

MEETING OF THE NEAFC WORKING GROUP ON THE APPRAISAL OF REGULATORY MEASURES FOR DEEP-SEA SPECIES

Bergen, Norway 11-13 June
Chair Olav-Rune Godø

FINAL REPORT

1 Opening of the Meeting (Chair Olav Rune Godø)

The Chairman opened the meeting by welcoming everybody to Bergen. - 39 participants – managers and scientists - from all Contracting Parties (a list of participants is included in Annex 1). He noted the terms of reference of the Working Group (Annex 2) and that the deep-sea has been an issue for several years within NEAFC. Problems have been identified well, albeit not always studied very well. He expressed the hope that progress would be made.

2 Adoption of the Agenda and Appointment of Rapporteur (Chair Olav Rune Godø)

The meeting was planned as a working group of experts. After the first session, the format was changed as a result of a strong suggestion by one of the Contracting Parties, to a more formal format with participants organised by delegation.

The NEAFC Secretariat was appointed rapporteur. There were several amendments to the agenda - additions to the species list, changing the sequence of items and including other items. The adopted agenda is given in Annex 3.

The EU representative had reservations with respect to agenda item 7 and the possibility of preparing specific recommendations for NEAFC's 21st Annual Meeting. The Norwegian representative also had reservations on agenda item 7 and thought the preparation of recommendations is not in the Group's mandate.

3 Analysis and Advice (Chair Olav Rune Godø)

3.1 Species groups

- Great silver smelt (Argentina), *Argentina silus*
- Ling, *Molva molva*,
- Tusk, *Brosme brosme*
- Blue ling, *Molva dypterygia*
- Roundnose grenadier *Coryphaenoides rupestris*
- Orange roughy, *Hoplostethus atlanticus*
- Black scabbardfish, *Aphanopus carbo*

- Squalid sharks, esp. *Centrophorus squamosus* & *Centroscymnus coelolepis*
- Sea breams. *Pagellus bogaraveo*
- Alfonsinos/golden eye perch, *Beryx splendens*
- Greater forkbeard, *Phycis blennoides*
- Smooth head, *Alepocephalus bairdii*

3.2 Data on catch, gear, effort and fishing fleets

3.3 Fisheries and fishing fleets

3.4 Fishing areas

The following reports and papers had been circulated well in advance of the meeting:

1. Report of Special Session Symposium "Deep-sea Fisheries" NAFO, Report of Scientific Council Meeting, 17-21 September 2001
2. Report of the Working Group on Biology and Assessment of Deep-Sea Fisheries Resources - ICES CM 2001/ACFM:23
3. Commission Staff Working Paper: Deep Sea Fisheries Brussels, 22-26 October 2001, SEC(2002) 133 Report of the Subgroup Fishery and Environment (SGFEN) of the Scientific, Technical and Economic Committee for Fisheries.

They were presented by one of the conveners of the NAFO/ICES/CSIRO Symposium, John D.M. Gordon, Oban, Scotland, UK, Odd Aksel Bergstad Chair of the ICES Working Group on Deep-sea Species (WGDEEP) and the Chair of the EU Subgroup - Fishery and Environment, Sten Munch-Petersen of the Danish Fisheries Institute. The reports are accessible on the relevant websites: www.nafo.ca, and www.ices.dk. Summaries of these talks are given in Annex 4.

There was some debate following the presentation of the ICES advice. The EU representative had several comments. In 2000 ACFM had advised a reduction in effort of 50% or 30%. Effort seems to have increased since then but, although the baseline has therefore changed, ACFM has maintained its advice. He questioned the precautionary reference points and the assessment of sea breams' fisheries. He had also expected that ACFM would give advice on deep-sea sharks. The Norwegian representative noted that lack of knowledge and data seemed to be a common feature in these fisheries. He asked if it was a lack of commercial data or basic research.

The Chairman thanked the three invited speakers and then invited Philip Large to present a report on the effects of fishing on deep-water Fish Species to the West of Britain, a study financed by the UK Joint Nature Conservation Committee (JNCC), (www.jncc.uk). A copy of the summary report was made available. Two approaches have been used: the assessment approach based on fisheries data and pre- and post-exploitation ecological approach based on trawl surveys in the Hebridean slope. He gave an overview of methods, findings and problems and requirements for time series of abundance.

A review of data on catches of deep-water fisheries received by NEAFC under the Scheme showed that these data were of variable quality and often subject to major revisions. In some cases, they were not divided into international and national waters. However, these are probably the only data available of catches from international waters. It was agreed that Contracting Parties should look into the table internally and report any corrections or amendments to the Secretariat. Revised data are given in Annex 5.

With respect to effort data, it was suggested that the NEAFC VMS should be used to compile effort data, as there are difficulties with other sources. The Secretariat noted that the ICES system did not split data between international and national waters. The Scheme is designed to produce very detailed effort data together with weekly catch data. However the VMS reporting is not yet up and running in all countries so coverage is not complete.

3.5 Vulnerable habitats

John Gordon presented data on the impacts of fishing on deep-sea eco-systems and non-target species. He noted the problems of corals, which have attracted considerable public interest, but there are other impact problems so his presentation was more general.

It was noted that there is still no clear analysis of results from other areas of closure of Marine Protected Areas. Most MPAs are rather recent.

The Chairman asked if a list of additional information required from the fishing fleet to assess vulnerable areas could be developed. The representative of Denmark (in respect of the Faroe Islands and Greenland) suggested that it should not be difficult to close areas if there is clear evidence of vulnerability. The Chairman noted that these areas may be closed to some gears. The EU representative drew the meeting's attention to the fact that the required reporting period in the VMS – 6 hours – may not allow control of small areas. The Norwegian representative noted that NEAFC has closed an area west of Rockall to trawl fishing.

4 Regulatory Measures Applicable (Chair Sigmund Engesæter)

4.1 Output management measures

4.2 Input management measures

4.3 Technical measures (species and size selectivity)

4.4 Fleet based measures vs. stock based measures

Terje Løbach, Norway, introduced a general overview of those tools available for management without specifying any priority. He drew attention to the obligations of states under international law as seen in UNCLOS (Article 117-119), the 1995 Fish Stock Agreement (Article 5-7) and the NEAFC Convention (Articles 5-7). Copies of the relevant articles were made available.

He noted some key concepts.

Moratoria

Output measures

Input measures

Technical measures.

Moratoria are complicated because species under moratoria could be caught as by-catch outside the moratorium area.

Output measures could be confused by the issue of landings versus catches (including discards). Outputs are generally controlled by quotas, which could be joint or single species or distributed by gears, areas and periods.

Input measures - effort could be frozen, decreased or increased and could be measured by days at sea, number of fishing vessels, design of fishing vessels, gear restrictions. One example was the fishing days system in force for the Flemish Cap shrimp fishery.

Technical measures - closed areas, minimum mesh sizes, gear regulation, depth restrictions. It was suggested that depth restrictions should be expressed for a closed geographical area to be enforceable.

When allocating fishing rights, it is necessary to distinguish between straddling and discrete stocks. The legal mandate is found in the international law mentioned above. The guidance from this on allocations is rather vague and open to interpretation. On several occasions, NEAFC had had the task of how to allocate fishing rights between Contracting Parties and non-Contracting Parties.

The EU distributed two documents to the Working Group as an input for discussion. The EU representative gave an outline of the ideas behind these proposals for deep-sea fisheries. The Council is currently discussing the proposal from the Commission. The EU representative stressed that the texts were only provided as technical background and were not proposals for this meeting.

The EU documents are based on the concern expressed by scientists. A straight reduction of effort, as recommended, ran into problems with the historical database. The definition of fisheries was also a problem, because of fishing trips which exploited both shallow and deep-sea waters. The ICES advice had caused problems, particularly the most recent on maintaining levels of effort reduction. The advice was too global and it was not obvious which fleets should reduce effort. There was the problem of allocation, which was highly sensitive politically. Experience with effort systems was not convincing (3M shrimp) and a global reduction in effort would not protect against serial depletion, directing effort from one stock to another to maintain catch rates

To make progress, very specific scientific advice allowing for detailed measures on a detailed vessel and area basis is required.

Monitoring has to be very detailed at sea and in port. The system should be tied to specific deep-sea licences which would be related to historic presence in those fisheries or allow small by-catches.

The EU does not have the data to propose a reduction in effort. Catches have to be used as proxies for managing fishing mortality and as complementary tools to allow allocation. The Commission is aware of the problems of using TACs, for example with respect to discards. This is, however, a well-established management system in all ICES areas. The multi-species, mixed fisheries aspect is general and not specific to deep-sea fisheries and should be addressed by ICES. The aim of the licence system is to prohibit any increase in capacity, to provide better data for scientific analysis and to improve control measures.

The Chairman felt that the ideas in the Commission's proposal were a good basis for further discussions and hoped that this would assist progress towards more definite conclusions.

The Norwegian representative questioned the "TACs". He had the impression from other presentations that it was not possible to estimate "TACs" and wondered whether they included waters outside Community waters. The EU representative responded that "TACs" would be based on historical catch data and would be applicable to Community vessels both in Community and international waters. The areas and species are presented in the STCF report (page 77).

The Chairman wanted to involve other Contracting Parties and see what was applicable for NEAFC. He started by asking Contracting Parties to inform the meeting about which national measures were already in place for deep-sea fisheries.

The EU had put maximum effort levels in place for western waters, but not for all species. It was compulsory for vessels over a certain size to declare all species caught. Some Member States operate a system of designated ports and catch reports are found in logbooks. Vessels operating under this system will require a licence.

The Faroe Islands reported that their vessels need a license. The number of licences had been frozen since 1995 and vessels have to comply with the NEAFC reporting Scheme.

Iceland has a similar system, but there is no restriction on the number of licences.

Norway applies a licensing scheme. The number of vessels has been substantially reduced in the last three years. There are logbook requirements; VMS (hourly) and weekly catch reports.

Poland has a licence system and requirements for reporting catches.

The Russian Federation applies the NEAFC reporting rules in international waters. They do not operate a licensing system.

In the discussion, the following points were made: with respect to mixed fisheries, the EU representative distinguished between real deep-sea fisheries and species like ling and tusk. The direction of the discussions in the EU Council on 11 June was to apply the licence system only to real deep-sea fisheries and to apply TAC regulation for species that are also found on the continental shelf.

The Norwegian representative noted the difference between real deep-sea species and species like tusk and ling, which had more normal life histories. He wondered why ling and tusk should be included under the general heading of vulnerability with respect to deep-sea species. With regard to scientific observers, he would like ICES (or NEAFC) to coordinate sampling plans and the compilation of scientific data. There were such harmonized systems in place in other regional fisheries management organisations (RFMO), i.e. CCAMLR. He noted that the EU measures covered waters outside the jurisdiction of the EU and wanted clarification on what exactly was meant by the language “and waters not under the sovereignty or jurisdiction of third countries”.

The EU representative explained that ling and tusk also straddled deep waters and therefore were included in the proposals. They have now been taken out. One hundred per cent coverage by scientific observers was too difficult. This would only be required in exploratory fishing, but not when a number of vessels carried out similar fishery operations. Member States would be required to make plans for observers and sampling and these had to be accepted by the Commission. The language mentioned referred to international waters.

There was some discussion on which stage the coordination of scientific sampling takes place in ICES, i.e. harmonisation of logbooks. NEAFC may want to have an input into this process.

Norway queried the TACs in the interim proposal, which only covered EU Member States and wondered whether quotas for other Contracting Parties had been taken into consideration. The EU representative responded that this question had to be taken up in bilateral negotiations later in the year.

A review of management measures applied is given in Annex 6.

4.5 Control and enforcement considerations

The Chairman asked for comments.

The representative of Denmark (in respect of the Faroe Islands and Greenland) wanted to know how many vessels were fishing for deep-sea species in the Regulatory Area and if they only fished for these species.

The Norwegian representative noted that some measures were easier to control than others, e.g. effort control is easier than quota control. VMS provided good opportunities to monitor activity per area.

The EU representative noted that the data in logbooks did not currently give precise enough information on effort by area. In the new requirements more detail would be demanded (gear data as well as kilowatt/fishing days). The NEAFC VMS system should give a real time picture of activity of vessels in the RA, if reporting was complete. The EU representative doubted technical measures for these species, but closed area was an option and the VMS was also ideal here. These considerations are an integral part of the EU proposal for the future regulation of deep-sea stocks. The system of designated ports is an attempt to make the most efficient use of inspection resources. This would also be an efficient control of results from the general sampling plan.

Norway asked what strengthening of VMS requirement meant and would reporting more frequently be required. The EU representative replied it was particularly to cover situations where the transponder does not work. In the NEAFC area more frequent reporting (2 hours rather 6 hours) would be required.

The Chairman felt that the first step forward could be to include deep-sea species in Annex 1 of the NEAFC Scheme of Control and Enforcement to bring requirements up to the same standard as for other regulated resources in NEAFC.

5 Data Availability and Critical Gaps in Knowledge – (Chair Olav Rune Godø)

Three scientists had been invited to introduce this item.

Åge Fotland, IMR gave an overview of a Norwegian reference fleet for improving biological sampling and collection of correct effort statistics. The system is operated by cooperation between IMR in Bergen and fishermen and data are available online through a satellite link. A representative set of vessels from different fleets is used and presently cover trawlers and long liners. The system gives a unique opportunity for the efficient collection of data due to continuous communication between vessel and land. The system might easily be expanded to cover vessels that exploit deep-sea species.

Odd Aksel Bergstad gave an overview of programmes which do not look at the activity of fishing fleets, but for more basic scientific information to support management. He noted a number of projects (international, EU and Russian). Much of the information resided in the

grey literature and is not easily accessible which could cause problems. Basic knowledge is still limited and international cooperation is required to make progress. He then went on to describe a programme deriving from the global programme Census of Marine Life, called MAR-ECO (Patterns and processes of the Northern Mid-Atlantic) focusing on the Mid Atlantic Ridge. The studies in the North Atlantic hitherto had mainly dealt with hydrothermal vents and commercial fishery resources. It is an exploratory project still in the planning phase (2001-2003). With time, it should be able to render information of relevance for the management of resources. Plans can be seen on the MAR-ECO website, www.mar-eco.no

The representative of the Russian Federation noted that Soviet scientists had contributed to the exploration of the Mid Atlantic Ridge. A list of publications by Soviet and Russian scientists on this issue has been prepared and this could form the basis of further studies. It would make it possible to avoid replication of effort in the Mar-Eco programme and the use of scientific resources for other purposes. The Russian Federation will make their own surveys, also in the Mar-Eco context, over the coming years. Mr Bergstad noted that cooperation with Russian institutions is very important because of their experience from previous investigations. He hoped that it would be possible to establish strong cooperation with the Russian scientific community.

The Norwegian representative asked who would be making use of the results and wondered whether they would go into the flow of information to ICES to support its advisory process. Mr Bergstad confirmed this would be the case. The EU representative appreciated the contribution from MAR-ECO to the advisory process, but restated the immediate need for more specific advice and operational and enforceable measures in the short term. This task should have a high priority for scientists.

Gjermund Langdal of the Division of Experimental Fishing, Norwegian Fisheries Directorate, presented the results of exploratory fishing undertaken in cooperation with Niels Roar Hareide. He gave an overview of Norwegian exploratory fishing surveys and results for the period 1997 – 2000. During this period, surveys had focused on the Reykjanes Ridge and the Hatton Bank. A copy of the presentation was made available.

Paper WG DS 01-16 on data availability and gaps in knowledge was used as basis for further discussions. In the discussion the following points were made.

It was found that WG DS 01-06 (ACFM report 2000) was somewhat biased towards assessment and general fish biology. In an ideal world, there is always a requirement for knowledge but, for the task of establishing a simple approach management system for deep-sea fisheries, data on gear, fishing fleets, effort, fish distribution and abundance are of greater importance and should have a high scientific priority.

The three invited speakers revised WG DS 01-16, which is annexed as Annex 7. It was suggested that the results of scientific programmes should be filtered through ICES and

assist the advisory process. In monitoring fisheries, the importance of the NEAFC VMS system was stressed

Evaluation of Applicable Management Tools for Deep-sea Fisheries in the NEAFC Regulatory Area – (Chair Sigmund Engesæter)

This evaluation was done in two steps. First, the Working Group was split in two: the members of the EU delegation formed one subgroup and the remaining participants the other. The information available from sessions 3-5 was then used as a basis for the evaluation of management measures. The group results were presented in plenum (Annex 9) and the discussion is summarised as follows:

Output measures - TACs can be divided into single species, multi-species and single-species multi-annual TACs. TACs are widely used and Parties operate, and are familiar with, management systems based on TACs. If TACs or rather precautionary catch restrictions could be established, this would be a useful initial step but may not be sufficient to reduce fishing mortality. For deep-sea species the main problem is the lack of scientific advice to establish TACs and the mixed nature of several deep-sea fisheries. The allocation of TACs between CPs and between the Regulatory Area and areas under CP jurisdiction could also prove difficult. It was also felt that output measures are much more difficult to control than input measures. It was noted that TACs can lead to serious problems with discarding and high grading, particularly as all discarded deep-water fish die because of pressure and/or abrasion effects.

Input measures could be days at sea, restriction on fishing capacity (numbers of vessels, kilowatts, tonnage) and restrictions on the use of certain gears. Although fishing days or number of vessels are rather crude measures of effort, more detailed further restrictions on gear etc would complicate control. Restrictions on the design of the vessels could be considered but this would also be complicated. Days at sea or number of fishing vessels measures were easy to control and enforce. A reduction in standardised fishing effort would produce a proportionate reduction in fishing mortality for most deep-sea stocks, but not for highly-aggregating species like orange roughy. Input measures could also be beneficial in preventing damage to vulnerable habitats.

Technical measures - closed areas can curb effort but data on which to base closures are not always available. Closed areas are an important tool to protect vulnerable habitats. Minimum fish size, gear regulations and moratoria generally are not seen as applicable to deep-sea fisheries, although closing areas with juvenile and/or spawning fish could be an option. It was noted that depth restrictions are only enforceable if defined by geographical coordinates.

Moratoria - it was felt a moratorium would be a very drastic measure and might affect fisheries for stocks which could withstand fishery. They are efficient at stock and environmental protection if fishing activity outpaces the rate of data acquisition.

Observer schemes are a cost effective way to monitor deep-sea fisheries which cover vast area in distant waters. The main purpose should be to obtain facts about fisheries.

VMS was felt to be vital and the reporting frequency should be changed from 6 to 2 hours. With respect to transponders that did not send messages, procedures should be established and monitored by the NEAFC Secretariat. The existing NEAFC Scheme of Control and Enforcement should be used as a starting point. The general need for strengthening the rules on VMS with respect to deep-sea species should be considered by PECCOE.

Designated ports - whatever management measures (effort control or quota control) are adopted, there is still a need to monitor landing and reporting. A possible way of doing this effectively is in designated ports.

Regulations of by-catch and discards - there was no support for regulations of this type.

Amended Annex 1 of the NEAFC Control and Enforcement Scheme

As to the question of amending Annex 1 to include deep-sea species, the Working Group observed that there is already an obligation to record all catches and to report catches from international waters. If deep-sea species are added, Article 8.3 stipulates that fisheries for deep-sea species inside national waters also have to be reported to NEAFC. Article 10 will also apply with an obligation to report catches on board when entering and exiting the area and also to send weekly catch reports from vessels. Such an amendment requires further examination.

6 Results of Examination of Regulatory Measures and Management Areas for Deep-sea Fisheries in the NEAFC Regulatory Area to be presented to the 21st Annual Meeting - Chairs (Olav Rune Godø and Sigmund Engesæter)

The scientists present had, at the behest of the Working Group, prepared a paper on the blue ling and orange roughy fisheries. The reason was that these two stocks have been singled out by ICES as in need of immediate management action. The paper is annexed as Annex 8.

All CPs in the Working Group contributed to a paper with the following recommendations:

1. *The Working Group takes note of the serious stock situation with respect to deep-sea species in the North-East Atlantic as advised by ICES, and expresses its desire that NEAFC should introduce effective and appropriate regulatory measures within the shortest possible time.*

2. *The Working Group also expresses its concern at the lack of available information about these fisheries, and the corresponding high uncertainty about basic biological characteristics, species and technical interactions, abundance, stock size estimates, distribution, effects on deep-sea ecosystems and non-target species and estimates of sustainable fishing activity. The Working Group notes that, consistent with the application of the precautionary approach, absence of information should not be used as a reason for not taking precautionary management measures.*

3. *As deep-sea fisheries are mostly carried out in distant waters, and yet can cause local depletions of fish stocks and local habitat degradations, for example on sea-mounts, there are special control problems to be considered.*

4. *Regulation of the fisheries would require to be accompanied by appropriate allocation of fishing rights to the Contracting Parties of NEAFC.*

5. *Consistent with the above, the Working Group sees a need to :*

- *develop and improve the detail and reliability of scientific data;*
- *regulating fishing activity in accordance with ICES advice;*
- *improve relevant control measures;*
- *develop appropriate allocation of fishing rights.*

6. *To this end, the Working Group recommends:*

a. Improved data collection: *The Working Group urges NEAFC to examine ways to improve collection of scientific data by introducing detailed logbook reporting and additional information as detailed in Section 5. This should include requirements for implementing shipboard observer schemes with appropriate coverage, more detailed spatial information in order to reflect the distribution of the stocks and organising a more rapid, harmonised reporting of data to scientific agencies.*

b. Regulation of fishing activity: *As a first step in developing an effort-based management system, the Working Group sees an overall need to limit the size of the fishing fleets exploiting deep-sea species, until better knowledge about the sustainability of developing new fisheries has been evaluated. Consideration should*

also be given to other regulatory measures including catch limitations and closed areas, which may in some cases provide additional conservation benefits.

c. Improved control measures: *Given the remote location of most deep-sea fishing activities, the Working Group considers VMS a tool of prime importance in monitoring and controlling these fisheries. Strengthening VMS measures in terms of more frequent position reporting and better backup measures is a prerequisite for appropriate area-based management of these fisheries. The need to designate special landing places for deep-sea species should be considered. The VMS also provides a good opportunity to provide spatially structured data.*

d. Allocation of fishing rights: *The Working Group recommends that NEAFC begin discussions on allocation of fishing rights before the end of 2002.*

7. The Working Group recommends that NEAFC develops means to implement the measures in a., b. and c. above. These measures should be developed so as not to prejudice the activities of vessels not engaged in deep-sea fishing.

The WG recommends that NEAFC establishes conditions for deep-sea fishing corresponding to a. to c. that should form part of the licensing regulations for Contracting Parties.

7 Future Meetings

The Working Group realised the need for moving quickly on the deep-sea issue and it should be possible to decide on measures at the 21st Annual Meeting. If NEAFC is in the position to do this, a Contracting Party could put forward a proposal to NEAFC and ask for a technical evaluation of a proposed measure. NEAFC would then call the Working Group for a second meeting. This should be done before the 21st Annual Meeting. The EU thought this might create the need for an extra meeting day at the Annual Meeting.

8 The Report of the Meeting

The Chairmen and the rapporteur will prepare the report and circulate it to CPs for comment.

9 Any Other Business

There was no other business

10 Closure of the meeting

The Chairman thanked all participants for their contributions.

The President of NEAFC, Einar Lemche, thanked the organisers for setting up a complicated meeting and running it so smoothly. He thanked the two Chairmen and appreciated the fine hospitality shown by the Norwegian hosts.

The meeting was then closed

Annexes

- 1. List of participants**
- 2. Terms of Reference**
- 3. Adopted agenda**
- 4. Summary of expert presentations under agenda item 3**
- 5. Revised catch statistics**
- 6. Review of regulatory measures in place**
- 7. Data availability**
- 8. Comments on management measures**

Annex 1

WORKING GROUP ON DEEP SEA SPECIES

BERGEN, NORWAY

11-13 JUNE 2002

LIST OF PARTICIPANTS

NEAFC Secretariat

Hoydal, Kjartan
Partridge, Kate

Faroe Islands

Kristiansen, Andras
Reinert, Jákup

Greenland

Lemche, Einar

EU

Patterson, Kenneth
Svensson, Lars-Erik (Council)
Aragon, Maria Isabel – Spain
Vazquez, Xavier
Bailey, Nick – UK
Becouarn, Yann – France
Bergström, Magnus – Sweden
Clarke, Maurice – Ireland
Dobby, Helen – UK
Fassbender, Ulrich - Germany
Feldthaus, Sonja – Denmark
Girard, Marine – France
Hough, Elspeth – UK
Large, Philip – UK
Lorance, Pascal – France
Mancebo, Margarita - Spain
McGarvey, Pat - Ireland
Perfect, Trevor – UK
Szot, Christine – UK

Iceland

Sigurdsson, Þorsteinn
Steinarsson, Hoskuldur

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Bergstad, Odd A.

Engesæter, Sigmund
Godø, Olav Rune
Helle, Kristin
Langedal, Gjermund
Løbach, Terje
Oma, Paul
Thorvik, Thorbjørn

Poland

Janusz, Jerzy

Russian Federation

Gerber, Efim
Orlov, Alexei Markovich
Vinnitchenko, Vladimir
Sennikov, Sergei

Experts

Gordon, John
Munch-Petersen, Sten

Annex 2**WORKING GROUP ON THE APPRAISAL OF REGULATORY MEASURES
FOR DEEP-SEA SPECIES****TERMS OF REFERENCE**

The 20th Annual Meeting of NEAFC agreed to establish a Working Group on appraisal of Regulatory Measures for Deep-Sea Species for the Regulatory Area (as specified in the Annex of these Terms of Reference).

Terms of Reference

The Working group shall:

- identify and evaluate appropriate regulatory measures, taking into account the availability of existing information, biological characteristics of the species concerned, the technical interactions and the specificity of the various fisheries on these species, taking into account ecosystem considerations;
- examine relevant management areas for each species or groups of species;
- identify control issues of particular consequence for deep-sea fisheries, and indicate appropriate solutions;
- identify existing data resources (in particular information about catch, effort and vessel characteristics) and propose an appropriate data collection system. In particular, the Working Group shall consider appropriate database structures in accordance with ICES recommendations to support scientific evaluation and regulatory measures as described below;
- identify critical gaps in knowledge and recommend studies of importance for a sustainable management of deep- sea resources.

The Working Group shall, in particular, examine the efficiency of introducing management measures, including:

- output management measures;
- input management measures;
- technical measures such as closed areas or improved selectivity (species and size selectivity);

- identify measures to avoid local depletion

ICES shall be invited to participate and assist, particularly in identifying and proposing a data-gathering programme and, as appropriate, research activities.

The Working Group shall convene its meeting not later than 1 April 2002. It shall report to the Contracting Parties not later than the 1 September 2002 for consideration at the 21st Annual Meeting in November 2002.

List of deep-sea species

- Ling,
- tusk,
- blue ling
- great silver smelt,
- orange roughy,
- grenadiers,
- black scabbardfish,
- sea breams,
- alfonosinos/golden eye perch
- squalid sharks
- greater forkbeard

Annex 3

**MEETING OF THE NEAFC WORKING GROUP ON THE
APPRAISAL OF REGULATORY MEASURES FOR DEEP-SEA
SPECIES**

Bergen, Norway 11-13 June

Chair Olav-Rune Godø Co-Chair Sigmund Engesæter)

Final Agenda

11 Opening of the Meeting

12 Adoption of the Agenda and Appointment of Rapporteur

13 Analysis and Advice

13.1 Species groups

- Great silver smelt (Argentina), *Argentina silus*
- Ling, tusk *Molva molva*, *Brosme brosme*
- Blue ling *Molva dypterygia*
- Roundnose grenadier *Coryphenoides rupestris*
- Orange roughy *Hoplostethus atlanticus*
- Black scabbardfish *Aphanopus carbo*
- Squalid sharks, esp. *Centrophorus squamosus* & *Centroscymnus coelolepis*
- Sea breams *Pagello bogaraveo*
- Alfonsinos/golden eye perch *Beryx splendens*
- Greater forkbeard *Phycis blennoides*
- Smooth head *Alepocephalus bairdii*

13.2 Data on catch, gear, effort and fishing fleets

13.3 Fisheries and fishing fleets

13.4 Fishing areas

13.5 Vulnerable habitats

14 Regulatory Measures Applicable

14.1 Output management measures

14.2 Input management measures

14.3 Technical measures (species and size selectivity)

14.4 Fleet based measures vs. stock based measures

4.5 Control measures

15 Data Availability and Critical Gaps in Knowledge

16 Evaluation of Applicable Management Tools for Deep-sea Fisheries in the NEAFC Regulatory Area (Chair Sigmund Engesæter)

17 Results of Examination of Regulatory Measures and Management Areas for Deep-sea Fisheries in the NEAFC Regulatory Area to be presented to the 21st Annual Meeting

18 Future Meetings

19 The Report of the Meeting

20 Any Other Business

21 Closure of the meeting

Annex 4**SUMMARY OF EXPERT PRESENTATIONS****Report on the Joint NAFO/ICES/CSIRO symposium on deep-sea fisheries (2001)**

Summary of talk by John D. M. Gordon - Scottish Association for Marine Science, UK
www.sams.ac.uk

By way of introduction to the meeting John Gordon presented an abbreviated version of the joint paper on the deep-water fisheries of the ICES area.

Gordon, J.D.M., Bergstad, O.A., Figueiredo, I. and Menezes, G. (2001) The deep-water fisheries of the ICES area. NAFO SCR DOC., 01/92 Serial No. N4480, 16 pp. (available on www.nafo.ca

Some deep-water fisheries in the ICES area are long established and they tend to be artisanal in nature and utilise mainly static gears such as longlining. The advent of the factory trawler in the late 1960s and early 1970s led to the discovery and exploitation of deep-water fish species over a wide area. The development of the autoliner in the late 1970s also led to an expansion in deep-water fishing in the northern ICES areas.

Much of the information on these fisheries is in the 'grey literature'. This presentation gathered together these sources of information and provided an overview of the development of the deep-water fisheries by ICES Sub-area.

The Symposium "Deep-Sea Fisheries", hosted by NAFO, was held at the Centro de Convenciones de Plaza de Americas, Varadero, Cuba with co-conveners J. A. Moore (NAFO), J. D. M. Gordon (ICES), and J. A. Koslow (CSIRO) from 12-14 September 2001. There were 104 participants from Australia, Austria, Brazil, Canada, Cuba, Denmark, Estonia, Faroe Islands, France, Greece, Iceland, Ireland, Italy, Mexico, New Zealand, Norway, Poland, Portugal, Russia, Spain, United Kingdom, and United States of America.

The Symposium considered current research, advances, and impacts of deepwater fisheries in many different locations around the world. In addition, two sessions were devoted to important deepwater fisheries (Greenland halibut and redfish) of the North Atlant region. Three invited speakers addressed specific issues within the six sessions. Thirty-five other oral presentations were delivered and 63 posters were displayed. Posters were highlighted in the Greenland halibut session during which five poster authors presented 5-minute summaries of their work.

Day one began with a session on deepwater fisheries, which covered a wide range of topics from exploratory fishing, distribution and gear selectivity. This was followed by a session on Greenland halibut, which considered the effects of fishing on growth, stock structure issues and reproduction. The opening session of the second day began with some papers on the impact of trawling on deep-water corals and other sessile organisms. Two papers covered the deep-water fisheries of the ICES area and options for their assessment. The afternoon session was on biology and life history and described the trophic ecology and biological parameters of a number of deep-water species. The final day comprised a session on redfish and another on fisheries ecology, the latter covering a wide range of topics from age estimation to size spectra.

In the general discussion it was considered that the emerging deep-water fisheries could learn from the experience in managing some of the longer established fisheries such as Greenland halibut and redfish. It was noted that the 2001 report of the ICES Working Group on the Biology and Assessment of Deep-sea Fishery Resources had, at the request of NEAFC, made a first attempt at ranking life history characteristics of deep-water fish in relation to these two species. A recurring theme in many papers was the fact that the current ICES Sub-areas and Divisions are, in many instances, unsuitable in terms of bathymetry and water masses for reporting information on deep-water species. Given the high discard rates and likely high mortality of escapees in trawl fisheries it was considered to be important to report

catch and not simply landings. There is increasing public awareness about the impact of fishing activities on the deep-water ecosystem and the conservation of deep-water coral reefs and seamounts were good examples of how there should be wider involvement in the decision making process. The importance of the use of non-invasive technology for studies in the deep-sea, was considered to be an area that should be given greater priority.

Most of the papers read are available as NAFO Scientific Council Reports on www.nafo.ca/meetings/scicoun/2001/resdocs/scrtoc.htm, and a more detailed account of the proceedings, the programme and the list of participants are given as a Redbook Report at www.nafo.ca/publications/redbook/2001/index.htm

ICES management advice for deep-sea resources

Summary of talk by Odd Aksel Bergstad, Chair of ICES WGDEEP

In 1994 ICES initiated regular advisory work on deep-sea resources by establishing a dedicated study group. This group was re-established as the ICES Working Group on the Biology and Assessment of Deep-Sea Fisheries (WGDEEP) in 2001. WGDEEP meets bi-annually to review the status of the stocks and compile relevant information that is subsequently used by ICES ACFM to formulate management advice. The last meeting of WGDEEP was held in April 2002, and the advice from ACFM was presented in early June.

It continues to be a major problem for the assessment of stock status of deep-sea resources that data on landings and particularly fishing effort are limited or of relatively poor quality. This lack of suitable data prevents ICES from carrying out analytical assessments for most of the deep-sea stocks, and in cases where analyses were attempted, the results are unreliable or of questionable quality. Thus in most cases only qualitative assessments based on simple analysis of trends in catches and catch per unit of effort are presented and form the basis for advice statements. ICES cannot in the present situation provide very specific advice that would have been more useful to management bodies.

Within a precautionary framework, however, lack of sufficient data should not be used as an excuse for not giving advice or taking management action. Hence ICES maintains that given the generally higher vulnerability of deep-sea stocks and environments, and the continued too high catch and effort levels, significant reductions in the exploitation rates are needed. Some stocks such as orange roughy (*Hoplostethus atlanticus*) in ICES Sub-area VI and red seabream (*Pagellus bogaraveo*) in Sub-areas VII and VIII are severely depleted, and for many other species the CPUE either declines or remain at a low level. A general advice for reduction in fishing effort is given, and for a number of stocks it is recommended that directed fisheries are stopped, or areas of aggregations closed. The stock-specific statements may be downloaded from the ICES website (www.ices.dk).

ICES has responded in 2000 and 2001 to special requests regarding management issues from NEAFC, the EU and Norway. These responses are also available on the ICES website. A general view expressed by ICES is that no single management solution is likely to be effective for deep-sea stocks, and that effort control is favoured over other options. Data collection and provision needs to be improved, especially with regards to spatial resolution.

Summary of the Report of the STECF-SGFEN report on deep-sea fisheries

Sten Munch Petersen

Chapter 1. Background for this WG and its meeting. Terms of Reference:

Review and identify appropriate stock units for management of deep-sea fisheries

Describe Community fisheries for deep-sea species in the Mediterranean and Antarctic areas, and in the North East Atlantic areas where new information is available.

Compile and update the available data on species landings, species catch rates, discard rates and species and size composition of deep-water fisheries. Temporal trends by area and by species should be reported

Identify sensitive marine habitats that might be affected by deep-sea fisheries.

In the light of existing scientific evaluations indicate appropriate conservation measures for each stock unit in terms of:

- Restrictions on use of fishing gear (trawl, static gear, type of gear, gear specifications, areas, seasons etc.)

- Effort restrictions, with appropriate considerations of control measures

- Appropriate catch levels.

Identify technical interactions between fisheries for deep-sea species and species more traditionally fished on the continental shelf or on the upper part of the slope

Indicate future research needs.

The NE Atlantic and the Mediterranean differ fundamentally both regarding deep-water /shelf areas and their fisheries. Also regarding the management problems and approaches to these the two sea areas differ very much. There are therefore treated separately in this report (A & B).

Since NEAFC covers the NE Atlantic only, the presentation of the content of the report focused on the NE Atlantic only.

Chapter A.2 (TOR item 1) provide overviews of the commercially important deep-water species both in the North-east Atlantic region (ICES region) and the Mediterranean. However, for the Mediterranean the coverage of the fisheries is only by the 4 member states Spain, France, Italy and Greece.

Chapter A.2 also gives overviews of the available biological criteria for defining stocks units associated with the species when possible. For the NE Atlantic only the stocks which are not included in the ICES regular assessments are further described here. The Commission has suggested 5 geographically determined management units for the deep-water species in the NE Atlantic. The Group has the view, that it is possible to identify potential management units on the basis of available information on stock structure, the geographical distribution of international landings of each species and the similarity of catch-rate trends (as an index of depletion) between ICES Sub-areas, and differences in fishing gear between fisheries. These management units are defined in terms of ICES areas. However, it is recognised that these areas may be somewhat imperfect.

Chapter A.3 (items 2 & 3 in TOR) give overviews of the current fisheries by country and major fleet in the various sub-areas. More detailed information on trends in landings is presented if available. In the NE Atlantic many of the long-line fisheries are long standing. The deep-water trawl fisheries have developed recently. A few of the line fisheries seem to be sustainable, but in general during the past 10-20 years most of the long-line fisheries have shown decreasing catch rates along with increasing mechanisation. For the deep-water trawl fisheries the typical development is a rapid increase in catches when a new resource is discovered followed by a decrease reflecting depletion of the resource. The trends in landings and CPUE for most deep-water fisheries currently indicate that fishing pressure is far beyond sustainability. Also data on discards and selectivity are presented in the report.

Chapter A.4. (Item 4 in TOR) deal with sensitive areas/bottom communities.

In this chapter are short descriptions of the types of deep-water bottom communities for which there is evidence of changes due to fishing activities. For comparison, examples from Australian waters are also

mentioned. From the NE Atlantic special attention is given to cold water coral communities, because the impact of trawl fisheries on this type of deep-water bottom communities already has been well documented in several cases. The group points out several bottom localities, also such which are not coral beds, which may be considered for special conservation measures.

Chapter A.5 (Item 5 in TOR) list the various management measures 'on the market', i.e. technical measures, TAC regulation, effort regulation and, for some fisheries, moratoria. For the NE Atlantic the group is generally in favour of management measures based on some effort control of the various deep-water fisheries, most of which are mixed fisheries. It is furthermore the opinion of the group, that application of TACs for these mixed fisheries are not likely to be effective, and several reasons for this are listed. Should the Commission proceed to introduce TACs, then these could only be regarded as 'ad hoc' emergency measures, until they can be replaced by effort-based management measures.

Chapter A.6 (item 6 in TOR) give examples of interactions between deep-water fisheries and shelf fisheries.

Because of special relevance to the NEAFC meeting the presentation had special focus on the options for calculation of reference mean landings as basis for the Commission's emergency TAC proposals.

Catches of deep sea non-Regulated Resources

NEAFC Regulatory Area 2001

BLUE LING (BLI - *Molva dypterygia*)

CP/ICES Sub-area	II	V	VI	VII	XII	XIV	Total	
European Union			941.0		1,483.0	1,114.0	3,538.0	
Faroe Islands		391.0					391.0	
Greenland							0.0	
Iceland			2.0				2.0	
Norway			162.0	3.0	103.0		268.0	
Poland							0.0	
Russian Federation							0.0	
Estonia			85.0					85.0
Total		391.0	1,190.0	3.0	1,586.0	1,114.0	4,284.0	

LING (LIN - *Molva molva*)

CP/ICES Sub-area	II	V	VI	VII	X	XII	Total
European Union			147.0			24.0	171.0
Faroe Islands							0.0
Greenland							0.0
Iceland							0.0
Norway			58.0	95.0	12.0	29.0	194.0
Poland			0.8			18.3	19.1
Russian Federation							0.0
Total	0.0	0.0	205.8	95.0		71.3	384.1

TUSK (USK - *Brosme brosme*)

CP/ICES Sub-area	II	V	VI	VII	XII	Total
European Union			35.0		1.0	36.0
Faroe Islands						0.0
Greenland						0.0
Iceland			20.0			20.0
Norway			295.0	115.0	51.0	461.0
Poland						0.0
Russian Federation			5.0			5.0
Japan					8.0	8.0
Total	0.0	0.0	355.0	115.0	60.0	530.0

ROUND NOSE GRENADIER (RNG - *Coryphaenoides rupestris*)

CP/ICES Sub-area	V	VI	X	XII	XIV	Total
European Union		131.0		5,592.0	265.0	5,988.0
Faroe Islands	11.0		1.0			12.0
Greenland						0.0
Iceland						0.0

Norway		27.0		1.0			28.0
Poland		57.8		120.5			178.3
Russian Federation		3.0		1,714.0		72.0	75.0
Estonia		68.0					68.0
Total	11.0	286.8	1.0	7,307.0		337.0	6,349.3

BLACK SCABBARD FISH (BSF - *Aphanopus carbo*)

CP/ICES Sub-area	V	VI	X	XII	XIV	Total
European Union		30.0		379.0	12.0	421.0
Faroe Islands	2.0		1.0			3.0
Greenland						0.0
Iceland						0.0
Norway						0.0
Poland		0.2		10.9		11.1
Russian Federation						0.0
Total	2.0	30.2	1.0	389.9	12.0	435.1

ARGENTINES (ARG - *Argentina spp.*)

CP/ICES Sub-area				VI	XII	Total
European Union				13.0	6.0	19.0
Faroe Islands						0.0
Greenland						0.0
Iceland				11.0		11.0
Norway						0.0
Poland						0.0
Russian Federation				4.0		4.0
Total	0.0	0.0	0.0	28.0	6.0	34.0

ORANGE ROUGHY (ORY - *Hoplostethus atlanticus*)

CP/ICES Sub-area			VI	X	XII	Total
European Union			4.0		29.0	33.0
Faroe Islands			173.0	175.0		348.0
Greenland						0.0
Iceland						0.0
Norway						0.0
Poland						0.0
Russian Federation						0.0
New Zealand					450.0	450.0
Total	0.0	0.0	177.0	175.0	479.0	831.0

Annex 6

Review of regulatory measures in place

Contracting Party

Based on information given at the meeting

	Curbing effort	Reporting		
	Number of licenses	Declaring all catches	VMS	Effort reporting
Denmark (in respect of the Faroe Islands and Greenland	Frozen	Yes	Yes	Logbooks
The EU	Frozen	Yes	Yes	Logbooks
Iceland	No limit	Yes	Yes	Logbooks
Norway	Frozen and reduced	Yes	Yes	Logbooks
Poland	No limit	Yes	Not implemented	?
The Russian Federation	No limit	Yes	Yes	??
Non-Contracting Parties	Open access	Yes/no	Yes/no	??

Annex 7**DATA AVAILABILITY AND GAPS IN KNOWLEDGE**

Summary prepared by invited experts

Data collection methods and instruments

Data for stock assessments and management need to be improved. In order to enhance data quality and quantity, and also speed up data flow it is necessary to utilise more up-to-date and efficient collection and communication systems and instruments. Systems should be implemented so that data can be evaluated and conveyed to assessment and management bodies without significant delay.

There are several sources of basic data, and it was agreed by the working group that all of the following instruments may be utilised:

Commercial fishing vessels as observation platforms

Monitoring surveys

Expeditions

 Exploratory fishing

 Research vessel expeditions

Commercial vessels taking part in deep-sea fisheries should be required to keep and submit more detailed logbooks, containing information on gears used, fishing position, depth, catch composition, discards etc. Vessels should also carry instruments for recording automatically environmental variables (temp, salinity, acoustic recordings). Vessels should also have an obligation to carry out some sampling of biological data and samples. There is a clear need for harmonisation of log books between countries and management areas. Online information exchange would greatly improve data flow to assessments and management.

Monitoring or assessment surveys by research vessels or chartered vessels become very expensive, especially for widely distributed stocks. To be feasible, such efforts need to have very specific goals and sufficient committed ship-time. It is probable that international efforts are required. A range of methods and technologies need to be adopted, well adapted to the resources and habitats under consideration. Monitoring surveys cannot readily be implemented before extensive methodological development and testing has been carried out.

Scientific expeditions are extensive one-time efforts or major investigations carried out at intervals, mainly aimed at filling significant gaps in knowledge on biology and ecology of deep-sea species, communities and ecosystems. Such efforts would be used to address specific questions/hypothesis and would enhance the general competence of the scientific community providing assessments and advice. It should be recognised that there is a documented need for more fundamental knowledge of deep-sea resources and ecosystems (see below).

Data availability

Below are listed data required for assessment of fisheries and stocks and the provision of management advice. In order to introduce management measures stock assessments should ideally be available for all stocks. Given the general data limitations, satisfactory assessments remain long-term goals. However, management actions may still be taken in spite of the current lack of stock assessments. Immediate management actions will then mainly rely on improved fisheries data.

Fisheries data

Accurate updated species-specific catch data series (incl. discarded catch) by statistical rectangle and depth.

Updated effort data series broken down by rectangle and depth for all relevant vessels, corrected for efficiency changes.

Data on gear types used and their selectivity patterns by area and depth to facilitate assessments of impact on habitats.

Data on distribution of fisheries activities, outside and inside EEZs.

Data on technical interactions.

Other data necessary for analyses of consequences of alternative management actions.

Additional data for stock assessments

General requirements, for all deep-sea species and habitats:

Length and age compositions of catches.

Fishery independent information from surveys, e.g. abundance estimates, length and age compositions, recruitment indices.

Species- and habitat-specific data needs:

Species	Data needs
Ling	Updated CPUE data from all major fisheries, especially the longliners, age-disaggregated data to at least estimate mortality.
Blue ling	Information on distribution of historical and present spawning aggregations, updated series of age-disaggregated data (at least for Vb and VI, and XII).
Tusk	Updated CPUE data from all major fisheries, especially by longliners, age-disaggregated data to at least estimate mortality.
Greater silver smelt	Survey data, e.g. hydroacoustic abundance estimates and distribution data, age-distributions from major fishing areas, documentation of reasons for wide variation in landings.
Orange roughy	Knowledge on distribution of aggregations, CPUE data at relevant geographical scale, age-distributions. Detailed information on fleet behaviour.
Roundnose grenadier	Age-disaggregated data to conduct assessments, at least in VI, VII, Vb, and XII.
Black scabbardfish	Detailed data from all fleets, also on behaviour. Length compositions in different fishing areas, and age-disaggregated data,
Red seabream	Extension of the age-disaggregated data series in Sub-area X in order to improve basis for future VPA. Data on effects of regulations in continental slope waters.
Greater forkbeard	Correct catch data (improved discard sampling). Consistent separation of landings/discards of this species and <i>Phycis phycis</i> and <i>Mora</i> .
Alfonsinos	Improved CPUE data and/or absolute abundance estimates from international waters. Improved survey data from the Azores.
Squalid sharks	Species-specific catch data from all fisheries. Size compositions, and age-disaggregated data.
Other species	Consistently recorded catch data.
Seamounts and other sensitive features	Time-series of data on physical disturbance, benthic community structure, history of antropogenic activities.

Gaps in biological knowledge

For many deep-sea species the knowledge on biology and ecology has improved significantly in recent years, mainly through the efforts of a few recently completed international projects. Despite these efforts, however, for most species there still remains serious gaps in our information on vital rates and

population biology. Compared with most species of the shelf and coastal waters, most deep-sea species are poorly known.

In the table below the major exploited deep-sea species are listed, and for each species it is indicated with an asterisk if documented information on biological characteristics suitable for assessments, at least in some areas, is available. Cases where no information is available are marked with a question mark. It should be emphasised that in many cases where some information exists it is based on a single source only, often unpublished.

The source of this table is the updated records given for individual species in the 2001 and 2002 reports of the ICES WGDEEP.

For deep-sea species not listed in the table, the information is severely limited and mainly restricted to overall distribution patterns and scattered data on other aspects.

Species	Stock structure	Abundance (relative estimates)	Exploitation rate	Longevity	Growth rate	Natural Mortality rate	Fecundity	Length and age at first maturity	Recruitment variation (yearclass)
Ling	?	*	*	*	?	*	*	*	?
Blue ling	?	*	?	*	?	*	*	*	?
Tusk	?	*	*	*	?	*	*	*	?
Greater silver smelt	?	?	?	*	*	?	*	*	?
Orange roughy	?	*	?	*	*	*	*	*	?
Roundnose grenadier	?	*	?	*	*	*	*	*	?
Black scabbardfish	?	*	?	*	*	*	?	*	?
Red seabream	?	*	?	*	*	?	*	*	?
Greater forkbeard	?	?	?	*	*	*	*	*	?
Alfonsinos	?	*	?	*	*	?	?	*	?
Squalid sharks	?	*	?	*	?	*	*	*	?

There are also significant gaps in our knowledge on deep-sea habitats and communities, and hence it is difficult to assess the probable impacts of exploitation by e.g. trawls or other gears. These issues are of increasing concern and already being addressed in shelf areas. Other management bodies such as OSPAR and conservation organisations pay increasing attention to the impact of fisheries on the deep-sea ecosystem.

Some aspects that should be given higher priority in future studies are:

- Comparative analyses of community structure in similar but unexploited and exploited habitats.
- Time-series comparisons in pre- and postexploitation periods of particular habitats.
- Monitoring of community patterns in areas previously impacted by fisheries in order to quantify recovery rates.

Management, control and enforcement aspects

In addition to the gaps in biological knowledge and fisheries data important for assessments, there are significant and critical gaps in the information required to implement an operational management scheme based on effort as advised by ICES.

In general terms more information is needed on the following aspects:

More specific advice on the effort reductions, including:

- in which areas;

- by which type of gear;

- to what levels;

- in what units should effort be measured;

- from one reference period;

- advice that is delivered in a fisheries context rather than a stock-specific context, e.g. “effort in area XX by gear YY should be reduced by ZZ %” rather than “effort on species AA should be reduced by ZZ %”.

Equivalence or correspondence of different types of effort unit. This information is required in support of any decisions concerning allocations or distributions of fishing effort.

Corresponding means to measure effort, and legally-enforcable basis for effort measurement.

Annex 8**Comments on possible management measures**

Measure	For	Against	Comments
OUTPUT MEASURES			
Single-Species TACs	<p>Management Infrastructure and Reporting Systems exist already.</p> <p>Accepted precedents for allocation</p> <p>Allows limitation of fishing mortality for highly aggregating species</p> <p>Rapid implementation</p> <p>Appropriate for single-species fisheries?</p>	<p>Unreported landings, misreported catches are problematic.</p> <p>Regulation of landings does not necessarily have the desired effect on catches.</p> <p>Relationship between catches and fishing mortality is unknown</p> <p>Possible inconsistencies in TACs for different species in mixed fisheries with the consequences of increased discarding or different levels of risk in mixed species.</p> <p>Can result in high-grading.</p> <p>No protection of non-target species</p> <p>No protection against sequential depletion of populations, depending on size of management area.</p> <p>In the long-term, TAC management may be more costly than other measures.</p>	<p>Requires specific landings obligations, e.g. designated ports.</p> <p>Proper setting of single-species TACs requires knowledge of technical interactions</p>
Multispecies TACs	Takes account of mixed-nature of fisheries	<p>Large incentive for high-grading due to different values of species in mixed catches.</p> <p>Different management areas could be</p>	Large overhead in data and analysis

		appropriate for different species	
Single-species Multiannual TACs (additional points)	Consistent with available scientific advice (biennial basis) Provide stability, helpful for industry	Can imply higher risk	
INPUT MEASURES			
Days at Sea	Easy to enforce (as days in port) Fewer discards, lower environmental impact Lower impact on non-target species	Large data requirements Technical developments and power increases can negate restrictions on activity. Days at sea includes days not fishing Days at sea not restrictive when static gears are used. Causes allocation problems due to different efficiencies of different vessels Clearer link between effective effort and fishing mortality for non-shoaling species	Data on catchability by vessel types gears type required
Restriction on fishing capacity	Reducing capacity and investment reduces incentives to overexploit stocks Defining a fleet segment can make management easier.	Socially Difficult to implement Difficult to reduce capacity to compensate for technological developments Capacity can be difficult to define, to measure and to enforce (especially Kw)	Reducing capacity not guaranteed to reduce effective deployed effort.
Gear restrictions	Can reduce impact on non-target species and ecosystem structure	Can be difficult to enforce Static gears especially difficult to enforce because unclear link to vessel	
TECHNICAL			

MEASURES			
Closed Areas	<p>Large benefits for aggregating species, spawning areas and habitats, preventing effort increasing on large aggregations</p> <p>Easy to control IF a comprehensive VMS + Designated port scheme in place</p> <p>Allows comparison with fully exploited areas</p>	<p>Possible displacement of effort if effort not also restricted.</p> <p>Information loss from closed areas.</p>	Areas need to be closed for a long time for ecosystem benefits.
Minimum sizes		<p>Causes discards</p> <p>Difficult to enforce</p> <p>No benefit</p>	
Gear regulations	<p>Can reduce technology creep</p> <p>Mesh-size restrictions may in very few cases</p> <p>Needed for effort limitation in static gear fisheries</p>	Can be very difficult to enforce	
Depth Restriction	<p>Can be biologically desirable if closed areas can be defined on bathymetric basis</p> <p>Can have considerable benefit if fisheries take place in widely separate depth intervals</p>	Difficult to enforce by depth definitions	
MORATORIUM			
	<p>Easier to control</p> <p>Efficient at stock and environmental protection if fishing activity outpaces rate of data acquisition.</p>	<p>Loss of data when fishing operations cease</p> <p>Difficult to know when to re-open the fishery</p>	Monitoring would need to be by independent survey

