

MINUTES OF THE
Advisory Committee on Fishery Management

ICES Headquarters
24 October–2 November 2000

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International Council for the Exploration of the Sea
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1 TUESDAY 24 OCTOBER 2000

ACFM was called to order on 24 October 2000 at 9:40. Tore Jakobsen was in the chair. ACFM was welcomed by the ICES General Secretary David Griffith.

David Griffith mentioned the new advisory structure just decided at the ASC 2000. The new Chair of MCAP, Gerd Hubolt, will visit ICES HQ on Wednesday next week to meet ACFM. David Griffith also mentioned that the next meeting of ACFM in the ICES HQ (likely to be in autumn 2001) will not be in the Castle room, but in the new meeting room, which will be build in the present print shop. It is not expected that the reconstruction of the HQ will be finished before for the May meeting 2001 and it is likely that this meeting will be held in some conference hotel north of Copenhagen. David Griffith thanked the ACFM for its understanding and cooperation in rescheduling the next years assessment WG and ACFM meetings in order to meet our customers long and strong wish for getting the advice at different dates than at present.

The agenda was adopted, with the addition that a WGDOC from Frans van Beek about precision in short-term projections will be dealt with under "Any other business".

The Timetable was adopted.

It was agreed that a small sub-group dealing with the EC deep sea fish request should meet on Saturday and the WGDOC by C. Hammer and A. Forest was available and will be a back ground document for developing the draft answer.

The Chair reminded ACFM of the timetable for releasing the ACFM report. A document was available which described the procedure. Everybody agreed to the scheduled proposed, with the addition that the press release moratorium will be until Monday morning 6 November 2000, 9:00 UTC.

1.1 Minutes of the ACFM Consultations

Willy van Hee is missing from the participant list. Eero Aro mentioned that he was not present at the Consultations and not aware that he actually had been nominated for the Vice-Chair of ACFM. He stressed that it is important that people are asked personally about whether they stand for election or not a point of view that ACFM agrees with. However, the situation was special, if he had been elected he would have been in this case totally free to say "no" afterwards as even the specific tasks of the Vice-Chair were not defined. With those comments the Minutes was adopted.

1.2 The new advisory structure

The ACFM Vice-Chair was not mentioned in the document presented to ACFM, this was an oversight, the Vice-Chair was in fact appointed at the Statutory meeting. The new structure will be implemented starting from 1st January 2001. The Delegates did not discuss the tasks of the Vice-Chair, and it is up to ACFM to define the roles. The new system must be close to cost neutral compared to the present advisory system. This means that the meetings of advisory committees would have to be back to back to each other or other ways of saving travel costs need to be found. This will probably give practical problems as it might put extra stress on those ACFM members that will cover both ACE and ACFM. They need to stay on after an ACFM meeting to join an ACE meeting.

There were several points in the paper that were found to be unclear. The Fishery Adviser informed the Group that there remains uncertainties about the precise tasks of MCAP although it was clear that MCAP would deal with both tactical and strategic issues. One specific problem regarding tactics was how ICES should deal with the EC request for advice on fisheries effects on small cetaceans. Another one was on brand names like ACFM and ACME. The advice has for many years been sent out as the "ICES" advice and it is expected that this also in the future must be the case. The paper talks about "Additional structural elements" and ACFM found this to be unclear what was meant here. Development and condition of peer review is stated to be under the guidance of MCAP. It was unclear whether this was considering the external per review only.

1.3 Requests for advice

The EC deep sea requests was briefly discussed and it was mentioned, that it was quite similar to a NEAFC request that was discussed in May 2000. It was noted that the answer to EC would probably require, that the answer to NEAFC prepared in May 2000 be revisited.

1.4 Matter arising from 2000 ASC

The dates for WGNSSK has been moved about a week later in June compared to what was decided at the ASC, due to some members having other commitments at the time originally decided. WGBFAS was by the Delegates shortened by one day, because the Polish institute was not in favour of starting the meeting on the first day after Easter. This means that the total number of meeting days for WGBFAS is back to normal (10 days). The recommendations on dates for NWWG and AFWG showed inconsistencies in the meeting dates given in various documents. These inconsistencies were rectified.

Medium-term analysis is not included in the TORs for assessment WGs for 2001. Sometimes the analysis from last year can be used, but sometimes the stock status has changed so much that a new analysis is needed. The dilemma is to keep the assessment and advice stable and at the same time to take account of all the new information available. If guidelines could be given to the WGs for how and when to change PA reference points etc., it would be possible to cope with the dilemma in a more orderly and consistent way. It is not appropriate to turn the blind eye to new scientific evidence, as ICES has decided to give advice on "best scientific information".

The Method WG meeting dates are not decided. June has been suggested, but at that time we have ACFM, WGNSSK, WGFS, CONC and due to expected overlap in membership, this is unfortunate. WGIBTS venue is put to ICES HQ, which means that the past policy of WGIBTS having its meeting outside ICES in order to involve scientists from the western area is discontinued. It might mean that one new IBTS partner, Northern Ireland, will not participate.

Capelin Symposium in July 2001 was mentioned, in order to make ACFM members aware of it.

There is a proposal for a symposium on PA in the 1st half of 2003 in Chile (Chile was at the 2000 Statutory meeting granted Observer status to ICES). Laura Richards (USA) will take the lead in setting this up. ACFM members were encouraged to contribute papers to this symposium.

ICES is co-sponsoring two NAFO symposia 1) **Deep Sea Symposium in Havana, Cuba**. Nils Hammer informed the Group that he probably will present a paper about deep sea fisheries at this symposium, actually the WP presented to ACFM. 2) A symposium on **elasmobranch fisheries** in September 2002.

Report from Theme sessions and mini symposium. The Mini symposium resulted in a WS on ecosystem modelling. There will be a **Planning Group for a Workshop on Ecosystem Models** [PGEM] (New Chair: Dr C. Frid (UK)) meeting at ICES Headquarters from 6–8 March 2001. ACFM should be involved in this and ACFM members are encouraged to participate. Fisheries expertise will be important. The Theme session on Medium-term analysis have important results, which ACFM should have in mind when discussing this during the present ACFM meeting.

1.4.1 Election of WG Chair

WGNSSK needs a new Chair and Martin Pastoors has been suggested by WGNSSK. A nomination took place. Many nominated Martin Pastoors, and nobody else was nominated. ACFM was informed that Martin Pastoors is willing and allowed by his institute to stand for election. The nomination was kept open for a few days as is normal practise to allow ACFM members time for reflection.

1.4.2 Stock Rebuilding Plans

Henrik Sparholt presented a paper prepared by the Secretariat. This paper reviewed ACFM practice mainly based on the advice given in 1999 and the paper included a decision tree for developing a stock rebuilding plan. ACFM was hesitant to adopt such a scheme at this point in time, but generally supported the structure. Hitherto the word "recovery" and "rebuilding" have been used as aliases. ACFM considered that it is better to use only the phrase "Rebuilding Plan" since the term "Recovery Plan" is used by other organisations in the context of species in risks of extinction. How should rebuilding plan work if the reference points are changed in the period of rebuilding? This was a question put forward as one difficult to answer at the moment. Fans van Beek noticed that there would be situations where the scheme would not be applicable. There was general support for the framework while ACFM wanted to have time to reflect on the details of the scheme. The rebuilding plan should be pre-agreed i.e. that ACFM should take care that targets are not constantly moving. At the same time rebuilding plans should be able to take into account new information about stock status as it become available. Typically, there will each year be new information on F, SSB, etc, and the rebuilding plan should be such, that new information is an integrated part of the plan. It is, however, difficult to say precisely how this can be done. Instead of using fixed limit, where one F value is chosen if the stock is above and a quite different one if

the stock is below, a linear approach of changing F would be more appropriate. ACFM would come back to this paper and its issue later on in the meeting

1.5 ACFM TORs

The NASCO advice in 2001 will be dealt with as in 2000 and ACFM members are requested to be available by e-mail communication in spring 2001, when this will be discussed over e-mail.

1.6 Format of advice for 2001 ACFM report.

Tore Jakobsen presented a WGDOC dealing with the format of advice for discussion. Generally, he found, the current format is appropriate and some costumers have expressed their satisfaction while others have been more critical. There have been conflicting requests for revisions and it was decided to develop an inventory of past feedback on the format from Dialogue meetings etc. However, there are several improvements, which can be made.

It was proposed to study what wording is effective in terms of communicating with the managers. Also the issue of normal and clear wording of the advice was discussed. It was suggested to include a paragraph in the beginning of the ACFM report explaining various points in the report. However, the ICES advice also needs to be stringent to be defensible even in the possible event of a court case involving the advice. We have to use the "lawyer's" language. There is a dilemma between plain language and a stringent advice and ICES should maybe be clearer about what route to take. For the time being the advisory format will not be changed.

"Lack of consistency" is one of the most important points of critique of the advice that ICES receives. In some cases the advice is inconsistent or the apparent inconsistency is not well explained. ACFM will follow up on these problems and be careful when phrasing the advice. However, in several cases the apparent inconsistency is more related to the form of advice than to the format. It was also noted that ICES should be more offensive, often ICES is just listening to critique without "fighting back". It was questioned whether this was an appropriate approach.

The **overviews** have been very consistent over the years. Actually, they have almost been unchanged. ACFM found that time was ripe to find a new form and making some new and more interesting overviews. Topics such as overall ecosystem changes or common trends in recruitment for a number of stocks could be part of these overviews. It should be kept in mind that the SGEMS are working on similar issues and work needs to be coordinated within ICES. Aspects of mixed fisheries could also be part of an overview as the individual stock sections are not the appropriate place to discuss this. To mark such a change the name It was also suggested that overviews should not be called overviews anymore but something else. ACFM decided to await the results of inter-session work to be done before the May 2001 meeting before defining a changed format and content. Tore J., Eero and Frans should be part of this. It was agreed that during the present meeting a list of ideas should be produced.

A section to deal with Consistency in the advice compared to advice provided on other stocks was considered. This, however ACFM found, is better dealt with in a special chapter, dealing with this issue for all stocks at the same time, i.e. as part of the Overviews.

The discussion then reviewed the specific sections and paragraphs in the current lay-out of the summary sheets. There was general satisfaction with the present format.

New Sections to appear from ACFM 2001 onwards: ACFM decided starting from May 2001 to include a new section comparing present advice with previous advice. Also starting from May 2001 a new section on Medium-term and Long-term projections. Managers have requested more information on these topics.

State of the stock/fishery. It was agreed that the heading of the section should be "State of stock/exploitation" instead of "state of stock/fishery", as state of the fishery is often understood as economics of the fishery. In the past the ACFM report has included phrases like "the stock is probably (or likely) this or that". It would be better to use "estimated to be close to" or a similar phrase. ACFM has been meandering a bit on this in the past and more consistency would be better. The feature of an "on-of" switch in description of status is not as good as having more nuances in the phrasing by saying the "close" to or "just outside", in those cases where this is relevant. Statements about recruitment should only be included when incoming year classes are either very large or very small. However, it was also mentioned that it would be nice to always have this information in the same place in the documents. "State of the stock" shall only include information about the state of the stock/fishery, and recruitment can in fact be said to be both a part of the State of the Stock and a part of the projections. Growth and maturity could be included as it is an aspect of the state of the stock. It was agreed that recruitment needs to be commented upon in the "State of the stock/exploitation" section, as

recruitment is part of the status of the stock. It was also an issue, precisely which time is referred to regarding the status of the stock. This should be standardised and presented in an introductory section to the ACFM report and when referred to under each stock the year should be given in brackets. The general rule could be SSB in the year after the last VPA year, i.e. the survivor SSB from the VPA and regarding F the value in the last VPA year. There is a problem with stocks spawning in mid-year instead of at 1st Jan., and here it would be most obvious to use the SSB in the last VPA year. It was also discussed whether to use the last three years mean F as the F_{sq} or only the last years F. ACFM has sometimes advised WGs to use the three years mean and sometimes the three years mean re-scaled to last year F. Whether in general to advice to use the three year mean or just the last year for F_{sq} could actually be analysed by considering past advice or by simulations. It was agreed that F_{sq} should be the last years F, but if there is a retrospective pattern, then this should be taken into account in the advice. A bias correction has in a few cases been used in assessments (Icelandic saithe, cod Baltic recruitment) based on estimates of the bias. It is very difficult to develop a common practise for bias correction and it might be better to just state the bias problem in a paragraph about quality of the assessment. A probabilistic approach for F_{sq} compared to a deterministic one with information on uncertainty was also briefly discussed.

Where there is a scope or potential for gain in yield for the fishery by changing F to say F_{MSY} or by changing exploitation pattern for a given stock, this should be stated. Managers have requested this. It might be very difficult to be precise on this and it might be more appropriate to just state in broad terms whether there are major gains in catch by changes in exploitation patterns or by changing F levels. In some cases where actual analysis is available, it might be appropriate to include this.

“Management objectives”. ACFM found that the general statement "There are no explicit management objective..." should only be used when ACFM positive knows that this is the case. In many cases the statement should be replaced with “ICES has no information on management objectives for this stock”. It is often a problem to get the latest management agreement on objectives. These agreements are needed in order for ICES to formulate the advice. While it on one hand seems like a useless exercise to repeat the standard phrase on the other hand it was considered important in case there is no management objective, that this is clearly stated. It was agreed that the section is important and should be kept.

“Proposed PA Reference Points”. The term “proposed” in PA ref. points means that they are open for discussion with managers, because managers should decide which kind of risk they are prepared to take. However, this does not relate to limit reference points, phrasing should be changed or the proposed only be used for F_{pa} and B_{pa} .

“Management advice”. The advice should be to "to or below F_{pa} " rather than "to F_{pa} ".

“Catch forecast”. $F_{0.1}$ or F_{max} , if relevant, should be included in the forecast table as management agencies have asked for that. F_{MSY} might also be considered in this context. The F_{MSY} will be dealt with by a WG meeting in April 2001 and ACFM should wait with its decision until the result of the Study Group is available.

Intermediate Year - Projection of catch. There was an extended discussion on whether to assume a TAC or a *status quo* catch in the intermediate year in the short-term projections. A WPDOP by F. van Beek was presented. Compensation or cancellation of errors by using F_{sq} seems not to be very large. A systematic trends in bias in F can actually be rather complicated as analysis of some Icelandic stocks have shown that for different age groups the bias can sometimes be of different sign for different age. It is not possible to say, which method is preferable in general, thus not possible to have a default procedure. It seems more appropriate to let it be an open option, and let it be stock specific. The best judgement should not be based on what can be sold to managers, but what from a scientific point of view is regarded as the best. NAFO has the same problems in some stocks but not in others assessed with ADAPT indicating that it is a problem, which is only due to the use of XSA as the VPA tuning method. Discarding, high-grading, mis-reporting and changes in natural mortality can be the reasons. It should be explained why one or the other (TAC or F_{sq}) is selected in the forecast section.

A new heading “Comparison with previous assessment and advice” should be included and always contain comparisons with previous assessment and advice. (See discussion above).

“Relevant factors to be considered in management“ and “Elaboration and special comment” should have few restrictions about what to put in, but matters directly relevant for management should go under "Relevant factors..." . The “Relevant factors” section should only deal with factors relevant to management. Any other comments should go under “Elaboration”.

The PA ref. points paragraph should always come right after the “Management objectives” paragraph, also in the most case that there are no changes to the PA point.

“Catch data” should be changed to “Overview of ACFM advice”.

Care needs to be taken when using the terms “catch” and “landings”.

The standard graphs given were found to be a bit “grey” and ACFM welcomed the promise by the Secretariat to review the design of these graphs for the 2001 ACFM report. The four standard plots are still appropriate to have. Y/R and SSB/R are needed as well, but F_{max} and $F_{0.1}$ should be given if relevant. The short-term forecast plot is probably not used very much, but it is good to direct managers to, when they ask for more options in the predictions. It might be an idea to include something about size structure of the fish in the stock in the Y/R graph. It could be mean individual weight of the catch as a function of F.

The PA plot should be kept for the time being.

S/R plot should be kept. References to F_{high} , F_{med} and F_{low} need not to be included.

It was suggested to include a graph, which shows the contribution by year class to catch and SSB. The Secretariat promised to consider these proposals.

Icelandic experience was that showing the managers and the fishers the age or size composition of the catch in the good old days compared to that seen at present, was an efficient way of illustrating the effect of heavy fishing.

In conclusion of this discussion it ACFM was warned against including too many graphs as managers are not looking very much on these, but mainly considering the numbers given in the catch option table etc. However, simple and appropriate graphs can help getting the message across.

Finally ACFM noted that the outcome of the present discussions about format and the description of what should be discussed under each heading in the ACFM Stock Summaries, shall be included in the future Quality Manual.

1.6.1 ACFM/ACME coordination

Janet Pawlak participated in this discussion.

Bio-diversity. A report prepared by the ICES Secretariat for the Danish Forest and Nature Directorate will become available at the end of the week of the ACFM meeting. ACFM was invited to have review the fish sections and comment on it. Jake Rice and Henk Heessen were appointed to deal with this topic.

PGEQO (Planning Group on Ecosystem Objectives). Janet Pawlak presented the work. The Group met 23 October 2000. Sea mammals and sea birds EQOs have been put to ICES from OSPAR. SGEMS will also consider this and will be ready in time for the ACFM meeting in May 2001.

CONSSO (Committee of North Sea Conference Senior Officials). Hans Lassen presented the outcome of the meeting in Norway in October 2000. The fifth North Sea Conference will be held in March 2002. Fishery is very much on the agenda of this the meeting. The Conference will review the development of the system in the light of the targets established at the Esbjerg meeting in 1995 and the IMM in 1997. ICES is also involved in reporting on Species and habitat issues. There might not be much work for ICES as the 5th North Sea Conference Secretariat will probably just take the ACFM and ACME 2000 reports and extract what they need. If ICES is going to be involved, there might be the need for a small ACFM sub-group to review the report.

1.7 Other matters

Some members found that ACFM and WG reports are difficult to download from the web for some institutes. The reports are big and it can take a long time to download the reports and this blocks the computers meanwhile. Often there is very little time for reviewers to study the reports and there is no time to waste in this process. In one country an old computer was set aside only for the purpose of downloading ICES reports. This might be an idea for other countries to overcome the problem. Although the Secretariat take care in explaining the status draft, semi-draft or a final version of the reports this was not always clear to members. It was proposed that there on the ICES website would be a list, where this information is given. Also a draft stock summary was available on the web for a short while without password protection. The Secretariat promised to take care that this does not happen.

The Plenary was closed 18:15.

2 WEDNESDAY 25 - SATURDAY 28 OCTOBER 2000

During these days ACFM met in plenum in the morning to review progress in the sub-group and various issues were raised from the subgroups. These topics related to the reviews and are dealt with in the Technical Minutes or were discussed in plenum in the following week when the advice was formulated.

3 MONDAY 30 OCTOBER 2000

ACFM was called to order on 30 October 2000 at 9:10. Tore Jakobsen was in the chair.

Robin Cook joined ACFM from this day and onwards, as representative for the RMC.

The Norwegian Minister of Fisheries visited the Secretariat this day, but this did not involve ACFM.

A new timetable plan for the rest of the week was presented and adopted.

General Discussion

The use of F_{lim} and B_{lim} in formulating the advice was discussed. The different shading of the stock situations in the PA plot indicate that the limit reference points are used in advice. It can, however, be said that the PA plot is mainly to show historical situations and thus does not contain uncertainty to the same extent as in the advice, which is based on forecasts.

It was agreed always to relate the status of the stocks to the F_{pa} and B_{pa} points. If also F_{lim} or B_{lim} is compromised then state in addition something like "...F is even above F_{lim} ...", so that readers are not wondering why limit points are not mentioned if they have been compromised.

It was also agreed that advice should always be given in relation to F_{pa} and B_{pa} and not to F_{lim} or B_{lim} .

Standards for medium-term projections to be included in the forecast table were also discussed. Should it be 5 or 10 years projections are something else. No conclusion was reached.

Consistency across stocks and consistency within stocks from year to year are very important. However, these two aims are to some extent conflicting, because the advice is changed for a given stock in order to make it consistent with other stocks then it will not be consistent with the advice given the year before. As things develop and new forms of advice are decided continuously, consistency will be a never ending struggle and the point is to develop this in an orderly and well planned way.

The word "collapse" and other similar strong words were extensively discussed. No conclusion was reached.

It was decided to not include F(2000) in the four standard plots and nor in the summary table.

There was an ongoing discussion of the assessment strategies and several comments of great inside knowledge were offered at various times: These comments include

- In cases where a working group encounters problems with the data, the data are often discarded. This is not in general the best way forward. It is often better to try and be creative and use the data as far as the data quality permits.

3.1 Arctic WG - Summaries

Asgeir Aglen presented the summary sheets.

NEA Cod. A new assessment has been done by the AFWG, with revisions of XSA settings in order to improve the stability of the assessment from year to year, and especially to avoid the bias seen in the past years.

A separate text was presented on the revision of B_{pa} . The in progress work on historic maturity will soon mean revisions of the B_{pa} and the direction will be towards a lower value according to info from the Tore Jakobsen.

The use of a TAC constraint in the forecast was questioned in the light of mis-reporting in the past. However, information from the fishing this year by large trawlers indicated that TACs were more strongly enforced in 2000 than in the past.

The R time series given in y the standard plot and in the summary table was not consistent, as cannibalism was not included in all years. This means that R probably is underestimated in the first part of the time series. A revision of the R time series will be done next year when also the maturity time series is revised.

Coastal cod. Some more analysis is needed in order to give a useful advice. To just advise: "To halt the stock decline and allow for rebuilding, it is recommended that F be reduced considerably." is not very useful, as the managers do not know to how much etc.

Maybe F_{med} could be used as a kind of reference point.

The coastal cod is more like a stock complex of coastal and fjord cod.

NEA Saithe. It was mentioned that for this stock survey data becomes available in November. Next year the AFWG will meet in spring and ACFM will deal with the advice in May. Managers will make in-year revisions to the advice in the future, if needed.

The improvement in exploitation pattern was questioned, as there were poor sampling of young saithe in the commercial catch. However, there were indirect indications of this from change in areas of exploitation etc.

S. marinus. The CPUE downward trend might be stronger than it appears, as the improvements in catchability of fishing over the years have not been taken into account.

Greenland halibut. PA reference points are still not proposed. The assessment is uncertain but precisely how uncertain is difficult to say. The residuals in the XSA are not very big but the correlation to the survey indices is low.

It was agreed to revisit the NEA cod and Greenland halibut summaries, but the others can be regarded as "Final" with the corrections made during the above discussion.

3.2 WG Southern Shelf Demersal Stocks - Summaries

Manuela Azevedo presented the summaries.

Whiting VIIe-k. There was an extended discussion about using 3-year mean for F_{sq} or the F99. In this case there was a larger than normal uncertainty about F99. On the other hand there seems to a significant increase in F over the last three years and using a 3 year mean on survivors calculated based on F99 gives some significant inconsistency in the forecasts. On balance it was agreed to use the F_{sq} (3 year mean).

F_{lim} and F_{pa} seem premature to define as there seems to be a large degree of instability in the assessments illustrated by F_{med} changing significantly from last year's assessment to this year's assessment.

Celtic Sea plaice: There were editorial changes. The advice was adopted. The general problem of using 10 year Medium term projections as the basis for setting reference points was also recognised for this stock and the coming SGPA group shall look seriously on this issue.

Celtic Sea sole: There were only editorial changes to the draft. The link between the Celtic Sea sole and plaice was recognised and the advice was checked for consistency between these two stocks.

Sole and Plaice in VIIe: The links between sole and plaice were considered so strong that the discussions were done taking both drafts at the same time. The draft advices for both stocks were after some considerable discussion accepted by ACFM.

Sole in the Bay of Biscay: This advice was not finally accepted. ACFM wanted to see it again after redrafting. The projections were considered unreliable as 59 % of the projected catch for 2001 stems from the assumed average recruitment. The lack of French data for 1999 added to the uncertainties around this assessment. ACFM asked for a redraft based on

- It has not been possible to update the assessment due to lack of French data
- The recommendation should therefore be that any TAC for 2001 should not be greater than that for 2000
- The Catch forecast was not accepted, the table was deleted from the draft,
- Unless the data problem (French data) will be solved in the nearer future application of the PA implies a reduction of the TAC already from 2002
- Note that the long term catch corresponds to the recent catches

Megrim VII+ VIIIa,b,d,e: There were a number of editorial changes. ACFM realised that the change in technical measures for megrim decreasing the minimum landing size from 25 cm to 20 cm may have significant but unknown impacts on fishing strategy and discard practices. This makes the projections (based on unchanged exploitation pattern) unreliable, it was proposed to delete these from the text but in the end ACFM still found them useful and the catch option table remained part of the advice.

Anglerfish VIIIb-k + VIIIa,b: ACFM asked for a revised draft taking into account the following points: 1) The assessment has been changed compared to last year and this should be reflected early in the advisory text in the State of Stock/Fisheries section, 2) SSB is expected to decline and the features in the stock structure that causes this should be explained. The Catch projections were accepted and shall be part of the advice.

Southern Hake: The draft proposed an advised TAC for 2001 of 8,500 t while a straight forward F_{pa} catch projection suggested 8,900t. ACFM decided after discussion to accept this latter (8,900 t). The argument for the reduction was centred around a consideration of bias in the assessment (underestimating F and overestimating SSB). The advice shall be revisited using the advice from 199 as the basis. There was a discussion of the basis for the possible bias 1) trend in catchability, 2) lack of reporting of small (undersized) fish were suggested as explanations.

Northern Hake: The draft advice (50 % reduction) was considered to too weak to convey the message to manager on the deplorable state of this stock. The text was therefore changed to advice "lowest possible catch", recognise that SSB cannot be brought back to levels when average recruitment was seen in the short term, and that a rebuilding plan is required. There was a text proposal that ACFM wants to see again.

The session closed at 20:30

4 TUESDAY 31 OCTOBER

The session was opened at 8:30 am with Tore Jakobsen in the chair. The work on the WGSSDS report and the draft summaries was continued.

Megrim (*L. boscii* and *L. whiffiagonis*) in Divisions VIIIc and IXa: The draft advice suggested changes in the reference points for *L. boscii*. This caused a general discussion on the principles when to change the reference points. It was required to keep an overview of when ACFM make changes to allow consistency. Several members indicated that they were hesitant to change these reference points and asked the coming PA group to look into principles on which to change reference points. The discussion on the specific advice concluded that the changed reference point could not be accepted, the S-r plot that was the basis for the proposal from the working group could be interpreted in several ways and therefore was not sufficient for determining a reliable reference point. ACFM instead wished to see a re-draft of the text based on F_{med} used as an interim reference point until such time when a better founded point(s) can be defined. The advice would then be based on these reference points (0.3 and 0.37) but the advice would be based on $F_{sq} < F_{med}$. The argument was the stability in SSB and variation in recruitment. Finally it was decided to drop shading of the catch forecast tables. The Catch option table was to remain part of the advice.

Anglerfish in Divisions VIIIc and IXa: This text should be seen again by ACFM. A section on how the reference points (B_{MSY}) should be understood was to be drafted (B_{MSY}) is used in the same context as ACFM would use a B_{pa}

reference point). It was also found appropriate to lead in with a statement on the type of assessment that differs from the normal ICES approach.

4.1 **WGNSDS Stocks in Division VIa (Northern Shelf Demersal Stocks) - Summaries**

Anglerfish in Via and IV. The text was accepted with editorial changes.

Cod in VIa: This discussion was not concluded, It was agreed that the advice "lowest possible catch" would be appropriate but that more explanation of the stock status and the immediate expectations for stock development (which are glum) should be given in the text. There was an unfinished discussion how much information the advice should present on the management possibilities to achieve the rebuilding desired. Robin Cook was asked to redraft the text on this point for ACFM considerations.

Haddock VIa. ACFM had during the sub-group review revised the assessment made by the WG due to errors discovered in the tuning data. The revised draft was accepted.

Cod VIIa. The 1999 year class is a central point in the assessment. New information on its strength has just been made available to ACFM from a survey just conducted. This survey indicate that the y.c. is not as strong as estimated previously. However, the survey data are preliminary and it is not clear how well it reflects the actual abundance of the y.c. It is problematic to use data, which have not been properly tested and it was decided not to use the data.

4.2 **Arctic Fisheries 3rd draft**

ACFM reviewed the third draft and for NEA cod recognised that some problem that were raised during the sub-groups had now been revisited and the analysis confirmed the statement proposed by the AFWG.

The MBAL issue was discussed and it was recognised that the WG will in 2001 revisit this issue based on new analysis of the time series data among those the time series of mean weights per individual.

For the haddock the link to the cod fishery should be made more clear and similar for the coastal cod..

With these and some editorial comments the texts were adopted as final.

4.3 **North Sea and Skagerakk Demersal WG - Summaries**

North Sea Cod. The very poor state of the cod stock was recognised and the basic text was accepted. The formulation of the precise advice took some time and several formulations were aired. The link with the haddock, plaice and whiting stocks due to technical interactions were recognised although it was accepted that these links could not be quantified on the available data.

North Sea haddock. The assessment was accepted by the sub-group and the text accepted. The link to the cod and whiting fisheries where the stock is in bad shape was noted in the report.

Whiting IV. RCT3 seems often to over -estimate R and the present stock seems to be an example of this. The text was accepted

North Sea Plaice. The advice was discussed and the basis was changed to advice on a 20 % reduction in F. ACFM furthermore considered that the WGNSSK should revisit the MT projections. Also the reference points need revisiting.

North Sea Sole. It was agreed to take out the paragraph about cold winters 95/96 etc., as it is not so relevant anymore and there were doubt about the actual precision of the statement. Otherwise the text was accepted.

Saithe in IV and VI. This text was generally accepted but in line with the logic used for the plaice the reduction should be based on the 20 % reduction in F. The text should only show 5 year projections. Alain Biseau would provide text for the re[port.

Sandeel. The present advice is not very helpful to managers. Maybe it would be possible to give a useful advice if the management system were changed so that in-year revisions of TAC could be made. The problem is that the main part of

the catch is made up of young fish, which abundance cannot be predicted in time in the current management system. A special SG could consider this issue.

ACFM discussed if it might be more relevant to deal with sandeel and N. pout in ACE, as they are important for the ecosystem. This would mean that these stocks are taken out of the tasks of WGNSSK. However, it was also recognised that there are large commercial fisheries that exploits these stocks/species, At this point in time ACFM will take no initiative.

4.4 American eel

The text was accepted with some editorial amendments

4.5 Pandalus

The text for all components of advice from this WG was accepted with minor editorials

5 WEDNESDAY 1 NOVEMBER 2000

5.1 WGMHSA

Carmela Porteiro presented to summaries.

N.Sea horse mackerel. IBTS data might be useful in order to make rough evaluations about the state of the stock. The WGMHSA should look into this.

The stock complex is complicated and there seems to be a need for a major evaluation of the present perception. This is clearly not something the WGMHSA have time for during a normal meeting and it might be appropriate to set up a special sub-group for this.

Southern horse mackerel. The S-R plot this year is rather different from last year in the way that there now seems to be a clear downward trend in R with increasing SSB. The reason for the change is that the time series is relatively short and that the most recent 3-4 R-values from this year's vpa are somewhat different from last year's vpa values. With the downward trend, the normal procedure would be to regard the lowest observed SSB as B_{lim} and not B_{pa} , as it is at present. It was decided that there was no urgent need for changing the PA reference points and maybe the estimated S-R relationship has not stabilised yet.

NEA mackerel. The management plan of F between 0.15 and 0.20 was discussed whether this was in agreement with the PA criteria. The main problem is that ICES has proposed an F_{pa} of 0.17. In the past ICES has recommended both 0.15 and 0.20 as target ref. Points or upper limits for it, so the EU Observer mentioned that EC was uncertain about what the actual advice was. However, ICES regards 0.17 as the best estimate of F_{pa} . A problem is also whether managers can those an F_{pa} higher than the one proposed by ICES. ICES has in its introduction stated that the "... distance between the limit and the precautionary approach reference points is also related to the risk managers are willing to accept..." and that "...adoption of precautionary reference points requires discussion with fishery management agencies." (ACFM report section 1, 1999). In other circumstances F_{pa} and B_{pa} have regarded by ICES as upper limits to target reference points that managers can use in management plans. It was agreed in the present case to say that the mackerel management plan is consistent with the PA criteria if F on average is kept below 0.17.

Sardine VIIIc and IXa. The forecast table has been redone because of error in the WG report on recruitment for 23000, the GM recruitment was wrong. There were a number of editorial changes. The text was accepted.

Anchovy in Div. VIII. The basis for the advice is the proposed HCR that the WG studied. This HCR was accepted by ACFM as the basis for the advice and the text was changed accordingly. The draft text included a recommendation for an in-year revision of the TAC. The revision would be based on three datasets 1) Acoustic survey results, 2) Egg survey results and 3) the fishery for about the first half of the year. ACFM discussed whether on its own initiative it would provide advice on an in-year revision. ACFM decided based on the short longevity of the anchovy and the problems with even a short term projection that this should be done and the advice includes a provision for a revision based on the above information.

Fisheries on Deep water species. A group under C. Hammer had worked and produced a draft for ACFMs consideration. This draft was reviewed and commented upon. Directions on revisions were mainly editing and expressing the viewpoint more clearly. ACFM would revisit this draft the following day. ACFM thanked the Hammer group for producing a very useful draft that facilitated ACFM's work immensely.

6 THURSDAY 2 NOVEMBER 2000

The following stocks summaries were reviewed during the morning session Anchovy in Bay of Biscay, Sole in the Bay of Biscay, Megrim in VII and VIII, Anglerfish VII and VIII, Northeast Arctic Cod and coastal cod, Greenland halibut, Cod Via, Cod VIIa, Cod IV, Plaice IV, Saithe IV, Sole IV, all Pandalus advice, American eel and the answer on Deep water fisheries.

Furthermore the was election of WG chairs, Martin Pastoors (Netherlands) was nominated by the WG and unanimously elected by ACFM.

6.1 WGNSSK

Anglerfish in IV and VI. This draft was considered after having the assessment has been re-analysed. The rationale for F_{pa} was discussed but kept for the time being. It is a point to reconsider in the context of revising PA point The text was accepted.

Harp and hooded seals. It should be remembered that there generally are large differences in the population dynamics between fish and sea mammals. For instance the S-R aspects are very different. The text was accepted with editorial changes.

This concluded the formulation of advice and ACFM broke for lunch at 13:30

The meeting was reopened at 14:15. Having closed the topic on Advice formulation ACFM went over a number of general points. These proceedings are summarised below.

Ad 8a) Report on a strategy for Biodiversity for the Danish Authorities. Jake Rice and Henk Heesen had looked on this report. The report mainly focus on the activities in Sweden and Norway. Both found the report well balanced and a useful document.

Ad 14 f) SG on Market Sampling Methodology. Henk Heesen (Netherlands) gave a brief presentation of the contents of the report, Tore Jakobsen supplemented

Ad 14 d) SG on Elasmobranch Fishes. This group works by correspondence. A NAFO/ICES meeting will be held in September 2002 on this issue. Paddy Walker (Chair SGEL) is one of the conveners. There is also activities in a 3-year project aimed at assessing the status of elasmobranch stocks. There is a large number of countries involved with this project. Only spurdog has previously been assessed by ICES. Furthermore, there are plans to have a joint ICES/ICCAT joint workshop on at least assessment of pelagic sharks in 2002.

Ad 14 g) Sg on *Nephrops*. This SG alternates with the assessment WG every second year the SG meets. Development of alternative assessment methods are not provided through the SG and the AWG expects to encounter problems to meet its TOR when they meet in 2001 Nick bailey the present chair of the SG has resigned after a very long term of duty. ACFM thanked him for his efforts and regretted that he resigns. In spite of that the SG do very good and very important job it has not been possible to find a new chair. ACFM asked the *Nephrops* scientists to reconsider the situation and see if it would be possible to find a chair.

Ad 14e) Workshop on the Estimation of Spawning Stock Biomass of Sardine (Manuela Azaveda)

The biomass estimates made by the SG were included in the assessment. A very good description of the methods was given. The GAM methods were however not developed due to technical problems. There were problem in reaching consensus on egg stage determination.

Planning future survey was discussed by the SG and it was decided to do the surveys every third year.

An SG on egg production estimates of SSB for sardine has been agreed at the ASC 2000. This is important as it means that the close co-operation between Spanish and Portuguese scientists can be continued.

The report was commended. The report was presented at the LRC at the ASC.

It was suggested that each science committee might have a timeslot scheduled at their meeting for brain storming. One problem seems to be that the science committees still do have a great impact on the ICES work.

Ad 14 h) SG on Ecosystem Assessment and Monitoring (Jake Rice)

The SG wants more fishery expertise in the group. The Ken Sherman large marine ecosystem approach was considered. The plan of the group is to make ecosystem overviews and status description. ACFM and ICES need be aware of this and avoid that more than one ICES body is giving advice on the same matter.

There are two trends that will have influence on ecosystem advice and that are the fishery tradition and the environmental tradition. It is important for ICES to sort out the matters before ICES is caught in a "cross fire", MCAP and ACE should be instrumental on this.

Ad 14 i) SG on the Scientific Basis for Ecosystem Advice in the Baltic (Maris Vitins)

The report was commended. The very comprehensive TORs given to the Group were dealt with in a good way. However, the structure of the report was complicated and it was difficult to follow the response to a given point in the TORs.

Ad 17) Jan Horbowy presented a paper on bias in prediction of with biased F. It showed that the bias problem can be quite large especially when F is large.

Ad 17) Gert Hubold said a few words about MCAP. He presented himself. He was a pupil of Hempel. He worked in Brasil for some year with fish larvae and ecosystem. Became director of a German institute and became involved in ICES work from that and onwards. Have been a Delegate for some years. He said that he could probably contribute with an outside ICES view on the work from customers and from other scientific communities.

It was mentioned that the working conditions and procedures in ACFM are close to collapse in infra-structure. It might be a task for MCAP to consider this. It is for instance very difficult for labs to find resources to do needed scientific work. MCAP in its interactions with clients will look for ways to promote progress in this respect. The new committee structure is really not resolving the work load problem of the assessment work, on the contrary there might be more stress on some members which will now also have to be at ACE meetings. There need to be an improvement in recruitment of scientists. There are few of ACFM tasks that can be handed over to ACE, Harp and Hooded seals might be one, but that is almost all.

It was mentioned that quality control and transparency, should be one of the focus points for MCAP in order to give guidelines for how ACFM, ACE and ACME should deal with this.

Ad 8 b). Jake Rice presented a document with glossary in relation to words used routinely by ACFM and by others in relation to PA, but meaning rather different things. The meeting of PGEQO clearly showed the need for this. ACFM members were invited to comment on the document and its content.

Ad 14 j). WG on Fisheries Systems. Hans Lassen presented this report. It is important that ACFM pay attention to this group because it might allow us to predict how fisheries react to fisheries regulation like TACs.

Ad 16 a). IFAP. Immediate needs. Next year several wgs will not meet in the Secretariat. Therefore, they will not have access to IFAP.

Ad 17 a). FIGIS+FIRMS Hans Lassen presented this project. It has been a long standing wish that there should be a possibility to get easily access to information on fish stock biology. Also there is a demand for stock assessment information on a world wise scale. The web site will be distributed to ACFM from the Secretariat.

Ad 17 c) Hans Lassen presented the issue of courses in Fish Stock Assessment. Funding will be looked for at especially EC.

Ad 10. There will be a standard section about potential gains in exploitation pattern and levels. Feedback on the wgdoc available during this meeting regarding the form and format of ACFM advice was encouraged by the Chair. Regarding the SGPA this coming winter it seems important that ACFM gets started on this and that priorities regarding tasks for the SGPA are determined. Still there is no Chair for the Group.

Agenda

**Advisory Committee on Fishery Management
ICES Headquarters, 24 October – 2 November 2000**

Plenary Sessions 24 October, 30 October - 2 November 2000

- 1. Opening**
- 2. Adoption of agenda and timetable**
- 3. Approval of minutes of ACFM Consultations**
- 4. Advisory Structure – report from Council**
- 5. Documentation and Requests for Advice**
- 6. Matters from 2000 Annual Science Conference**
 - a) ACFM recommendations**
 - b) RMC recommendations and report**
 - c) LRC recommendations and report**
 - d) Symposia and theme sessions in the coming years**
 - e) Mini-Symposium on Defining the Role of ICES in Supporting Biodiversity**
 - f) Theme session on Trophic Dynamics of Top Predators: Foraging Strategies and Requirements, and Consumption Models**
 - g) Theme session on the Application of Experimental Laboratory Studies to Fisheries Science**
 - h) Theme session on Downturn in North Atlantic Salmon Abundance**
 - i) Theme Session on Medium-Term Forecasts in Decision-Making**
 - j) Theme Session on Cooperative Research with the Fishing Industry: Lessons Learned**
 - k) Theme Session on the Development of Reference Points and Management Systems for Fisheries and the Marine Ecosystem**
 - l) Theme Session on the Incorporation of External Factors in Marine Resource Surveys**
 - m) Theme Session on Environment – Plankton – Fish Linkages**
 - n) Theme Session on General Fisheries and Marine Ecology**

7. **Meeting facilities (Plan for rebuilding the ICES HQ)**
8. **ACFM/ACME coordination**
 - a) **Biodiversity**
 - b) **Planning Group for the Ecological Quality Objective Request (PGEQO)**
 - c) **5th North Sea Conference (CONSSO)**
9. **Election of WG Chairs**
 - a) **WGNSK - Martin Pastoors (Netherlands) nominated by WG**
10. **ACFM Working protocols and Form of Advice**
 - a) **Guidelines for establishing stock rebuilding plans**
11. **ACFM report**
 - a) **Format of the report**
 - b) **Introductory items**
 - c) **Table of contents**
12. **ACFM SG to consider the NA salmon advice**
13. **ACFM meeting in May 2001 (presenters and reviewers)**
14. **Working and Study Group Reports**
 - a) **Baltic International Fish Survey WG**
 - b) **Planning Group on Surveys on Pelagic Fish in the Norwegian Sea**
 - c) **WG on Beam Trawl Surveys**
 - d) **SG on Elasmobranch Fishes**
 - e) **Workshop on the Estimation of Spawning Stock Biomass of Sardine**
 - f) **SG on Market Sampling Methodology**
 - g) **SG on Life History of *Nephrops***
 - h) **SG on Ecosystem Assessment and Monitoring**
 - i) **SG on the Scientific Basis for Ecosystem Advice in the Baltic**
 - j) **WG on Fishery Systems**
 - k) **Workshop on the Dynamics of Growth in Cod**
 - l) **International Bottom Trawl WG**

- m) **SG on the Biology and Life History of Crabs**
 - n) **SG on Baltic Cod Age Reading**
 - o) ***Crangon* Fisheries and Life History**
 - p) **Cephalopod Fisheries and Life History**
15. **Preparation of Advice to Commissions and Member Governments**
16. **ACFM Quality Management Procedures - Manuals and Handbook**
- a) **Design of new IFAP**
 - b) **Lay-out of Handbook for WGs**
17. **Any Other Business**
- a) **FIGIS + FIRMS**
 - b) **Project on expanding the IBTS Database to include Beam trawl Survey Data and IBTS data for Western and Southern Divisions**
 - c) **Courses in Fish Stock Assessment**
18. **Closing**

ANNEX II

ACFM Sub-group meeting 25-28 October

	Sub-group Chair	WG Chair	Reviewers	
			1. Rapporteur	2.
Northern Shelf	E. Hjørleifsson	S. Reeves	N. Hammer	J. Pönni
North Sea Demersal	J. Rice	F. van Beek	M. Terceiro	C. Bannister
Pandalus	E. Aro	B. Sjöstrand	E. Hjørleifsson	C. Porteiro
Eels	E. Aro	L. Marshall	B. Sjöstrand	W. Demaré
Arctic Fisheries	A. Aglen	R. Bowering	J. Horbowy	V. Shleinik
Southern Shelf	T. Jakobsen	A. Biseau	M. Azevedo	S. Munch-Petersen
Mackerel	C. Porteiro	D. Skagen	H. Heessen	P. Connolly
Harp and Hooded Seals	E. Aro	T. Haug	J. Rice	J. Reinert

ANNEX III

FORMAT OF THE ACFM REPORT – IS THERE A NEED FOR CHANGES?

Tore Jakobsen
Chair ACFM

Introduction

The aim of this document is to give some background and some fuel for a discussion on changes to the format of the ACFM report. Such changes would then be implemented in May 2001.

The format of the ACFM report has been little changed after the precautionary approach was introduced. The feedback from managers on the format is as could be expected ambiguous, but on the whole not negative (my personal interpretation, based on the fact that there is no consistent demand for major changes to the format). Some managers have expressed a reasonable degree of satisfaction with the format, some would like more detail, some complain about the use of technical terms, all ask for improvement in consistency and transparency.

Also, in spite of possible shortcomings, the present format has the advantage that managers are used to it. Therefore, radical changes should be avoided unless they are felt absolutely necessary or demanded by the clients. On the other hand, a static format gives in the long term an impression of a static committee. Therefore, ACFM should always look for possible improvement.

There are five aspects on the format of the report that at least initially can be discussed separately:

- 1) Overviews
- 2) Sections and paragraphs and their content
- 3) Formulations used in each section
- 4) Tables
- 5) Figures

Overviews

The general overview will depend very much on the ICES policy in management advice in the coming years. With the new advisory committee system, ICES is expected to focus more on ecosystem management. Furthermore, it is hoped that the study group on the precautionary approach will have some impact on the advice formulation. It may therefore be premature to discuss changes in the general overview at this stage, but comments are certainly welcome.

The regional overviews contain a lot of background information that should be useful to managers. The impression is, however, that the overviews are not read. At least they are rarely, if at all, referred to in quota negotiations. One reason for this may be that the overviews are basically static in nature, i.e. there is little, if any, new information added each year. A manager having read an overview once may therefore feel that there is no need to do this every year.

This information contained in the overviews is relevant as background for understanding mixed fisheries problems, multispecies interactions, and ecosystem aspects. With the new advisory committee system, ICES is expected to focus more on ecosystem management. It is therefore possible that the overviews will have a more central place in the advice in the future.

Conclusion: The regional overviews contain useful information. However, information that is directly relevant to (short-term) management decisions should be moved to (or repeated in) the relevant advice section. General changes to the overviews should be considered in the light of the development of ICES' advisory policy.

Sections And Paragraphs And Their Content

At present following standard sections (including text tables) are found in the advice for most of the stocks:

- State of stock/fishery
- Management objectives
- Advice on management
- Catch forecast for XXXX (Table)
- Relevant factors to be considered in management
- Elaboration and special comments
- Data and assessment
- Reference points proposed by ICES (Table)
- Source of information
- Catch data (Table)

All these sections are relevant and I see no reason that any of them should be removed. The discussion should therefore focus on the contents of the sections. However, there may be a need for adding one or two new sections/paragraphs.

Firstly, with special reference to the letter from the Baltic Fishermen's Association, there appears to a need for explaining changes in the advice compared to that of the previous year, even if the changes are as trivial as being caused by the updated assessment. This would perhaps also be useful in improving the consistency in the formulation of the advice between years. I have problems finding a good name for such a section, and a better alternative could be to add it as a second paragraph under Advice on management.

Secondly, some clients (and also some scientists) have pointed to a lack of reference in the advice to the potential for increasing long-term yield. This has two sides. Firstly, there is the question of what could be achieved by improving the exploitation (selection) pattern. This will concern some fisheries where national interests will be conflicting and comments may not be welcome by all parties. The issue is more relevant for some stocks than for others and it could in some cases open a new discussion on multispecies interactions. On the other hand, there are certainly stocks where there would be obvious benefits from improving the exploitation pattern and with ecosystem management as a political catch phrase (no pun intended), the issue is likely to become more burning in the future. In general it is very difficult to quantify the potential gain in yield resulting from an improved exploitation pattern, partly because there are a number of different management measures that might be considered. However, I think ICES should comment on the potential for improved yield, although probably not in quantitative terms.

Thirdly, there is the exploitation rate. Traditional yield per recruit curves will indicate the fishing mortality corresponding to the maximum long-term yield, (F_{max}) but in many cases these curves are fairly flat-topped and hardly suitable for convincing managers that there is much benefit from reducing the fishing mortality. Ideally, such considerations should be based on MSY-calculations, and this is something ACFM will need to have a look at anyway, but the calculation of MSY depends very much on the stock-recruitment relationship and density dependent mechanisms, and there may be few cases where we can be confident about the effect on the long-term yield by optimising fishing mortality.

Contents Of Sections

General

Reading through the advice from last year and comparing the contents of sections between stocks, it is clear that there are inconsistencies (it is also a bit disheartening to find that quite a few nonsense sentences have passed through the

system). We should try to establish a code for what information should be included in each section and also consider a standard for some of the formulations (our words are not always interpreted by managers in the way we think they should be).

State of stocks/fishery

The state of the fishery is not strictly what we are describing here, but the state of exploitation. This is not popular with some managers who will claim that it does not matter if the stock is highly exploited as long as the SSB is above B_{pa} . However, this is not something that we should consider changing before we have had a new look at the way we apply the precautionary approach. In addition to the general state of the stock, comments on recruitment and growth and trends in stock and fishing mortality should be included when relevant. Statements like “the stock is probably within safe biological limits” should be avoided.

Comments to the potential for increasing long-term yield would belong here.

Management objectives

Reference to existing management objectives are useful. However, the general statement on how to meet the precautionary criteria seems a bit redundant and could perhaps be transferred to the general overview.

Advice on management

Even if ACFM has established guidelines for the formulation of the advice, there are special situations where the procedure is not clear. There will be cases where short-term rebuilding of the stock to B_{pa} cannot be achieved even with full stop in the fishery. In these cases it is tempting to advice on a short-term rebuilding to B_{lim} (if that can be achieved), but our guidelines says that the advice always should refer to B_{pa} . Either we change the guidelines or we refrain from giving advice related to B_{lim} (advice related to B_{lim} for 1999 and B_{pa} for 2000 was one of the things that created confusion with the Baltic Fishermen’s Association). If rebuilding to B_{pa} cannot be achieved in the short-term, a rebuilding plan should be proposed. How specific this advice should be is open for discussion. One possibility could be to give a firm recommendation in the cases where the stock is below B_{lim} and options if it is above.

ACFM for some obscure reason has decided to use the term “less than” rather than “no more than” when referring to the TAC. However, I find in the report statements like “fishing mortality should not exceed F_{pa} , corresponding to a catch of less than X_t ” that are not internally consistent. If we want fishing mortality to be below F_{pa} , catches should be less than X_t . If we want fishing mortality not to exceed F_{pa} , catches should be no more than X_t . In some cases it may be appropriate to recommend fishing mortality below F_{pa} , but do we in general have a reason to do that?

Comments on changes in the advice should aim at explaining what is caused simply by changes in the assessment, and if these changes also require changes to the advice formulation, elaborate on this.

Catch forecast

This table seems to suit the purpose well. However, it reminds me that there are different practices in referring to status quo F (either the last year in the VPA or the recent 3-year average) and we should try to be consistent. The shading policy was discussed in May, but perhaps not at full length, so this could be revisited if desirable. Because we have moved the table showing the reference points further back, usually to the next page, we should consider adding a footnote with the values of at least F_{pa} and B_{pa} for quick reference.

Relevant factors to be considered in management

Elaboration and special comments

In these two sections are we should be at liberty in choosing the points we want to make. I do not think there is a need for more specific guidelines.

Data and assessment

The information here is probably more useful for scientists than for managers. I think we should keep it, but it should be short. Problems with the data or assessment should if needed be dealt with under special comments. For some stocks, it has been left out.

Reference points proposed by ICES

Again (apart from the actual reference points) something that is probably more useful for scientists than managers, but it should be kept in.

Source of information

No problem.

Catch data

The table is useful, but the heading is strange. "Overview of ACFM advice" would be better.

TABLES

The rest of the tables seem fine.

FIGURES

Landings, recruitment, fishing mortality and SSB

The figures are useful. The layout has been questioned, mainly in relation to presentations. There have been problems with the quality of print in the past, preventing direct copying to overheads. However, for presentation purposes there is no problem transferring the data in the summary table to Excel and Power Point to produce plots with colours etc. On the other hand, the figures will be changed anyway, so The only slight improvement I would suggest is to put units on the means (except for F).

Yield and Spawning Stock Biomass

I question if these figures have a purpose anymore. F_{max} and $F_{0.1}$ are not referred to anywhere in the advice (and are not shown on the figure). However, it may be an argument to keep the yield per recruit if we decide to refer to long-term effects of changing fishing mortality or to put in references to F_{max} and $F_{0.1}$ somewhere.

In general I am sceptical to yield per recruit plots. The plot basically only reflects to what extent growth compensates for mortality, and is very dependent on the natural mortality assumed. It assumes no effect of fishing mortality on weight at age in the catch, which is why it in some cases does not reach a maximum. The level of SSB at zero exploitation may be useful in some theoretical considerations (virgin stock), although I doubt it, but has no root in reality and gives a misleading impression of what the spawning stock level would be if fishing mortality were reduced. An MSY/MSB plot would be more informative, provided that it could be reliably calculated.

I have yet not heard any manager refer to the short term forecast figure and the information there is well covered in the text table giving the management options.

The PA plot

For some stocks this plot is virtually unreadable and in the longer term we should consider to drop it. However, for the time being it probably serves the purpose.

The Stock and Recruitment plot

F_{med} is not used directly in the advice, but is referred to in some cases as basis for F_{pa} or F_{lim} . However, it is questionable if there is a need for keeping the figure which chiefly is relevant in connection with estimation of reference points.

New figures

Suggestions for new informative figures (and tables) are welcome.

Consistency And Transparency

The comments above do not address all the consistency and transparency problems. Concerning consistency, the main problem is to be consistent across stocks with regard to PA values. This is a complex problem which not only concerns biology and population dynamics, but also management practices in different areas, and it will probably require a long process including inter-sessional work. However, some discussion on this issue would be useful at this stage. Management practices are referred to because this is one source of inconsistency between stocks with regards to biological reference points, i.e. the choices of reference points are in some cases influenced by the management regimes. This could be an increasing problem, because ACFM states that PA reference points are proposed and gives the managers the choice to choose the risk level. With targets being set by managers for an increasing number of stocks, and if these targets are accepted as PA reference points, inconsistency between stocks is likely to increase.

Concerning transparency it is not at all clear what managers really want. In general we should aim at giving unambiguous advice, based on some general principles, which we already try to do. It is very difficult to avoid technical terms, but we should keep in mind that the readers of the advice have a varied background.

ANNEX IV

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA

REQUESTS FOR SERVICES AND ADVICE

November 1999–October 2000

This document is a compilation of formal requests for services from ICES clients. The wording in the ‘Service(s) Requested’ column is a direct quotation of the request(s) received. It is within the remit of the Advisory Committees to review these requests for services and to formulate the terms of reference (or Council Resolutions referred to in the ‘C. Res.’ column) for their subsidiary groups that will provide the scientific basis for the information/advice given.

Customer	Service(s) Requested	ICES C.Res./	Advisory Committee	ICES Coordinator	ICES Group and Shadow	Notes for Action (Deadlines, etc.)
NASCO <i>letter</i> 02.07.1999	1 with respect to Atlantic salmon in the North Atlantic area: 1.1 provide an overview of salmon catches and landings, including unreported catches by country and catch and release, and worldwide production of farmed and ranched salmon in 1999 1.2 describe and evaluate methods currently used for estimating unreported catch by country and advise on improvements to these methods where appropriate 1.3 advise on the data requirements and methods for the scientific evaluation of bird and marine mammal predation on Atlantic salmon 1.4 report on significant developments which might assist NASCO with the management of salmon stocks 1.5 provide compilations of egg collections and juvenile releases and of tag releases, by country in 1999 1.6 provide estimates of escapement from marine salmon farms by country and assess the reliability and comparability of estimates of salmon farm escapees in fisheries and stocks	1999/2ACFM07	ACFM	F	WGNAS (F)	ACFM MAY (special procedure)

Customer	Service(s) Requested	ICES C.Res./	Advisory Committee	ICES Coordinator	ICES Group and Shadow	Notes for Action (Deadlines, etc.)
	<p>2 with respect to Atlantic salmon in the North-East Atlantic Commission area</p> <p>2.1 describe the events of the 1999 fisheries and the status of the stocks</p> <p>2.2 evaluate the effects on stocks and homewater fisheries of significant management measures introduced since 1991</p> <p>2.3 further develop the age-specific stock conservation limits where possible based upon individual river stocks</p> <p>2.4 further develop methods to estimate the expected abundance of salmon in the Commission area</p> <p>2.5 determine the most appropriate stock groupings for the provision of catch options or alternative management advice</p> <p>2.6 provide catch options or alternative management advice with an assessment of risks relative to the objective of exceeding stock conservation limits</p> <p>2.7 provide an estimate of the by-catch of salmon post-smolts in pelagic fisheries</p> <p>identify relevant data deficiencies, monitoring needs and research requirements.</p>	1999/2ACFM07	ACFM	F	WGNAS (F)	ACFM MAY (special procedure)
NASCO <i>letter</i> 02.07.1999	<p>3 with respect to Atlantic salmon in the North American Commission area</p> <p>3.1 describe the events of the 1999 fisheries and the status of the stocks</p> <p>3.2 update the evaluation of the effects on US and Canadian stocks and fisheries of management measures implemented after 1991 in the Canadian commercial salmon fisheries with special emphasis on the Newfoundland stocks</p> <p>3.3 update age-specific stock conservation limits based on new information as available</p> <p>3.4 provide catch options or alternative management advice with an assessment of risks relative to the objective of exceeding stock conservation limits</p> <p>3.5 identify relevant data deficiencies, monitoring needs and research requirements</p>	1999/2ACFM07	ACFM	F	WGNAS (F)	ACFM MAY (special procedure)
	<p>4 with respect to Atlantic salmon in the West Greenland Commission area</p> <p>4.1 describe the events of the 1999 fisheries and the status of the stocks</p>	1999/2ACFM07	ACFM	F	WGNAS (F)	ACFM MAY (special procedure)

Customer	Service(s) Requested	ICES C.Res./	Advisory Committee	ICES Coordinator	ICES Group and Shadow	Notes for Action (Deadlines, etc.)
	<p>4.2 critically evaluate, and provide sensitivity analyses of, the effects on European and North American stocks of the Greenlandic quota management measures and compensation arrangements since 1993</p> <p>4.3 provide estimates of uncertainty and evaluate apparent recent changes in the proportion of continent of origin detected in the West Greenland fishery catches</p> <p>4.4 provide a detailed explanation and critical examination of any changes to the model used to provide catch advice and of the impacts of any changes to the model on the calculated quota</p> <p>4.5 provide age-specific stock conservation limits for all stocks occurring in the Commission area based on best available information</p> <p>4.6 provide catch options or alternative management advice with an assessment of risks relative to the objective of exceeding stock conservation limits</p> <p>4.7 identify relevant data deficiencies, monitoring needs and research requirements</p> <p><i>Notes:</i></p> <p>1. <i>In the responses to questions 2.1, 3.1 and 4.1 ICES is asked to provide details of catch, gear, effort, composition and origin of the catch and rates of exploitation. For homewater fisheries, the information provided should indicate the location of the catch in the following categories: in-river; estuarine; and coastal. Any new information on non-catch fishing mortality of the salmon gear used and on the by-catch of other species in salmon gear and of salmon in any new fisheries for other species is also requested.</i></p> <p><i>In response to question 4.1, ICES is requested to provide a brief summary of the status of North American and North-East Atlantic salmon stocks. The detailed information on the status of these stocks should be provided in response to questions 2.1 and 3.1.</i></p>					
NEAFC letter 07.02.2000	The Commission requests ICES to provide, not later than 15 October 2000, advice on the status of fish stocks in the NEAFC Convention Area in accordance with the MoU between ICES and NEAFC. In this context NEAFC is particularly interested in:					

Customer	Service(s) Requested	ICES C.Res./	Advisory Committee	ICES Coordinator	ICES Group and Shadow	Notes for Action (Deadlines, etc.)
	<p>Regarding Deep-sea stocks</p> <ul style="list-style-type: none"> What further information is needed to provide a basis for comprehensive management measures for appropriate stock units (which might include conventional catch, effort and gear restrictions) to conserve deep water species What interim management measures could be introduced based on existing biological and other information. <p>Regarding Redfish stocks</p> <ul style="list-style-type: none"> Update on new information about stock identity of the components of redfish such as “pelagic deep sea” <i>Sebastes mentella</i>, “oceanic” <i>Sebastes mentella</i> fished in the pelagic fisheries and the “deep sea” <i>Sebastes mentella</i> fished in demersal fisheries on the continental shelf and slope Information on the horizontal and vertical distribution of pelagic redfish stock components in the Irminger Sea as well as seasonal and interannual changes in distribution Information on the development of the pelagic fishery for redfish with respect of seasonal and area distribution to allow NEAFC to further consider the appropriateness of area and seasonal closures Evaluation of stock development and associated risks for the different stock components if managing these under a common TAC. 	1999/2ACFM02	ACFM	F	SGDEEP (F)	ACFM MAY
		1999/2ACFM01	ACFM	F	ACFM (F)	ACFM MAY
		1999/2ACFM09	ACFM	F	NWWG (F)	ACFM MAY
NEAFC <i>letter</i> <i>06.04.2000</i>	<p>During the meeting of the Blue Whiting Working Group of NEAFC on 5 and 6 April 2000, Russia presented a scientific paper dealing with the distribution of Blue Whiting in the Barents Sea.</p> <p>In order to further discussion on the management of the Blue Whiting stock within NEAFC, ICES (as the advisory body of NEAFC) is requested to validate this information at its forthcoming ACFM meeting, and return the advice to NEAFC as soon as possible.</p>		ACFM	F	WGNPBW	ACFM MAY
RUSSIA-NORWAY <i>letter</i> <i>04.02.2000</i>	At the 28th session of The Joint Norwegian-Russian Fisheries Commission the Parties agreed on the need to have a revised assessment of the North-East arctic cod.		ACFM	F	AFWG	ACFM MAY

Customer	Service(s) Requested	ICES C.Res./	Advisory Committee	ICES Coordinator	ICES Group and Shadow	Notes for Action (Deadlines, etc.)
	<p>Accordingly, the Norwegian-Russian Fisheries Commission requests ICES to undertake a revision of the stock situation based on the results from the winter and spring research cruises.</p> <p>In this connection, The Norwegian Party would like to invite the relevant representatives of ICES to join the Norwegian and Russian scientists in Bergen at the Institute of Marine Research 9-12 May 2000 to an extraordinary assessment meeting.</p> <p>The Norwegian Party of the Joint Norwegian-Russian Fisheries Commission would like to request ICES to include shrimp in the management advice for 2001 concerning ICES Sub-areas I and II.</p> <p>The shrimp stock in the Barents Sea area form the basis for important commercial fisheries. These fisheries also affect other important commercial species which are taken as bycatch, mainly juveniles, in the shrimp fisheries. Furthermore, shrimp is an important prey in the multispecies ecological complex of the area. It is therefore important that research on shrimp is conducted as a part of other management related research on relevant stocks in the area.</p> <p>Presently methods and models for research on shrimps in the Barents Sea are developed only by Norwegian and Russian scientists. Norway sees the need for a broader international participation in the analyses and assessment of research data. Due to multispecies aspects as well as bycatch problems, the Arctic Fisheries Working Group would appear to be the appropriate Working Group for treating shrimps in ICES Sub-areas I and II.</p> <p>Advice from ICES should initially concern stock identity and stock assessment methods, including multispecies models. The long term objective would be to get advice on management of shrimps seen in the context of a multispecies approach.</p>		ACFM	F	AFWG	ACFM OCT
RUSSIA-NORWAY <i>letter</i> <i>06.03.2000</i>	The Norwegian Party of the Joint Norwegian-Russian Fisheries Commission would also like to request ICES to undertake a revision of the stock situation for the North-East Arctic haddock based on the results from the winter and spring research cruises.		ACFM	F	AFWG	ACFM MAY

Customer	Service(s) Requested	ICES C.Res./	Advisory Committee	ICES Coordinator	ICES Group and Shadow	Notes for Action (Deadlines, etc.)
	The Norwegian Party would like ICES to present the assessment in due time before mid-June when there may be held an extraordinary meeting in the Joint Norwegian-Russian Fisheries Commission.					
NORWAY <i>letter</i> 08.10.999	The basis for managing the saithe stock in the North-East Arctic would improve if the latest survey and preliminary landing data could be included as a basis for the ICES advice. ICES is requested to explore the possibilities of introducing a special procedure for this purpose, so that the advice for 2000 is given a few weeks after the October ACFM meeting, preferably before 1 December.		ACFM	F	ACFM	ACFM OCT New procedure
EC <i>letter</i> 01.10.999	The European Commission wishes to stress 1) the importance that ICES provides alternative scenarios with realistic time frames to achieve recovery of stocks that have fallen below B_{pa} or B_{lim} . It is also appreciated that ICES provides 2) an early indication on stock status and exploitation rates, although preliminary, for stocks where data is scarce or based on limited analytical assessment. This would also apply for stocks where no specific advice is requested.	1) 2) LRC				ACFM MAY/OCT
IBSFC <i>letter</i> 23.09.1999	Assessments of the state of the stocks of cod, herring, sprat, flatfish, salmon and sea trout by appropriate areas and stocks. The assessments should take into account the biological interactions between species. <ul style="list-style-type: none"> The assessment of the cod stock should include a review of the most recent discard information and an evaluation of its effects. ICES should evaluate the potential improvement in the gear selectivity's in the directed cod fisheries as concluded by the Project for Improvement of Baltic Cod Management (BACOMA) and estimate effects of changes in the exploitation pattern on the cod stocks and the fisheries. For the cod stock in Sub-division 22-24, which have sustained an apparent fishing mortality exceeding 1.0 per year for two decades, ICES is requested to evaluate factors which may cause the estimated fishing mortality to be higher than the real fishing mortality experienced by the stock. The assessment of the herring, sprat and cod stocks should include a review of the information (including maps of the distribution) on juvenile herring, sprat and undersized cod taken in small mesh fisheries. For sprat and herring ICES is further requested to evaluate the effect of 	1999/2ACFM04 1999/2ACFM06 1999/2ACFM08	ACFM	F	HAWG (F) WGBAST (F) WGBFAS (F)	ACFM MAY

Customer	Service(s) Requested	ICES C.Res./	Advisory Committee	ICES Coordinator	ICES Group and Shadow	Notes for Action (Deadlines, etc.)
	<p>introducing minimum landing sizes as well as gear, area and seasonal restrictions with respect to yields and SSB.</p> <ul style="list-style-type: none"> • For herring and sprat IBSFC needs information on the maturity by age and length (maturity ogive by age and length) provided by Sub-divisions. If the maturity ogives have changed considerably in parallel with the observed reductions in size at age the importance of such changes for the precautionary reference points should be evaluated. • For herring a separate assessment of the Main Basin (25-29S, excl. the Gulf of Riga) should be included. Consider the possibility of providing the advice on catch options separately for herring in the Main Basin (excl. the Gulf of Riga). • For sprat provide estimates of precautionary reference points including the effect of species interactions, I.e. as Zlim and Zpa. <p>Advice on catch options for cod, herring and sprat for year 2001 that are consistent with the precautionary approach, according to IBSFC management areas and stocks. Catch options of the herring in the Main Basin (including the Gulf of Riga) and the Gulf of Riga herring should be shown separately. For cod, ICES is requested to update the advised TAC for 2000 taking into account the most recent survey and catch information and to supply the advice to IBSFC as early as possible and not later than May 10, 2000.</p> <p>Review existing management measures for Baltic salmon in the light of IBSFC objectives:</p> <ul style="list-style-type: none"> • To gradually increase the production of wild Baltic salmon to attain by 2010 at least 50 % of the natural production capacity of each river with current or potential natural production of salmon • To maintain the commercial Baltic salmon fishery as high as possible. • Advice on necessary management measures and catches in number for Baltic salmon in year 2001 for the Main Basin and the Gulf of Bothnia, and for the Gulf of Finland. The measures should meet IBSFC objectives given above. 					
FAROE ISLANDS	The coastal states of the Norwegian Spring Spawning Herring (Atlanto-Scandian Herring) (European Union, Faroe Islands, Iceland, Norway and		ACFM	WGNPBW	F	ACFM MAY

Customer	Service(s) Requested	ICES C.Res./	Advisory Committee	ICES Coordinator	ICES Group and Shadow	Notes for Action (Deadlines, etc.)
<p><i>letter</i> 01.02.2000</p>	<p>Russia) have agreed to request ICES to provide information about the stock development in accordance with the Annex of the Memorandum of Understanding with NEAFC. Furthermore, it should provide catch options for 2001 based on fishing mortalities in the range $F=0.08$ to 0.15.</p> <p>ICES should evaluate the probability that the SSB will fall below B_{pa} of 5 000 000 t and B_{lim} of 2 500 000 t in a 5 and 10-year period at various levels of constant fishing mortalities while the SSB is above B_{pa}, including values in the range of $F=0.05, 0.08, 0.10, 0.125, 0.15$.</p> <p>ICES should evaluate strategies that would ensure a probability in the range of 50 to 80 % of restoring the SSB to above B_{pa} within 2 to 5 years, in a case where SSB is below B_{pa}.</p> <p>For each of these combinations, evaluate the expected average percentage change in catches from year to year and the expected average catches over the same ten year period.</p>					
<p>EC <i>letter</i> 13.04.2000</p>	<p>ICES is requested to provide advice on possible management measures to be applied to deep-water species as indicated in the Memorandum of Understanding. In particular, ICES is requested to indicate the probable utility of application of</p> <ul style="list-style-type: none"> • TAC's • Geographical and/or temporal closures • Other technical measures including appropriate mesh size, hook size and gear structure • Effort limitation <p>In addition, ICES is requested to comment on environmental impacts created as a result of fishing for deep-water species and to advice on possibilities for reducing or eliminating such effects.</p>		ACFM	SGDEEP	F	ACFM MAY/OCT
<p>Russian Government <i>Letter</i> 07.08.2000</p>	<p>ICES is requested to re-estimate the MBAL=500 thousand tons criteria taking into account cod stock condition for the last 3-4 decades and other factors influencing on strength of year class.</p>		ACFM	AFWG	F	ACFM OCT

STOCK RECOVERY PLANS

by

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Proposed Action: ACFM is invited to discuss and amends this paper. If such a paper could be agreed it would serve as guidelines to ICES Working Groups and indeed to ACFM itself as a help towards more transparency in the advisory process, i.e. the proposal would be part of the Introductory Remarks of the ACFM report. The guidelines might also serve internally in ACFM to better achieve consistent advice.

ABSTRACT

This paper describes the stock recovery plans used by ICES in formulating management advice on the exploitation of depleted fish stocks. The paper summarises how ACFM operationally has defined the stock recovery plans and how the advice has been formulated based on these stock recovery plans.

IMPLEMENTATION BY ACFM

ACFM shall on behalf of ICES provide scientific information and advice on management of fish stocks. ICES has agreed MoUs with EC, IBSFC, NASCO and NEAFC (Commissions with responsibility for management of fish stocks in the Northeast Atlantic) that request ICES to provide:

1. Scientific information and advice, which is independent and free from political influence,
2. ICES will provide the Commission/Government with:
 - annual “standard advice” (i.e. recurring advice) on the state and the management of the main commercial stocks. These are listed in Annex 1 according to the layout contained in Annex 2 of the MoUs;
 - “non-recurring” advice as agreed by the Commission/Government and ICES.

The advice shall be formulated taking the following international agreement into account:

- UNCLOS (1982)
- Rio Declaration (UN) (1992)
- *New York: (1995) UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stock, in particular Annex II*
- Cancun (1995) FAO Code of Conduct for Responsible Fishery
- IBSFC, Warsaw (1998) Adoption of the Precautionary approach Oslo (1999) (Norge/EU) : PA for Nordsø bestande

This has been analysed technically, e.g.

- Lysekil (1995) (FAO) Precautionary Approach to Fisheries Management

- ICES (1998) Reports of the Study Group on Precautionary Approach to Fisheries Management (ICES CM 1997/Assess:7 and ICES CM 1998/ACFM:10);
- ICES (1999) Introduction to the ACFM Report 1999 (ICES Cooperative Research Report No. 236, 2000);
- ICES (2000) CWP International Meeting. Working Group on Precautionary Approach terminology and CWP Sub-group on Publication of Integrated Catch Statistics for the Atlantic (ICES CM 2000/ACFM:17);

According to the Precautionary Approach (FAO Code of Conduct, Annex II of Agreement on Straddling and Highly Migratory Stocks) the scientific advisory body (ICES) shall co-operate with the management agencies to develop rebuilding (or recovery) plans for depleted fish stocks.

A rebuilding plan is a scheme for reducing fishing mortality over a longer time period than the short term TAC scheme (normally one year) until some stock indicator shows that the stock is inside safe biological limits. The standard indicator is SSB. An example of such a rebuilding plan is the IBSFC Salmon Action Plan. The actual management measure that will be used in a specific situation can be selected from a wide range of measures, e.g. TAC, closed areas, closed seasons, minimum mesh size, etc.

Section 4, Annex II of the UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stock states:

“Management strategies shall seek to maintain or restore populations of harvested stocks, and where necessary associated or dependent species, at levels consistent with previously-agreed reference points. Such reference points shall be used to trigger pre-agreed conservation and management action. Management strategies shall include measures which can be implemented when precautionary reference points are approached.”

and that:

“...For overfished stocks, the biomass which would produce maximum sustainable yield can serve as a rebuilding target.”

In ICES(2000) it is stated that:

“...Again in all three agencies (NAFO, ICCAT and ICES), it is presupposed that if a stock falls outside the “safe” or “target” area of its precautionary framework, action should be taken to

- *decrease fishing mortality below the threshold value*
- *take action to allow biomass to increase towards a rebuilding target.”*

And that:

“It is difficult for managers to pre-agree to exploit fish stocks according to a specified harvest control rule for a variety of reasons, which may include:

- *lack of information on the social and economic implications of their consequences. This is in part because scientific agencies only have competence in evaluating harvest rules in biological terms.*
- *The annual nature of the decision making process made by most customers of scientific advice can hinder pre-agreement of harvest strategies at present.*

Nevertheless, evaluation of a variety of harvest rules by scientific agencies is seen as extremely helpful for managers in order to inform the annual decision-making process. For example, in the event that a stock falls below a threshold biomass, it would be helpful that managers be provided with catch options that correspond to some model of catch restriction for which the long-term consequences had already been evaluated as above. This could be in addition to advice provided in its present form of conventional catch option tables.”

Regarding the time horizon of rebuilding plans FAO Code of Conduct of Responsible Fishing article 7.5.5 states:

"If a natural phenomenon has a significant adverse impact on the status of living resources, States should adopt conservation and management measures on an emergency basis to ensure that fishing activity does not exacerbate such adverse impact. States should also adopt such measures on an emergency basis where fishing activity presents a serious threat to the sustainability of such resources. Measures taken on an emergency basis should be temporary and should be based on the best scientific evidence available."

ICES(1997) states the following regarding the time horizon:

"Any rebuilding programme should ensure that the stock increases to levels above SSB_{pa} over a pre-specified time horizon. One example of a time horizon would be one generation time in the stock, with this time reduced when SSB is close to SSB_{pa} , as:

$$\text{Rebuilding time} = \frac{SSB - SSB_{pa}}{SSB_{limit} - SSB_{pa}} * T$$

Generation time (T) could be estimated as the average age of the spawning stock in a stable age distribution where only natural mortality is acting. Generation time would then be the sum of products of the age (a), the proportion surviving to that age [$S_a = \exp(-(\text{sum } M))$], and the maturity at age (ma), divided by the sum of the products of S_a and ma or:

$$T = \frac{\sum a * S_a * ma}{\sum S_a * ma}$$

Alternatively, generation time could be the number of ages occurring naturally in the population if it were unfished (e.g. $T = 3/M$).

Exceptions may arise depending on the life history of the stock (e.g. for stocks with very high age at maturity) or when stocks fail to recover even when fisheries are closed for long periods of time (e.g. North Sea mackerel). Control rules for rebuilding should be developed to control fishing mortalities and catches in a pre-agreed way as spawning stock biomass increases. Simulation studies have demonstrated that rebuilding programmes are most effective when large reductions in fishing mortality are implemented immediately, rather than when small reductions are implemented over long periods of time. Rebuilding would also proceed more rapidly if exploitation patterns were improved at the same time, which would enable greater contributions of good year classes to spawning stock biomass.

Although a recovered stock may be defined as having spawning stock biomass above precautionary levels, additional criteria may also be applied. It may be desirable to restore an age structure to approximately that obtained at equilibrium at F_{pa} , in order to rebuild population fecundity or to buffer against recruitment failure; or, to restore a spatial distribution, to spread risk at spawning over a wider range of environmental conditions. Similarly, any of these characteristics should be specified before stock recovery plans are implemented, so that it is clear when stock recovery is complete."

The terms "recovery plan" and "rebuilding plan" are in the present paper regarded as synonyms.

This paper looks at the practical use as exercised at the ACFM meetings in October 1998, May 1999 and October 1999, and May 2000 and suggest guide lines for form of recovery plan advice in case of overfished or otherwise depleted stocks.

GENERAL PROCEDURES

Table 1 shows under which stock status situations recovery or rebuilding plans might be advised by ACFM.

Table 1. ICES usage of reference points in formulating advice, based on accepted analytical assessment for fairly long-lived stocks. Advised F and TAC are always upper limits, because if managers chose lower values managers will self-evidently be in line with the precautionary approach. F_{current} refers to the last data year, i.e. if the assessment is done in year 2000 the last data year will be 1999. SSB_{current} refers to the last data year +1, i.e. if the assessment is done in year 2000 SSB_{current} refers to SSB (at spawning time, usually 1 January) year 2000. $SSB(2)$ refers to the assessment year +2, i.e. if the assessment year is 2000 then $SSB(2)$ refers to SSB (at spawning time, usually 1 January) 2002. Note that $F(\text{advice})$ is never higher than F_{pa} .

Current Estimates of F and SSB		State of stock	Future expectations			
			Short- and medium-term projections (years) using $F=F_{\text{pa}}$ for all years, except year 1 where $F=F_{\text{sq}}$ or TAC based			
$F_{\text{current}} < F_{\text{pa}}$	$SSB_{\text{current}} > B_{\text{pa}}$		1	2	3	4
			$SSB(2)_{\text{expected}} < B_{\text{pa}}$	$SSB(2)_{\text{expected}} > B_{\text{pa}}$	$SSB(2)_{\text{expected}} > B_{\text{pa}}$	$SSB(2)_{\text{expected}} > B_{\text{pa}}$
			$SSB(10)_{\text{expected}} < B_{\text{p}}$ a	$SSB(10)_{\text{expected}} > B_{\text{p}}$ a	$SSB(10)_{\text{expected}} < B_{\text{p}}$ a	$SSB(10)_{\text{expected}} > B_{\text{pa}}$
Y	Y	Inside safe biological limits	F(advice) which will bring $SSB(2)=B_{\text{pa}}$ or Rebuilding plan	F(advice) which will bring $SSB(2)=B_{\text{pa}}$	Reconsider F_{pa} $F(\text{advice}) = F_{\text{pa}}$	$F(\text{advice}) = F_{\text{pa}}$
Y	N	Outside safe biological limit but harvested at a fishing mortality that is sustainable	F(advice) which will bring $SSB(2)=B_{\text{pa}}$ or Rebuilding plan	F(advice) which will bring $SSB(2)=B_{\text{pa}}$	Reconsider F_{pa} $F(\text{advice}) = F_{\text{pa}}$	$F(\text{advice}) = F_{\text{pa}}$
N	Y	Harvested outside safe biological limits	F(advice) which will bring $SSB(2)=B_{\text{pa}}$ or Rebuilding plan	F(advice) which will bring $SSB(2)=B_{\text{pa}}$	$F(\text{advice}) = F_{\text{pa}}$	$F(\text{advice}) = F_{\text{pa}}$
N	N	Outside safe biological limits	F(advice) which will bring $SSB(2)=B_{\text{pa}}$ or Rebuilding plan	F(advice) which will bring $SSB(2)=B_{\text{pa}}$	$F(\text{advice}) = F_{\text{pa}}$	$F(\text{advice}) = F_{\text{pa}}$

IMPLEMENTED REBUILDING PLANS

The classic examples of rebuilding plans implemented are the ones for North Sea herring in 1977, Norwegian Spring Spawning herring in late 1960s and for North Sea mackerel in early 1980s.

For North Sea herring a total stop of directed fishing for herring was implemented in 1977. In 1983 the fishery was reopened based on the large year classes of 1981 and 1982. The projections made showed that fishing at $F_{0.1}$ in 1983-1985 would still allow the SSB to reach over 1.3 million t in 1985, from about 0.5 million t in 1983. ACFM had recommended that the fishery should not be opened until SSB was rebuilt to above 0.8 million t. However, there was a window open for starting the fishery on one of the stock components if they showed significant and sustainable increases, and based on this the Downs stock component was fished already in 1981.

The Norwegian Spring Spawning herring became depleted at the end of the 1960s. SSB was extremely low in the 1970s and there was a ban on fishing until the stock recovered due to a large 1983 year class. The recovery plan was that SSB should be rebuilt to at least 2.5 million t. This happened in the mid-1980s and the fisheries was reopened.

For North Sea mackerel ACFM recommended in 1982 a zero TAC. Since then the stock has not recovered. There seems to be no rebuilding target and no improvement in stock size has yet been observed. The recovery plan consists of no fishing in the southern North Sea and IIIa in order to protect the North Sea component.

More recently, managers have implemented stock rebuilding plans (or plans which carry an element of a rebuilding plan) for the following stocks:

Capelin Iceland and Barents Sea
Irish Sea cod
Arctic cod (1987-1990)
North Sea herring
Baltic salmon
Baltic cod and sprat
Icelandic cod

For the two **capelin** stocks (capelin in the Iceland-East Greenland - Jan Mayen area capelin in the Barents Sea) one can say that the ordinary management plans are also recovery plans. This is because when the stocks is below a certain size, the fishery is stopped until there are clear signs that it has recovered, in this case until there are clear signs that SSB will be above the size limit after fishing a pre-specified amount.

For **Irish Sea cod** it has recently been agreed that there should be a protected area for 10 weeks at spawning time (the main spawning area). TAC for 2000 is reduced to 2500t compared to 5500t in 1999. It is furthermore planned that from 2001 and onwards juvenile cod should be protected by some technical measures. However, there is no pre-agreed plans for what to do in the future at given stock sizes, i.e. there is no "harvest control rule" type agreements.

For **Arctic cod** it was realised in May 1988 that the TAC was much too high and that the stocks was lower than estimated in November 1987. An in year revision of TAC for 1988 was advised by ICES and agreed by managers (mainly Norway at that time). This was followed by low F recommended by ICES the following years and accepted by managers. In reality F dropped from around 0.9 before 1988 to 0.3 in 1990. F has since increased by about 0.1 per year and reached again in the late 1990s 0.9. ICES recommended in 1999 a reduction in F in 2001 to $F=0.13$ and a rebuilding plan to be installed.

According to the EU-Norway agreement (December 1997) on **North Sea herring** efforts will be made to maintain the SSB above the B_{lim} (800 000 t). An SSB reference point of 1.3 million t has been set, above which the TACs will be based on an $F = 0.25$ for adult herring and $F = 0.12$ for juveniles. If the SSB falls below 1.3 million t, other measures will be agreed and implemented taking account of scientific advice. So, again the managers have not any pre-agreed actions in place. ICES advises in May 2000 that the management measures proposed for 2000 should be applied in 2001 to ensure the rebuilding of the spawning stock biomass. These measures consist of adoption of an F_{2-6} of 0.2 and an $F_{0-1} < 0.1$ until the spawning stock biomass is rebuilt above 1.3 million t. The managers have accepted these F values for 4 years in a row (1997-2000) and therefore there is in reality a pre-agreed recovery plan in place for this stock.

IBSFC has agreed a Baltic Salmon Action Plan 1997-2010, which is a kind of recovery plan with the objective to increase the natural production of **wild Baltic salmon** to at least 50% of the natural production capacity of each river by 2010, while retaining the catch level as high as possible. There is no pre-agreed harvest control rules, but long-term projections made by ICES each year indicate whether certain levels of catch are likely to results in the goal of having at least 50% of natural production of each river by 2010 and the same time retaining catches as high as possible. For the main basin (Sub-divisions 22-31) salmon the plan seems to be attainable, but not for the Gulf of Riga salmon even with no fishing. IBSFC has until now not really been reacting to this fact. In principle a new recovery plan should be made for the Gulf of Riga salmon.

IBSFC has recently adopted Long-Term Management Strategies for **cod in Sub-divisions 22-24, cod in Sub-divisions 25-32 and sprat in Sub-divisions 22-32**. For these stocks minimum SSB sizes have been defined and the strategy is that: "Every effort shall be made to maintain....." SSB above these limits. In addition other SSB sizes have been defined (B_{pa}) and if SSB fall below these the agreed target F values " ...will be adapted in the light of scientific estimates of the conditions then prevailing, to ensure safe and rapid recovery of (SSB values to above the B_{pa} values)..." .Cod in the eastern Baltic (Sub-divisions 25-32) are depleted at the moment and ICES advised in May 2000 that F be reduced to 0.3 ($=0.5 * F_{pa}$), which will recover the stock in the short-term , i.e. $SSB=B_{pa}$ in 2002. However, ICES also said that if such a big reduction could not be made in a single year (in 2001) then a recovery plan should be implemented. IBSFC agreed on a total cod TAC for the Baltic of 105,000t and if the cod catch according to the Long-Term Management Strategies for the cod in Sub-divisions 22-24 are subtracted form this value it becomes 56,400t for the eastern Baltic cod corresponding to $F=0.48$. This will bring $SSB=B_{pa}$ in 2003 if $F=0.48$ is maintained for 2002. Thus, there will be one year delay compared to ICES advice, but probably increased uncertainty whether it will be reached or not. Furthermore, IBSFC has not agreed that they will manage according to $F=0.48$ for 2002. There is a risk that the goal of being above B_{pa} will be a "moving target", and that next year IBSFC will agree to wait yet another year with getting to the goal.

A formal harvest control rule was implemented for **Icelandic cod** in 1995. The TAC for a fishing year is set as a fraction (25%) of the “available biomass” which is computed as the biomass of age 4 and older fish, $B(4+)$ -averaged over the two adjacent calendar years. In the long term, this corresponds to a fishing mortality of about 0.4. The harvest control rule currently applied is considered to be in accordance with the precautionary approach. Simulations have shown that there is only a very low probability that the stock will decline to very low levels when the rule is applied. However, if unfavourable environmental conditions for recruitment prevail for a number of years the stock might decline to low levels and a recovery plan might be needed. However, the harvest control rule dictates a low F , which in reality should prevent the stock from becoming very low.

Table 2. Depleted stocks (defined as $SSB(2, F_{pa}) < B_{pa}$) for which rebuilding plans were recommended (at least as an alternative) by ACFM.

Stock		F(advice) compared to F_{sq}	F(advice) compared to F_{pa}	$SSB(2, F_{pa})$ in % of B_{pa}	$SSB(2, F_{advice})$ in % of B_{pa}	Catch (advice year 1) in % of TAC (year 0)	Rationale
NE Arctic cod	Alternative 1	14%	31%	77%	100%	23%	Reach B_{pa} in 2001
	Alternative 2	35%	76%	77%	84%	54%	Reach B_{pa} in 2003
Saithe Faroe		Well below 70%	Well below 100%	50%	Well above 50%	63% [catch(1) of catch(0)]	Rebuilding cannot be achieved in short-term
Whiting N.Sea		0% (Lowest possible)	0% (Lowest possible)	58%	77%	0%	To give the greatest chance of recovery
Cod VIa		40%	53%	70%	87%	36% (47% catch(1) of catch(0))	If advised F is maintained for 5 years \Rightarrow high prob. for $SSB > B_{pa}$
Cod VIIa		0% (Lowest possible)	0% (Lowest possible)	34%	64%	0%	Rebuild SSB as soon as possible
Herring VIaS+VIIb,c	Alternative 1	37%	100%	92%	92%	67%	Reduce F to F_{pa}
	Alternative 2	Multiannual plan to reduce F as rapidly as possible					If a 63% reduction in F is not possible in 1 year
Hake northern		50%	65%	75%	81%	36%	High prob. of $SSB > B_{pa}$ in 5 years (high~50%!!)
Herring 25-29+32		46%	100%	73%	73%	45%(advice compared to expected catch year 0, "paperfish" problem)	To ensure SSB increase towards B_{pa}
Sprat 22-32	Alternative 1	52%	100%	220%	220%	41%	
	Alternative 2	a plan be implemented which reduces F to F_{pa} in steps				If this 48% reduction in F cannot be achieved in a single year	
Cod 25-32		60%	92%	68%	70%	67% (advice compared to expected catch year 0, because the TAC includes 22-24)	Increase SSB above B_{lim} in short-term

Rebuilding plan recommended

Table 3. Depleted stocks (defined as $SSB(2, F_{pa}) < B_{pa}$) where no rebuilding plan was recommended.

No rebuilding plan recommended	Stock	F(advice) compared to F_{sq}	F(advice) compared to F_{pa}	SSB(2, F_{pa}) in % of B_{pa}	SSB(2, F_{advice}) in % of B_{pa}	Catch (advice year 1) in % of TAC (year 0)	Rationale
	Saithe Iceland	60%	73%	64%	68%	80%	Ensure a stock increase in short-term
	Greenland halibut	45%	41%	76%	86%	110%	Although not said this will ensure a stock increase in the short-term
	Cod N.Sea	80%	85%	80%	88%	61%	To prevent further decline of SSB in the short-term
	Saithe N.Sea	70%	80%	77%	85%	68%	Prevent further decline
	Herring VIIa	90%	86%	95%	103%	59%	Bring SSB above B_{pa} in the short-term
	Plaice VIIf and g	70%	78%	84%	91%	78%	Increase SSB above B_{pa} in 10 year and consistent with sole advice
	Plaice VIIe	68%	100%	96%	96%	96%	No argument
	Sole VIIe	80%	100%	97%	97%	100%	Will promote an increase in SSB above B_{pa} in 10 years
	Anchovy	0%	0%	86%	141%	0%	No fishing until evidence of good R which will bring $SSB > B_{pa}$ (the most recent two y.c. estimated to be very poor)

Table 4. Not depleted stocks (defined as $SSB(2, F_{pa}) > B_{pa}$) where generally F_{pa} has been recommended.

	Stock	F(advice) compared to F_{sq}	F(advice) compared to F_{pa}	SSB(2, F_{pa}) in % of B_{pa}	SSB(2, F_{advice}) in % of B_{pa}	Catch (advice year 1) in % of TAC (year 0)	Rationale
1	Haddock N East	40%	54%	111%	131%	47%	High prob. of maintaining $SSB > B_{pa}$. Consistent with cod.
2	Saithe N East	65%	100%	124%	124%	62%	
3	Herring NSSpawners	132%	97%	153%	154%	115%	Agreed harvest rule
4	Cod Iceland	-	-	-	-	99%	Agreed harvest rule
5	Haddock Iceland	-	-	-	-	100%	Further work on PA points pending
6	Herring Iceland	122%	100%	170%	170%	113%	
7	Cod Faroe Plateau	100%	100%	190%	190%	102% (catch(1) of catch(0))	
8	Haddock Faroe	100%	84%	151%	158%	88% (catch(1) of catch(0))	y.c. 95-97 below average and $SSB(+2)$ expected to decline
9	Cod Kattegat	56%	100%	147%	147%	102%	
10	Plaice IIIa	95%	100%	146%	146%	84%	
11	Pandalus IIIa	100%	-	-	114%	86%	
12	Haddock N.Sea	90%	100%	142%	142%	57%	
13	Plaice N.Sea	67%	100%	102%	102%	93%	
14	Sole N.Sea	70%	100%	123%	123%	90%	
15	Herring N.Sea	51%	80%	100%	104%	93%	Use 1999 measures in 2000
16	Sole VIIId	93%	100%	138%	138%	83%	
17	Plaice VIIId	70%	100%	111%	111%	66%	
18	Haddock Via	89%	100%	138%	138%	78% (84% catch(1) of catch(0) the TAC covers also VIb and if that is subtracted ~100%).	
19	Haddock Vib	83%	100%	114%	114%	89% [catch(1) of catch(0)]	
20	Whiting	64%	100%	108%	108%	68%	
21	Haddock VIIa	45%	100%	-	-	56%	
22	Whiting VIIa	40%	100%	101%	101%	36%	
23	Plaice VIIa	107%	100%	148%	148%	96%	
24	Sole VIIa	73%	100%	111%	111%	120%	
25	Cod VIIe-k	83%	100%	111%	111%	72% [catch(1) of catch(0)]	
26	Whiting VIIe-k	83%	-	-	224%	86% [catch(1) of catch(0)]	
27	Sole VIIf and g	71%	100%	142%	142%	121%	
28	Plaice VIIe	68%	100%	96%	96%	72% [catch(1) of catch(0)]	
29	Sole VIIa,b	102%	100%	123%	123%	107%	
30	Herring Celtic Sea	94%	-	-	200%	96%	
31	Megrim VII and VIIa,b,d,e	94%	100%	115%	115%	94% [catch(1) of catch(0)]	
32	Anglerfish (pisc.) VIIb-k and VIIab	80%	100%	99%	99%	70% [catch(1) of catch(0)]	

33	Anglerfish (bude.) VIIb-k VIIIab	80%	100%	318%	318%	78% [catch(1) of catch(0)]	
34	Megrim (bosci)VIIIc Ixa	80%	80%!!!	105%	109%	84% [catch(1) of catch(0)]	
35	Megrim (whiff.) VIIIc Ixa	80%	-	-	107%	89% [catch(1) of catch(0)]	
36	Horse mackerel Southern	94%	100%	117%	117%	98% [catch(1) of catch(0)]	
37	Mackerel combined	82%	100%	169%	169%	114%	
38	Horse mackerel Western	-	-	-	218%	75%	
39	Blue whiting	62%	100%	116%	116%	65%	
40	Herring Gulf of Riga	100%	88%	214%	224%	97%	
41	Cod 22-24	80%	-	-	133%	85%	

ADVISED REBUILDING PLANS

ICES has proposed rebuilding plans in cases where the stocks are severely depleted. "Depleted state" is defined here as $SSB(2, F_{pa})$ (SSB corresponding to F_{pa} in TAC year and at spawning time the year after the TAC year) $\ll B_{pa}$ or as $F_{sq} \gg F_{pa}$.

The definition of depleted state used here, that $SSB(2, F_{pa}) \ll B_{pa}$, is based on the negation to the obvious case where $SSB(2, F_{pa}) \geq B_{pa}$ and the advice is simply $F(\text{advice}) = F_{pa}$.

The problem arises when $SSB(2, F_{pa}) \ll B_{pa}$. The question becomes: how small values of $F(\text{advice})$ can be accepted? The problem for the industry is mainly large changes in TACs from one year to the next. Thus, the values to compare are Catch (advice year 1) in % of TAC (year 0). Sometimes there is no relevant TAC(0) due to differences in stock and management units and in those cases, it has been attempted to deduct catches in year 0 corresponding to the relevant TAC(0). The cases where this procedure has been used are indicated in Tables 2-4. Traditionally ACFM has also focused on changes in F , at least implicitly when given advice. Therefore, $F(\text{advice})$ is also compared to F_{sq} in Tables 2-4.

Table 2 lists the stocks for which ICES in 1999 has proposed rebuilding plans. For 8 out of the 10 stocks this has been due to low SSB values. For these stocks $SSB(2, F_{pa})$ have been between 34% and 77% (average 63%) of B_{pa} . Catch(1) (catch in year 1) recommended are between 0% and 67% of TAC(0). The rebuilding plans suggested, will result in SSB above B_{pa} in less than 5 years, except for the Irish Sea cod where no indications of the time span are given.

For 2 out of 10 stocks where rebuilding plans have been advised, this have been due to F_{sq} being far above F_{pa} , 92% and 170% higher than F_{pa} . For one of the stocks the advice was to reduce F to F_{pa} but: "If it cannot be achieved in a single year, a multiannual recovery plan to reduce the fishing mortality rate as rapidly as possible should be agreed". The phrase "...as rapidly as possible..." in the given context must mean in only a few years. This case is additionally severe as even fishing at F_{pa} would result in SSB(2) being below B_{pa} . The other stock is well above B_{pa} and the situation is not as serious. Also for this stock ACFM recommends that F be reduced to F_{pa} right away, but with the same addition that if this large reduction in F cannot be achieved in one year it should be done in a few year. The scenario given operates with 2 to 4 years time perspective in order to get at or under F_{pa} with 50% confidence.

From this it can be concluded that a rebuilding plan has been suggested if $SSB(2, F_{pa})$ is less than 77% of B_{pa} or if F_{sq} is about twice a high or higher than F_{pa} . Furthermore, a rebuilding plan shall in less than 5 year result in $SSB \geq B_{pa}$.

Table 3 lists some supposedly depleted stocks where ICES in 1999 has not proposed rebuilding plans. Anchovy seems to be an outlier in the system as $SSB(2, F_{advised})$ is far above B_{pa} , so that stock will not be considered further. All the other 8 stocks are depleted due to low SSB values. For two of these, however, the depletion is only minor as $SSB(2, F_{pa})$ is 96 and 97 % of B_{pa} and the catches do not have to be reduced. Therefore, these stocks can also be ignored in this context. For 6 other stocks $SSB(2, F_{pa})$ have been between 64% and 95% (average 80%) of B_{pa} . Catch(1) (catch in year 1) recommended are between 59% and 110% of TAC(0). Three of these stocks have $SSB(2, F_{pa})$ measures as 5 of B_{pa} ,

in the range, where ACFM for other stocks have recommended rebuilding plans (see above). For all these three stocks ACFM has actually recommended so high F values that $SSB(2, F_{advice})$ is under B_{pa} . Thus, in reality, ACFM has advised a kind of rebuilding plan.

It can be concluded that a reduction of F of over 55% has not been recommended. A reduction in catches of more than 45 % has neither been advised. Although it is not specifically stated rebuilding plans are implicit for these stocks.

Table 4 lists those stocks with an analytical assessment that by ACFM in 1999 were not classified as depleted and hence for which no rebuilding plan was neither indicated nor proposed. For a few stocks $SSB(2, F_{pa})$ is actually lower than B_{pa} , but only slightly. There seems to be a bagatelle limit of about 5%. For 8 of the 41 stocks F_{pa} are not defined. For 28 stocks F_{pa} (or an F only a few percentage below) are advised. For none of the stocks is F advised to be higher than F_{pa} . For NE haddock F is advised to be only 54% of F_{pa} and this is due to haddock being taken as a by-catch in the cod fishery. For Faroe Plateau cod F is advised to be 84% of F_{pa} , but is similar to F_{sq} . For N. Sea herring F is advised to be 51% of F_{sq} , 80% of F_{pa} , but the resulting catch only slightly below recent catch (7% lower). For megrim (*L. boschii*) in VIIIc and IXa F is advised at 80% of F_{pa} although $SSB(2, F_{pa})$ is higher than B_{pa} . This means that the catches for both this stock and *L. whiffiagonis* decrease by about 15%. Apparently there are no argument for not using F_{pa} which will give a similar catch to the preceding years catch. For the last stock F advice is 88% of F_{pa} , but equal to F_{sq} .

Reduction in catches which have been accepted range down to catches as low as 36% of the recent year's TAC, in 2 cases less than 50% of the recent year's TAC, in 2 cases between 50-60%, in 4 cases between 60-70%, in 6 cases between 70-80%, in 9 cases between 80-90%, in 9 cases between 90-100%, and in 9 cases above 100%.

It can be concluded that reductions in catch of up to about half of the recent year's TAC seems not to be a reason for proposing rebuilding plans.

CONSISTENCY IN ADVISED REBUILDING PLANS

It has been pointed out to ICES at the London (February 2000) meeting that ICES advice is not consistent between stocks of the same species. It was showed in the sections above that ICES has proposed rebuilding plans in some cases of stock depletions while in others ICES has refrained from doing so.

How can it be that for some of the depleted stocks (Faroe saithe, herring VIaS+VIIB,c, N. Sea cod, Baltic cod 25-23) only small reductions in catch(1) compared to TAC(0) are recommended, while for not depleted stocks (NE saithe, haddock N.Sea, plaice VIId, haddock VIIa, whiting VIIa, blue whiting) larger reductions are recommended? Intuitively it would seem more reasonable if larger reduction in catches were recommended for depleted stocks than for non depleted stocks. Consequently, larger reductions in catches for some of the depleted stocks should have been recommended, or lower reductions in catches and thus implicitly recovery plans should have been recommended for some of the non-depleted stocks [which then would have become depleted stocks according to the definition used here (that $SSB(2, F_{pa}) \ll B_{pa}$)].

It is also a problem that the catch of NE haddock is recommended to be reduced to 47% of TAC(0) with reference to reduction in NE cod catches. The reduction in advised cod catch is to either 23% or 54% of TAC(0), which are the two alternatives given. Haddock is a by-catch in the cod fishery. In terms of reductions in F advised for the cod stock this corresponds to reductions to only 14% or 35%, while for haddock it corresponds to a reduction to 40%. To be consistent there should have been two alternatives for haddock as there are for cod.

GENERATION TIME

ICES (1997) states that:

"Generation time (T) could be estimated as the average age of the spawning stock in a stable age distribution where only natural mortality is acting",

and finds that it can be approximated by $T = 3/M$, where M is natural mortality. For cod in the North Sea, in the North East Arctic, and in the Baltic it means that generation time is as high as 15 years.

For the term to be used in determining the time allowed for, in recovery plans, the term should have a close connection to the population dynamics of a given stock. As for fish stocks and especially unexploited fish stocks it is difficult to apply the normal concept of generation as the generations are not following one after each other. Instead there are a big overlap. Consider for instance cod in the Baltic Sea. As much as five generations (in the sense that for a young first

timer spawner its parents, grand parents, grand-grand parents, grand-grand-grand parents and grand-grand-grand-grand parents) will contribute significantly to the spawning in a given year, if the stock was unexploited.

It might be more appropriate to consider the generation time as the age where more than 50% are mature. For North Sea and Baltic cod it will be 4 years and for North East Arctic cod 7 years.

If the formula suggested by ICES 1997 :

$$\text{Rebuilding time} = \frac{SSB - SSB_{pa}}{SSB_{limit} - SSB_{pa}} * T$$

is applied, then it would mean that if a stock is depleted to SSB_{limit} then the rebuilding should take a generation time. This formula seems to give long rebuilding times. If it is applied to the Faroe saithe case given below the recovery time becomes 14.4 years and if also the generation time suggested by ICES (1997) is applied it will give a rebuilding time of 36 years!

Thus it can be concluded that the procedures for rebuilding time given by ICES(1997) is not appropriate.

PRE-AGREED PLANS

It is implicit in the concept of recovery plans that the actions in the entire time period until the stock has recovered, are pre-agreed. The pre-agreed action can for instance be that the fishing mortality applied in all years should be of a certain magnitude. The rationale for pre-agreement is to avoid that each year new recovery plans are made and the goal of recovery becomes a moving target.

However, the pre-agreed actions set for entire recovery period, will of course have to be updated according to new information. Typically, there will be new information about the stock status each year. The pre-agreed actions need to be able to encompass the new information, which will be available during the recovery period.

GUIDE LINES FOR RECOVERY PLANS

Based on the points discussed above the following key (Table 5) has been established which can help in guiding ACFM and others to reach at a consistent and hopefully correct advice. This is a single species approach and multispecies biological and fisheries interactions are not taking into account. Likewise very short-lived species like capelin will also fall outside the template below.

Table 5. A key to give guidelines to formulation of management advice by ACFM and others based on a given stock situation.

	Evaluation	Action	Comments
1	If $SSB(2, F_{pa}) \geq B_{pa} * 0.95$	Go to 2	
	If $SSB(2, F_{pa}) < B_{pa} * 0.95$	Go to 3	
2	If $F_{sq} > 2 * F_{pa}$	Advice recovery plan that reduces F to F_{pa} in 2-4 years	(If the advice is given in year y then F_{pa} should be reached in year y+2 to y+4)
	If $F_{sq} < 2 * F_{pa}$	Advice F_{pa}	
3	If $SSB(2, F=0) \geq B_{pa} * 0.95$	Go to 4	
	If $SSB(2, F=0) < B_{pa} * 0.95$	Go to 6	
4 Find F' corresponding to $SSB(2, F') = B_{pa}$	If $Catch(1, F') > 75\%$ of TAC(0)	Advice F'	F' always $< F_{pa}$
	If $Catch(1, F') < 75\%$ of TAC(0)	Go to 5	
5 Find F'' corresponding to $Catch(1, F'') = 50\%$ TAC(0)	If $SSB(3, F'') \geq B_{pa}$	Advice F''	F'' always $< F'$. The stock will be rebuild in the year after the year given advice for.
	If $SSB(3, F'') < B_{pa}$	Advice recovery plan which rebuild the stock in 3-4 years	The stock will be rebuild in the 2-3 years after the year given advice for.
6	If $SSB(7, F=0) \geq B_{pa} * 0.95$	Advice recovery plan which rebuild the stock in 2-5 years	The number of years should be related to the population dynamic of the stock
	If $SSB(7, F=0) < B_{pa} * 0.95$	Advice recovery plan which rebuild the stock in 6-15 years	The number of years should be related to the population dynamic of the stock

Example:

Faroe saithe (assessment made in 1999).

1. $SSB(2, F_{pa}) (= 55\ 000t)$ is $< B_{pa} * 0.95 (= 104\ 500t)$.
2. $SSB(2, F=0) (= 69\ 300t)$ is $< B_{pa} * 0.95$
3. $SSB(7, F=0) (= 160\ 300t)$ is $\Rightarrow B_{pa} * 0.95$ thus a recovery plan which rebuilds the stock in 3-5 years time. As the generation time is 6 years (maturity at age 6 is 65%) and thus quite long, it would be the 5 year rebuilding scenario that is most relevant. F which will rebuild the stock in 2006 at 1st Jan. is $0.2 * F_{sq}$.