Linkages to other committees or groups:	Outcomes from this Workshop will be of interest to the Living Resources Committee and the Resource Management Committee.
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, including GFCM and NAFO.
Secretariat marginal cost share:	??

[WKMSMAC] Workshop on Sexual Maturity Staging of Mackerel and Horse Mackerel

Introduction

A Workshop on Sexual Maturity Staging of Mackerel and Horse Mackerel [WKMSMAC] (Chair: XXX) will take place in Lisbon, from XXX to XXX 2007 to:

Terms of Reference

- a) Compare the macroscopic maturity scales for Mackerel and Horse Mackerel used in the different laboratories.
- b) Compare and calibrate the criteria, followed by the scientists/technicians involved in stage sampling, to classify each maturity stage for males and females.
- c) Standardise the criteria to classify each maturity stage.
- d) Propose a common scale, with common classification criteria, to be used by all laboratories.

Supporting Information

Priority:	The maturity stage is an important biological parameter to be used in the calculation of maturity ogives (and therefore of Spawning Stock Biomass), for the definition of the spawning season of a species, for the monitoring of long-term changes in the spawning cycle, and for many other research needs regarding the biology of fish.
Scientific justification and relation to action plan:	<p>Action Plan No: ??</p> <p>Although several laboratories sampling for mackerel/horse mackerel macroscopic maturity stages follow the scale proposed by Martin Walsh, some labs may have different scales. Even those that use the same scale, may be using slightly different criteria to classify the maturity stages that are more prone to a subjective interpretation. This may lead to bias in the data that may be going to be used, for example, in fisheries stock assessment models, or in any other kind of analysis. Therefore, this workshop has the objective of reaching an agreement on a common scale to be used, but also to define objective criteria to classify the maturity stages of that scale.</p> <p>The expectation of TOR 1 is that the Workshop produces a comparative description of the scales in use in the different labs, and if possible a correspondence between maturity stages of those different scales.</p> <p>TOR 2 has the goal of measuring in what extent the criteria to classify maturity stages is coherent between technicians, and to identify where are the major sources of disagreement.</p> <p>With TOR 3 it is intended to minimise those sources of disagreement, by discussing the structure and the criteria to be used in the common scale.</p> <p>TOR 6 will eventually correspond to the final goal of the workshop, that is having a common scale for maturity stage, with a common set of criteria to classify each stage, to be used by all labs. It is recommended that the Workshop be organised in 2007.</p>
Resource requirements:	This workshop will be based on the analysis of both digital photos of gonads and fresh/frozen gonads. Therefore facilities suitable to examine fresh biological material must be available during the workshop. It would be useful also the availability of space in a web server for storage and easy access to the photos collected by the participants before the workshop.
Participants:	In view of its relevance to the DCR, the Workshop is expected to attract wide interest from ICES Member States that participate in biological sampling of Mackerel and Horse Mackerel.
Secretariat facilities:	None.

Financial:	To ensure wide attendance of relevant experts, additional funding will be required, preferably through the EU, e.g. by making attendance to the Workshop eligible under the DCR.
Linkages to advisory committees:	
Linkages to other committees or groups:	Outcomes from this Workshop will be of interest to all Working and Study Groups related to Mackerel and Horse Mackerel, namely WGMHSA and WGMEGGS, and to the Living Resources Committee and the Resource Management Committee.
Linkages to other organizations:	There is a direct link with the EU DCR.
Secretariat marginal cost share:	??

[WKMSHM] Workshop on Sexual Maturity Staging of Hake and Monk

Introduction

A Workshop on Sexual Maturity Staging of Hake and Monk [WKHMM] (Chair: Cristina Morgado and Patricia Gonçalves) will take place in Lisbon, from XXX to XXX 2007 to:

Terms of Reference

- a) Compare the macroscopic maturity scales for Hake, Monkfish and Megrim used in the different laboratories.
- b) Compare and calibrate the criteria, followed by the scientists/technicians involved in stage sampling, to classify each maturity stage for males and females.
- c) Validate macroscopic maturity scales with histological analysis.
- d) Standardise the criteria to classify each maturity stage.
- e) Propose a common scale, with common classification criteria, to be used by all laboratories.
- f) Alternative methods to identify immature and mature fish – GSI and HIS.
- g) Definition of the spawning season to estimated maturity ogives.

Supporting Information

Priority:	The maturity stage is an important biological parameter to be used in the calculation of maturity ogives (and therefore of Spawning Stock Biomass), for the definition of the spawning season of a species, for the monitoring of long-term changes in the spawning cycle, and for many other research needs regarding the biology of fish.
Scientific justification and relation to action plan:	<p>Action Plan No: ??</p> <p>Laboratories involved in collection ICES WGHMM maturity data used different macroscopic maturity scale for the same species. Even those that use the same scale, may be using slightly different criteria to classify the maturity stages that are more prone to a subjective interpretation. This may lead to bias in the data that may be going to be used, for example, in fisheries stock assessment models, or in any other kind of analysis. Therefore, this workshop has the objective of reaching an agreement on a common scale to be used, but also to define objective criteria to classify the maturity stages of that scale.</p> <p>The expectation of TOR 1 is that the Workshop produces a comparative description of the scales in use in the different labs, and if possible a correspondence between maturity stages of those different scales.</p> <p>TOR 2 has the goal of measuring in what extent the criteria to classify maturity stages is coherent between technicians, and to identify where are the major sources of disagreement.</p> <p>TOR 3 validate with histological analysis the macroscopic maturity stage, mainly the resting stages that are incorrectly classified as immature.</p> <p>With TOR 4 it is intended to minimise those sources of disagreement, by discussing the structure and the criteria to be used in the common scale.</p> <p>The expectation of TOR 5 is to have a common scale for maturity stage, with a common set of criteria to classify each stage, to be used by all labs.</p>

	<p>With TOR 6 it is intended to explore GSI and HIS data to help the classification of maturity stages. The TOR 7 is to selected the spawning season period considered to estimate maturity ogive. It is recommended that the Workshop be organised in 2007.</p>
Resource requirements:	<p>Before the Workshop each institute should collect during a one year cycle gonads of each species according to the following indications: HAKE: females between 30 and 60 cm (1 female per month per 1 cm length class), MONK: Males and females above 20 cm (1 specimen per 2 cm length class). For both species, the sampling parameters are: total length; gonad visual inspection - maturity stage by a standard maturity scale and the usual maturity scale used by the institute; total weight; gonad weight; liver weight; gutted weight; gonad photo; age; histological maturity stage; microscopic preparation photo. This workshop will be based on the analysis of both digital photos of gonads and fresh gonads. Therefore facilities suitable to examine fresh biological material must be available during the workshop. It would be useful also the availability of space in a web server for storage and easy access to the photos collected by the participants before the workshop.</p>
Participants:	<p>In view of its relevance to the DCR, the Workshop is expected to attract wide interest from ICES Member States that participate in biological sampling of Hake.</p>
Secretariat facilities:	<p>???</p>
Financial:	<p>The obtained all biological data before the Workshop, funding for buying fresh ungutted hake, the estimated age and to process gonads histology. To ensure wide attendance of relevant experts, additional funding will be required, preferably through the EU, e.g. by making attendance to the Workshop eligible under the DCR.</p>
Linkages to advisory committees:	
Linkages to other committees or groups:	<p>Outcomes from this Workshop will be of interest to all Working and Study Groups related to Hake, namely WGHMM and to the Living Resources Committee and the Resource Management Committee.</p>
Linkages to other organizations:	<p>There is a direct link with the EU DCR.</p>
Secretariat marginal cost share:	<p>??</p>

Annex 8: Recommendations

RECOMMENDATION	ACTION
To carry on the compilation of national sampling manuals and standard operation procedures online using the PGCCDBS unofficial website.	A team formed by Jørgen Dalskov, Christian Dintheer, Ulrich Berth and Costas Papaconstantinou will coordinate the protocols collection.
Develop a two step procedure for the flow of the information from data-providers to data-users: (i) provide a detailed description of the sampling scheme/raising procedures etc; (ii) provide an yearly report with information about the achieved sampling by stock.	ICES to develop the presented forms (Annex 3 and Annex 4).
That comparisons between readers in ageing workshops need to be planned from the start of the exchange and carried out using the principles of designed experiments (see for example, Heath (1995)).	PGCCDBS provided guidelines on how to incorporate experimental design into the age reading workshops, so that statistically sound analyses be carried out on comparisons between different methods and comparisons in readability between the start and end of the workshop
To develop a procedure for ensuring that Assessment WGs are more actively involved in both requesting information that they need and communicating back to the data collection system	ICES provide guidelines and procedural rules to the Stock Coordinators on how to address data-providers. ICES and the EC jointly develop standard enquiry forms which indicate what data Assessment WGs requested from the MS and what was actually received from the MS. ICES develop standard forms for the feedback from the Assessment and Advisory Groups to the data-providers.
Improve age readings and maturity staging for several species.	Promote workshops (see Tables 5-1 and 5-2)
Publish reports of age readings and maturity staging workshops online.	PGCCDBS will investigate web tools for storage and indexing the reports.
Each workshop to prepare a digitised set of agreed age otoliths with and without annotations.	The same system proposed above can be used for otoliths.
Each workshop to prepare a digitised set of maturity stages with and without annotations.	PGCCDBS nominated Ulrich Berth (Germany) to act as advisor on the development of a website to store an image collection of maturity stages
Considers that the continuing review and assessment of task sharing and cooperation within the discard sampling is best served at RCM level	
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 rates estimates.	
Workshop on the Use of UWTV Surveys for Determining Abundance in Nephrops Stocks throughout European Waters	ICES to consider the proposal on Annex 7.
Workshop on Sexual Maturity Sampling	ICES to consider the proposal on Annex 7.
Workshop on Discard Raising Procedures (PGCCDBS expects this proposal to be included on the "Discard Atlas" project otherwise the Chair of PGCCDBS should convene such a workshop)	ICES to consider the proposal on Annex 7.
Workshop on Using Fishermen to Sample Catches	ICES to consider the proposal on Annex 7.