



European Fish Ageing Network

# Newsletter

**TACADAR**

(Towards accreditation and certification of age determination of aquatic resources)  
2002 - 2005



Sponsored by:

**European  
Commission**  
Concerted Action  
(Q5CA-2002-01891)

Homepage:  
[www.efan.no/tacadar/](http://www.efan.no/tacadar/)

Newsletter Editor:  
E. Moksness

**No. 3-03; August 2003**

**Objectives**

To stimulate the achievement of a higher level of quality within and integration between the member institutions of TACADAR, concerning fish age determination.

## Contents

	Page
1. General report from the 1 <sup>st</sup> TACADAR Plenary Meeting.....	2
2. List of participants.....	4
3. Report from WG 1.....	5
4. Report from WG 2.....	8
5. Report from WG 3.....	14
6. Report from WG 4.....	16
7. Report from Steering Committee meetings.....	21
8. List of available procedures.....	22



TACADAR  
Institute of Marine Research  
Department of Coastal Zone  
Flødevigen Marine Research Station  
N-4817 His, Norway

Phone: +47 37 05 90 00  
Fax: +47 37 05 90 01  
Email: [bente.lundin@imr.no](mailto:bente.lundin@imr.no)  
Email: [moksness@imr.no](mailto:moksness@imr.no)



# 1. General report the 1<sup>st</sup> TACADAR Plenary Meeting

## Agenda

### Sunday 25 May

1700: TACADAR Steering Group meeting (At City Hotel Pilvax)

### Monday 26 May

Meeting location: Ministry of Education, Main building

1000: Welcome address

1015: Erlend Moksness: TACADAR: where are we going and how

1100: Coffee break

1130: Willie McCurdy: Guidelines for the Quality Assurance of Fish Age Determinations

1200: Michael Easey: CEFAS QC methods

1230: Henrik Mosegaard: Potential problems with year-class definitions exemplified with herring

1300: Lunch

1430: Willie McCurdy: the importance of preparation and observation methodology

1500: Helene DE PONTUAL: A pilot tagging experiment of hake (*Merluccius merluccius*) :method and preliminary results.

1530: Working Groups

**WG1:** Discuss the levels of precision and accuracy to be used as qualifiers in statistical terms.

**WG2:** Discuss the evaluation of individual methods of age determination in cases where several methods are used to provide data input for the same stock assessment or environmental management model.

**WG3:** Develop guidelines for the creation and application of quality assurance and quality control mechanisms to protocols for the determination of the ages of fish from hard tissues.

**WG4:** Define the framework for the application of quality assurance and quality control mechanisms, to protocols for the determination of fish ages from hard tissues.

1800: Boat river trip incl. Dinner

### Tuesday 27 May

0900: WG continues

1000: Coffee break

1230: Lunch

1300: TACADAR Steering Group meeting

1400: Summing up

1500: Coffee break

WG1	WG2	WG3	WG4
Nuno Formigo (Chair)	Pedro Re' (Chair)	Beatriz Morales (Chair)	Audrey Geffen (Chair)
Francis Neat	John D M Gordon	Lotte A. Worsøe Clausen	Magnus Appelberg
Helene DE PONTUAL	Rajlie Sjöberg	Helen McCormick	Cornelius Hammer
Henrik Mosegaard	Birgitta Krischansson	Ana Moreno	Erlend Moksness
	Michael Easey	Jenny Palmkvist	Jari Raitaniemi
	Jacques Panfili	Groa Petursdottir	Kari Nyberg
	Barbara Bland	Carmen Piñeiro Alvarez	
	Olga Bukovskaya	Ann-Sofie Ågren	
	Carin Ångström	Paulino Lucio	
	Carina Jernberg	Ronan FABLET	
	Willie McCurdy (Chair)	Javier Tomás	
	Katerina Anastasopoulou		
	José Eduardo Rebelo		
	Enrico Arneri		
	Iñaki Quincoces		
	J. Pedro Andrade		
	Fredrik Arrhenius		



## 2. List of participants

Name	Country	Tacadar
		No
Erlend Moksness	Norway	0
Cornelius Hammer	Germany	1
Nuno Formigo	Portugal	2
Rafael Duarte	Portugal	2
Ana Moreno	Portugal	3
Enrico Arneri	Italy	4
Jari Raitaniemi	Finland	5
Jose Pedro Andrade	Portugal	6
Paulino Lucio	Spain	7
Inaki Quincofces	Spain	7
Fredrik Arrhenius	Sweden	8
Barbara Bland	Sweden	8
Birgitta Krischansso	Sweden	8
Rajlie Sjøberg	Sweden	8
Carina Jernberg	Sweden	8
Annsophie Ågren	Sweden	8
Magnus Appelberg	Sweden	9
Jenny Palmkvist	Sweden	9
Carin Ångström	Sweden	9
Helene de Pontual	France	10
Ronan Fablet	France	10
Francis Neat	UK	11
William James Mc Curdy	UK	12
Henrik Mosegaard	Denmark	13
Lotte A. Worsøe Clausen	Denmark	13
Beatriz Morales-Nin	Spain	14
Javier Tomás	Spain	14
Michael Easey	UK	15
Carmen Piñeiro Alvarez	Spain	16
Groa Petursdottir	Iceland	17
Paola Belcari	Italy	18
Jacques Panfili	France	19
Anastasopoulou		
Aikaterini	Greece	20
John Gordon	UK	22
Audrey Geffen	UK	23
Pedro Re	Portugal	24
Jose Eduardo Rebelo	Portugal	25
Olga Bukovskaya	Hungary	27
Kari Nyberg	Finland	28
Helen McCormick	Ireland	

### **3. Report from WG 1**

#### **PRECISION AND ACCURACY IN THE FRAMEWORK OF QUALITY CONTROL**

##### **CONCLUSIONS**

The workgroup agreed that an accurate reading is one in which the real age of an animal and the age attributed by the reader are coincident. It was also agreed that this problem is not addressable using statistical methods.

It was also agreed that, although the accuracy problem is fundamental in the framework of quality control, further consideration of the question should be postponed, and the question of precision should be considered a priority.

The main reasons for this decision are, on one hand, the extreme difficulty of resolving the question of accuracy, in a large scale (hundreds of thousands of hard structures every year), with the methodologies available (the question has already been discussed and addressed in the framework of EFAN, and this workgroup will depart from EFAN conclusions, to set new lines of work on this subject). On the other hand, problems in getting accurate readings of hard structures are, quite often, mixed with problems about the precision of the same readings, which should be clearly isolated and treated separately.

Concerning the precision of a set of different readings, of the same hard structures, by different readers, the workgroup agreed that it is measured by a variance (or a standard deviation). It was also agreed that lacks of precision can be one of the most important sources of error in the modelling process of fisheries assessment. Finally it was agreed that precision is a problem that can be addressed using statistical tools.

It was also defined that precision problems can be addressed using different perspectives: by reader, by species, by age-class, etc., each one consisting in a different type of situation that creates a precision problem.

Some of these problems are of biological origin:

- different species readings have different precision levels at the present time
- some age/year classes can be especially difficult to define
- the time of year the sample is collected

Some of these problems are of human origin:

- differences between readers of the same set of hard structures
- differences in the methods used by different institutions

- differences in the sampling methodology

Based on the considerations made above, the workgroup proposed the following lines of work:

1. use of a simulation approach to assess the importance of error propagation through models use in fisheries assessment and its impact on the estimation of numbers per age class in the population
2. definition of standard procedures for estimating precision levels within and between institutions
3. definition of minimal precision levels to be achieved when training new readers
4. definition of guidelines to identify and try to solve problems with accuracy

Next, a more detailed description of each line of work is presented.

### **1 - Use of a simulation approach to assess the importance of error propagation through models use in fisheries assessment and its impact on the estimation of numbers per age class in the population**

The objective is to determine how the precision level presently attainable for each species influences the quality of its assessment. This means investigating the relation between changes in precision and respective changes in the overall quality of the assessment produced. It also means investigating the effect of different methodologies of preparation and reading of hard structures in the overall quality of the assessment produced.

### **2 - Definition of standard procedures for estimating precision levels within and between institutions**

The objective is to define a standard level of precision that should be achieved by all institutions working with a given species (the exact level of precision is different from species to species). It means, as a consequence, that the methods used to assess the precision of each institution must also be defined.

### **3 – Definition of minimal precision levels to be achieved when training new readers**

The objective is to define a common criteria concerning the minimal level of precision that should be attained by all the new readers of all institutions involved in the reading of hard structures of a given species.

### **4 - Definition of guidelines to identify and try to solve problems with accuracy**

There are three different objectives to be achieved within this line of work:

- follow up the work done within EFAN, concerning the use of image processing tools to keep a permanent record of each reader interpretation of hard structures
- recommend that accuracy oriented procedures should be used whenever there is a persistent lack of precision between institutions, and develop a set of guidelines to achieve that purpose
- recommend that accuracy oriented procedures should be used whenever there is a poor knowledge concerning the interpretation of the growth pattern in the hard structures of a given species, and develop a set of guidelines to achieve that purpose

## 4. Report from WG 2

### 1st TACADAR MEETING

Budapest, Hungary 26-27 May 2003

#### TACADAR WG2 Progress Report

##### Participants:

Name	Country	TACADAR No.	
Katerina Anastasopoulou	Greece	20	
Jose Pedro Andrade	Portugal	6	
Carin Ångström	Sweden	9	
Enrico Arneri	Italy	4	
Barbara Bland	Sweden	8	
Michael Easey	UK	15	
John Gordon	UK	22	
Carina Jernberg	Sweden	8	
Birgitta Krischansson	Sweden	8	
William James Mc Curdy	UK	12	<i>Co-Chair</i>
Jacques Panfili	France	19	
Inaki Quincofces	Spain	7	
Pedro Re	Portugal	24	<i>Co-Chair</i>
Rajlie Sjøberg	Sweden	8	

##### REPORT:

The remit of WG2 for the 1<sup>st</sup> TACADAR meeting was to discuss the evaluation of individual methods of age determination in cases where several methods are used to provide data input for the same stock assessment or environmental management model. The members of WG2 discussed the remit and agreed that a starting point had to be found for this evaluation process. Quality assurance (QA), quality control (QC) and transparency, were recurring themes during the discussion. WG2 discussed how we could actually achieve this and developed the following recommendations.

Where two or more methods with acceptable methodology are used, the planned output from WG1, should be applied to determine if the levels of precision and accuracy of any or all of the methods, are acceptable for stock assessment or environmental management modelling.

All methods should have acceptable QA and QC mechanisms and these should be in accordance with the planned output from WG 3, guidelines for the creation and application of QA and QC mechanisms to protocols for the determination of the ages of fishes from hard tissues.

The first step in the evaluation of multiple methods should be the evolution of a protocol for evaluating the methodology of each individual method. An initial inspection should be performed to examine the robustness of the 'quality' of each stage of the method. It was concluded that this could best be performed by asking a series of 'quality questions', using Guidelines for the Quality Assurance of Fish Age Determination (EFAN Report 5-2000), as a framework for this process.

WG2 then began the process of defining suitable quality questions. As there was insufficient time to do this a limited number of examples were produced and it was agreed to continue this work by email. Examples of quality questions for each aspect of EFAN Report 5-2000 should be available for the next TACADAR meeting and if agreed at plenary session, these could form part of the input for the Quality manual that will be final output of TACADAR. Progress achieved at the 1st TACADAR Meeting is summarised in the attached table.

**Draft Protocol for Evaluating the Methodology of Fish Age Determination Methods.**

EFAN REPORT 5-200 GUIDELINES	QUALITY QUESTIONS
<b>Fish Sampling at Sea, Research Vessels and Commercial Fishing Vessels</b>	
Survey Design	Is the method part of a multi-partner survey?
	Is there vessel inter-calibration of the vessels?
	Are there protocols for the survey design?
	Are there protocols for the sampling programme?
	How is tow length defined?
Fish Sampling	Is the sample size adequate?
	Does the sub-sampling process reflect the species and size composition of the catch?
	Is there a protocol for measuring fish lengths?
<b>Fish Sampling at Commercial Fish Markets</b>	
Measurements of fish - the method of measurement must be clearly defined.	
The integrity of the links between the data and the age reading materials must be maintained at all times.	
All the information required in addition to the measurements themselves, must be specified, e.g. species, area, date, fishing gear, sex, maturity.	
<b>Selection of Age Reading Materials</b>	
Which hard structures are to be used.	
The preferred sampling site(s) for scale removal, this may vary with the species and the requirement	
Standards to be shared between institutes working on common stocks	
<b>Conservation of Age Reading Materials:</b>	
Cleaning method e.g. removing muscular tissue and fats from whole bones and drying.	
Transport and storage must prevent damage and deterioration	
Handling of Age Reading Materials	
Control of moisture content	
<b>Species Specific Preparation Techniques</b>	

Criteria for acceptance/rejection of age reading materials	
Preparation techniques	
Burning	
Staining	
Grinding	
Sawing	
<b>Age Reading Equipment</b>	
Reading equipment set up (e.g. binocular microscope)	
Magnification level	Is the magnification suitable for the species and age range of the fish? Is the magnification used suitable for the stock and the expected growth patterns e.g. increments near the edge of the otolith section or whole otolith
Light intensity	Do the light intensity, transmission path and illumination angle reveal the growth increments to be studied?
Type of illumination	
Equipment quality, define the equipment to be used in each process	
Confidence in equipment	
Training use of equipment	Is training provided?
Image analysis/digitisation	If digital images are used for age determination, are they conserved in an image database? Does the process reveal and/or generate the required information?
<b>Age Reading Procedure (Manual)</b>	
Time planning for readings and re-readings	Are the otoliths read by more than one person? Is the number of re-readings adequate to meet the quality requirement
Use of Glossary (1 <sup>st</sup> Otolith Research Symposium, Hilton Head, 1993)	
Where to start reading	
Definition of rings	
Criteria for genuine/ false rings	
Number and location of reading axes	
Potential age reading problems	
Double rings	
Juvenile growth	
Incomplete growth rings in older fish	
Edge patterns	

Providing additional information when reading calcified structures	
Advantages	
Disadvantages	
Ideally ring reading followed by conference reading	
<b>Recording Age Readings</b>	
Age (and fish) data	
Sample ID	
Reader identity	
Data storage	
Ability to trace data edits	
Handling and processing the data	
Backup of databases	
Responsibility for the data at different stages	
Training new readers:	
Teaching new readers	
Conference reading with skilled reader who has good presentation skills.	
Discussion of sample problems with mentor	
Benefits of conference reading	
All calcified structures must be re-read until sample readings reach target agreement level.	
Requirement for basic information on calcified structure or other structure	
Requirement for information on the biology of the species	
Training log	
Training course units e.g. preparing calcified structures, calcified structure reading, data handling	
<b>Inspection and Control of the process</b>	
Effective validation is mandatory for Quality Assurance,	
Apply EFAN Guidelines for Validation Studies	
Apply EFAN Tools and Guidelines for Age Reading Comparisons	
Reader accuracy checks	
Reader precision checks	
Statistics on readings returned to readers	
<b>Revision of the Procedures to improve the process</b>	
Revision of procedures/age reading is	

initiated by errors found in the control process.	
Revision of Procedures can be initiated by scientific and technical developments.	
<b>Revision of procedures should always rely on;</b>	
Scientific development within the field	
Technological development within the field	
Revision should always be performed as specified in the manual	

## 5. Report from WG 3

Chair: Beatriz Morales-Nin

Rapporteur: Helen McCormick

**WG3:** Develop guidelines for the creation and application of quality assurance and quality control mechanisms to protocols for the determination of the ages of fish from hard tissues.

The group initially had a brainstorming session,

The first discussion was on what systems if any did each of the laboratories/institutions present have in place. It ranged from all labs having protocols in place, but are in the process of up-dating and amending. Others are starting to produce manuals incorporating, biology, equipment, pictures and generating reference collections. Some labs have already methods in QA and also include traceability of samples. As new developments occur within the area these should be reflected in the protocols of each of the laboratories. All of the labs are to send the index part of their protocols so they can be incorporated in the guidelines, and other laboratories who are not part of the TACADAR group should be contacted and asked if they want their protocols included. Any documents should be send in PDF format.

Secondly a discussion was held on accuracy and precision: otolith workshops improve precision but do not however contribute to accuracy. More work like that presented by IFREMER on the Hake tagging programme improves precision. Another question was on how do age errors affect the assessment, perhaps this is a question for WG1. Countries who are involved in problem stocks should go through ICES, FAO or CGPM in order to maintain the quality of data going to assessments etc.

A further discussion took place on who will govern the accreditation, is there a body out there who would take on this task or would we have to govern ourselves.

A short discussion took place on samples tracking, and maybe information could be gathered on what is going on in this area.

Finally all of this additional work in QC and QA is going to need both additional time, manpower and more importantly money, that should be incorporated in the budgets.

### **Production of the Guidelines**

The manual/guidelines that we produce should be general and not specific, however highlighting some species as examples.

The guidelines will have flow charts and images of the processes.

Have quality control measures during each step of the procedure.

Include excel files for the stats with a simple explanation on the stats.

A chart of the structure to be used for ageing will be included, this already exists in EFAN for several species.

Fix a protocol for image acquisition, including hardware, software, annotations etc.

What is the minimum amount of biological information that you should collect when collecting the otolith. Establish levels of information that you need.

## **Terms of Reference**

TOR 1	Define the species
TOR2	Produce and Index
TOR 3	List of flow charts outlining procedures
TOR4	Basic excel spreadsheets for levels of data collection
TOR 5	Basic excel spreadsheets for statistical analysis
TOR 6	Guidelines for Image acquisition and annotation
TOR7	Guidelines on minimum hardware requirements for image acquisition and processing

## **Recommendations**

Meet at the next plenary meeting for at least on morning.

Review the draft TORS.

Produce a final version that should be evaluated by other TACADAR members and externally.

## 6. Report from WG 4

Audrey Geffen (chair), Jari Raitaniemi (rapporteur)

The discussion in this workgroup served to

1. define the role of the group during the life of TACADAR,
2. agree on the Terms of Reference for the group
3. agree on the plan of proposed work for the group
4. describe the links and interactions with the other WGs in TACADAR, and
5. define the content of the TACADAR deliverable, according to the view of WG4 members

### **1. define the role of the group during the life of TACADAR,**

The **Role** of WG4 was agreed to be:

#### **To define the *process* of applying quality assurance and quality control in age determination**

Our aim is to ensure that the application of QA and QC retains the ability to evolve, incorporating technical improvements and conceptual changes brought about by future research. The WG would continue with the existing members, open to new members over the course of the project.

### **2. agree on the Terms of Reference, plan for proposed work**

The **Terms of Reference**, and work that the WG will do during the TACADAR project are:

**To gather information about the process of QA and QC**, by first defining the terms used e.g. accreditation, certification, and second by evaluating various existing schemes for certification and standards (CEN, NIST). Accreditation and certification are very different standards, certification is usually less detailed and less involved compared to accreditation. These terms and others are used without proper consideration within the TACADAR project and also in the wider fish research community. The WG agreed that it would be important to define these terms early in the project to ensure best level of communication between all the WGs and members.

The WG also agreed to investigate five different models of accreditation/certification/standards. Examples of different models are to be found in medical sciences, technical standards, CEN, standard test fishing methods, etc. During 2003 these models will be identified and collected by Moksness and the information passed around to the other WG members. Despite the often quoted “more of an art than a science” description of age estimation, we felt that there were similar technical procedures, used in both research and routine work, that could provide us with very useful examples. We suggest that DNA testing, in particular, is similar in requiring some level of personal interpretation and thus introducing uncertainty into a procedure that is required to produce ‘accurate’ information for legal and health users. Other models are likely to be found in the environmental sciences and hydrobiology where standards and certification are also required for legal users.

WG4 discussed the type of experts that would be beneficial to invite to future TACADAR meetings, and agreed that we needed to hear from experts with experience

in developing different types of standards, especially those involved in the models we will have evaluated

**To gather information about expectations both within and about the project.** Using questionnaires and personal interviews the WG will evaluate the benefit to individual members and age readers, evaluate expectations of ‘officials’, and identify and inform Customers across other Framework Directives and among users of age data of the added value of analysis of calcified structures. We believe it is important to document the divergent expectations among members, the opinions as to what the output of TACADAR should be, and what individual members is the personal benefit they derived from TACADAR membership. We need to document the expectation of the commissioners and customers for this project. We believe that the project is expected to quantify (relatively) importance of age data in relation to catch statistics. This will be accomplished by surveying ICES delegates, using questionnaires to ask how important age data is for their work, and what level of precision is expected for the data. This information will also be exchanged with the other TACADAR WGs to increase the coverage.

The WG also should identify other customers for age estimation in addition to assessments, such as water quality directive, biodiversity, etc. For example, the WFD currently lacks a standard age estimation protocol although it is a requirement of the directive. There are also an increasing number of ways to analyse the calcified structures used for age estimation, and many of these new analyses provide not age information, but information on stock identity, migration, and environmental change. This information is in some ways a by product of the research effort to understand how calcified tissues form in relation to age and growth of individual fish, so that research which leads to understanding and improvements in age estimation techniques can also benefit other fields.

The information gathered about expectations will be reported back to the project members at the 2005 meeting, and the WG will reserve one half-day of the meeting for this.

**To promote TACADAR and the importance of quality data widely,** using personal contacts to report on progress of the project to the Directors Group, EFARO, etc.

#### **5. define the content of the TACADAR deliverable, according to the view of WG4 members**

WG4 agreed that a Guide would be the most appropriate output from the TACADAR project, rather than a rigid Manual. This Guide would contain Protocols, Definitions, and Steps to accreditation. The protocols could be divided into four categories:

Training, Technical, Ageing, QA & QC. It would be useful in the project to access existing protocols from members. The issue of language was raised in the plenary discussions, but within this WG meeting we discussed approaching the EU directly for translation costs. We suggested that translators for national protocols could be identified by members, at that members should also set the access levels for all their documents, including protocols

## **Investigation of impact of accreditation on publication prospects**

As part of the second Term of Reference (gather information about expectations both within and about the project), editors of various scientific journals that publish papers in fisheries, fish biology, and fish ecology were contacted and asked for their views on accreditation in age estimation work. They were specifically asked whether accreditation would influence the 'publishability' of manuscripts sent to their journal. This exercise was one aspect of evaluating the impact of developing an accreditation process.

The text of the letter sent to the editors was:

"I'm working on an EU Concerted Action project called TACADAR, that is looking at protocols for fish age estimation. I'm interested in assessing the impact of quality assurance and certification of age readers (those who estimate fish age from scales or otoliths), and for this reason I'd welcome your opinion on the acceptability of an internationally recognised accreditation scheme for age estimation. In particular, I'm interested in the 'credibility' of non-certified researchers when trying to publish their work:

- Would your acceptance of manuscripts be influenced by whether age estimates were done by accredited readers?
- Would your evaluation of reviewers comments be influenced by whether the work was criticised for being done without accredited readers?

I hope to present a summary of responses in the next TACADAR report. The project website is <http://www.efan.no/tacadar> and you can see there more details of the activities."

### **Summary of responses**

Thirty-three editors were contacted, spread across 12/13 countries, representing 18 journals, and these are listed in Table 1. Twelve editors had responded as of May 25, 2003, and several more by August 2003. The responses will be summarised for the next TACADAR meeting.

In general, the issue of accreditation was considered irrelevant, but the issue of following a recognised protocol or defining a repeatable protocol was considered very important. Most editors felt that the review process was sufficient and most appropriate for evaluating work that has been submitted for publication. Several editors felt that the accreditation status of the author would influence the acceptance of a manuscript

Most editors felt that they would not be influenced by reviewers comments that criticised only the lack of accredited readers, but again would be influenced by criticisms of the methods actually used.

**Table 1. List of editors contacted**

Journal	Editor	Country	Press
Journal of Fish Biology	RN Gibson	Scotland	Blackwell
	J Craig	Scotland	Blackwell
	S Rogers	UK	Blackwell
	J. Johnsson	Sweden	Blackwell
	M. Kaiser	UK	Blackwell
	J Thorpe	Scotland	Blackwell
ICES Journal of Marine Science	N Daan	Netherlands	Elsevier
	P Pepin	Canada	Elsevier
Fisheries Research	A McIntyre	Scotland	Elsevier
	Gavin Begg	Australia	Elsevier
	Mike Armstrong	UK	Elsevier
Aquatic Living Resources	B. Milcendeau	France	Elsevier
	A. Eleftheriou	Greece	Elsevier
Journal of Experimental Marine Biology and Ecology	T. Underwood	Australia	Elsevier
Aquaculture	B. Costa-Pierce	USA	Elsevier
Acta Oecologia	R. Arditi	France	Elsevier
Fishery Bulletin	N. Bartoo	USA	NMFS
Transactions of the American Fisheries Society	F. Utter	USA	Allen Press
	D. DeVries	USA	Allen Press
Fisheries Oceanography	S Coombs	UK	Blackwell
	B MacKenzie	Denmark	Blackwell
	D. Checkley	USA	Blackwell
Journal of the Marine Biological Association of the UK	A Pulsford	UK	Cambridge University Press
Canadian Journal of Fisheries and Aquatic Sciences	J. Hutchings	Canada	NRC Research Press
Marine Ecology Progress Series	K. Sherman	USA	Inter-Research
	H. Browman	Norway	Inter-Research
	O. Kinne	Germany	Inter-Research
Journal of Sea Research	J Beukema	Netherlands	elsevier
	H Veer	Netherlands	elsevier
Marine & Freshwater Research	M Kingsford	Australia	CSIRO
Sarsia	T Hoisater	Norway	UiB/IMR
Journal of Applied Ichthyology	H Rosenthal	Germany	Blackwell
Environmental Biology of Fishes	D Noakes	Canada	Kluwer



## 7. Report from Steering committee Meetings

The Steering Committee met twice during the meeting. For the rest of the TACADAR period the SC will have the following members:

### TACADAR Steering Committee

Chairman: Erlend Moksness, (Institute of Marine Research, Norway)  
Cornelius Hammer (Federal Research Centre for Fisheries, Germany)  
Nuno Formigo (Universidade do Porto, Portugal)  
Henrik Mosegaard (Danish Institute for Fisheries Research, Denmark)  
Beatriz Morales-Nin (CSIC-UIB, Spain)  
Audrey Geffen (University of Bergen, Norway)  
William James Mc Curdy (Department of Agriculture and Rural Development Aquatic Systems Group, Northern Ireland, UK)  
Magnus Appelberg (Institute of Coastal Research National Board of Fisheries, Sweden)

It decided the upcoming meeting should take place at the following locations:  
**Ancona, Italy**, during three days in early September 2004 (Local host: Enrico Arneri)  
**Enniskillen, Northern Ireland, UK**, during three days in July 2005 (Local host: William James Mc Curdy)  
2005 (not decided yet)

Present EFAN & TACADAR as posters at the otolith conference in 2004

## 8. List of available procedures

Overview of Technical Protocols:

Title	Responsible	Institute/Country	Version	Last updated
Sectioning otoliths using the accutom 5 cutting machine	M W Easey	CEFAS, UK	1.1	16.11.2001
Sectioning otoliths using the "V4" superior cutting machine	M W Easey	CEFAS, UK	1.1	19.12.2001
Mounting cut sections of otoliths onto glass slides	M W Easey	CEFAS, UK	1.1	19.12.2001
Mounting otoliths in black polyester resin for sectioning	M W Easey	CEFAS, UK	1.1	15.11.2001
Mounting pelagic otoliths in resin for age determination	M W Easey	CEFAS, UK	1.1	19.12.2001
Staining cut sections of otoliths	M W Easey	CEFAS, UK	1.1	19.12.2001
The otolin system of preparing demersal otolith sections	W.Mc. Curdy	DARD, UK		
Larval otolith microstructure	P. Re	Guia Mar. Lab., Portugal		Web-based <a href="http://astrosurf.com/re/otolith1_bio.html">http://astrosurf.com/re/otolith1_bio.html</a>
Otolith preparation: <i>Coryphaena hippurus</i>	J. Moanta & B. Morales-Nin	IMEDEA, Spain		
Age determination: Standard methodologies	P. Belcari, A. Ligas & C. Viva	Univ. of Pisa, Italy		
Larval otolith microstructure	J. Panfili	IFREMER, France		
Age determination methods for juvenile plaice <i>Pleuronectes platessa</i>	A.J. Geffen	Univ. Of Liverpool, UK		
Procedures for age determination of anchovy and sardine through the reading of the annual rings at ISMAR	G. Giannetti, F. Donato & E. Arneri	ISMAR, Italy		
Anglerfish ageing guide	Duearte et. al.	Spain, France, Portugal, Ireland		
Procedure for dissecting and preparing of age material on pelagic fish	H. Gjørseter	IMR, Norway	1.0	Sep. 1999
Age estimation of herring from the North Sea, subdiv. IIIa, and the Baltic.	Lotte Worsøe Clausen	DIFRES, Denmark		May 2003

## Overview of Ageing Procedures

<b>Title</b>	<b>Responsible</b>	<b>Institute/Country</b>	<b>Version</b>	<b>Last updated</b>
Procedure for ages estimation of herring ( <i>Clupea harengus</i> L.)	H. Gjørøseter	IMR, Norway	1.0	Des. 1999
Procedure for ages estimation of polar cod ( <i>Boreogadus saida</i> Lepechin.)	H. Gjørøseter	IMR, Norway	1.0	Des. 1999
Procedure for ages estimation of capelin ( <i>Mallotus villosus</i> Muller.)	H. Gjørøseter	IMR, Norway	1.0	Sep. 1999

## Overview of Quality Control Procedures

<b>Title</b>	<b>Responsible</b>	<b>Institute/Country</b>	<b>Version</b>	<b>Last updated</b>
Quality control of age determination	M W Easey	CEFAS, UK	1.1	01.04.2003
Procedure for quality assurance of age determination of fish	H. Gjørøseter & K. Nedreaas	IMR, Norway	1.0	June 1999

## Overview of Training Procedures

<b>Title</b>	<b>Responsible</b>	<b>Institute/Country</b>	<b>Version</b>	<b>Last updated</b>
Training in age determination	M W Easey	CEFAS, UK	1.1	01.05.2003

## Overview of National (native language) Protocols & Procedures

<b>Title</b>	<b>Responsible</b>	<b>Institute/Country</b>	<b>Version</b>	<b>Last updated</b>
Manual til alders aflæsninger	Lotte Worsøe Clausen	DIFRES, Denmark		December 2002