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DEEP-SEA FISHERIES IN THE HIGH SEAS

A trawl industry perspective on the International Guidelines for the Management of Deep-sea Fisheries in the High Seas

SIODFA

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Phillip Gaugler and Mark Hansen

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2008

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PREPARATION OF THIS DOCUMENT

The Skippers and Fleet Managers Workshop to Review the International Guidelines on the Management of Deep-sea Fisheries in the High Seas (26 to 28 May 2008) was organized to obtain an industry perspective on the International Guidelines and to solicit industry views and advice on how to conduct fisheries research from commercial vessels and to minimize adverse impacts on benthic habitat and vulnerable marine ecosystems.

The workshop took place in Cape Town, South Africa, and was organized in collaboration with the Southern Indian Ocean Deepsea Fishers Association (SIODFA).

This document contains the views expressed during the meeting on the International Guidelines, the potential impacts of bottom fishing and other relevant topics.

This workshop was funded by the Government of Norway and was organized under the umbrella of the deep-sea component of the project GP/INT/942/JPN "Promotion of sustainable fisheries: support for the Plan of Implementation of the World Summit on Sustainable Development." The workshop conveners would like to thank Indra Gondowarsito and Maria Eugenia Escobar for their invaluable assistance in the organization of the meeting.

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ABSTRACT

This document contains the results and recommendations of the discussions that took place during the Skippers and Fleet Managers Workshop to Review the International Guidelines on the Management of Deep-sea Fisheries in the High Seas which was held from 26 to 28 May 2008 in Cape Town, South Africa. This workshop was organized to obtain an industry perspective on the draft FAO International Guidelines on the Management of Deep-sea Fisheries in the High Seas and to solicit industry views and advice on how to conduct fisheries research from commercial vessels and to minimize adverse impacts on benthic habitat and vulnerable marine ecosystems.

CONTENTS

Preparation of this document iii

Abstract iv

Acronyms and abbreviations vi

FOREWORD 1

NOTE FROM THE WORKSHOP SECRETARIAT 3

PROFILES OF THE PARTICIPANTS 5

EXECUTIVE SUMMARY 7

INDUSTRY PERSPECTIVE ON DEEP-SEA FISHERIES IN THE HIGH SEAS 9

General comments 9

The International Guidelines on the Management of Deep-sea Fisheries in the High Seas 9

Skippers certification 9

Fishing gear impact 10

Gillnets *10*

Longlines *11*

Pots in deepwater *11*

Trawling *11*

Midwater trawls *11*

Bottom trawls *12*

Data and research 13

Observers 14

Data security 15

Management tools 15

Discards/offal 16

MESSAGES TO POLICY-MAKERS AND THE PUBLIC 16

What is the most important point you would like to present to policy-makers regarding your deep-sea fishery? 16

What do you feel is the biggest problem to resolve regarding your deep-sea fisheries? 17

How do you see the reputation of deep-sea fishing on the high seas being improved? 17

ABSTRACTS OF PRESENTATIONS 18

Faroese quest for orange roughy 18

Aimed trawling in the Indian Ocean 18

Reducing bottom impact in trawl fisheries 19

REFERENCES 19

ANNEX I – List of participants 20

ANNEX II – Agenda and timetable 22

ACRONYMS AND ABBREVIATIONS

COFI	FAO Committee on Fisheries
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
IP	Intellectual property
NEAFC	North East Atlantic Fisheries Commission
NGO	Non-governmental organization
RFMO/A	Regional fisheries management organization/Arrangement
SIODFA	Southern Indian Ocean Deepsea Fishers Association
UNGA	United Nations General Assembly
VMEs	Vulnerable marine ecosystems
VMS	Vessel monitoring system

FOREWORD

History has shown that effective management of deep-sea fisheries, largely developed over the last 25 years, has been difficult to achieve. There are many examples of deep-sea fisheries that have had boom and bust patterns. The reason for this pattern is that many deep-sea fishes grow slowly, have long life spans and thus, regeneration times, and have low or episodic recruitment. In addition, some species form dense schools that can provide high catch rates making them vulnerable to fishing. Other reasons for management failure arise from fisheries being conducted in international waters and thereby outside control of the neighbouring coastal States and often, international fishery management regimes.

It is, however, important to use the experience gained in the prosecution of these fisheries to develop guidelines for effective management of deep-sea resources in the high seas to ensure that these fisheries are sustainable.

Experience shows that fishing effort in deep-sea fisheries can expand rapidly, though this is not always the case. It is necessary to have sufficient and accurate information from the start of a fishery for effective management, particularly those that develop rapidly, if they are to be prevented from collapsing. And, experience shows that it is only through good cooperation with the fishing industry that a system of rapid flow of information can be established.

Based on information on where fishing occurs and what species are targeted, scientists, fishers and managers can rapidly assess whether the fishery is conducted on a vulnerable ecosystem, if the fishery needs urgent management actions and whether the ecosystem needs protection.

Effective assessments of fish stocks require the involvement of fishers as their data have proven to be useful and important. For scientists and managers to analyze and understand the information that is obtained, experience shows that cooperation is essential, particularly since the data must be validated and standardized. This is not possible without detailed knowledge about fishing operations, gear, fishing vessels and crew that is collected regularly. Information on new technical developments and the economics of the fisheries is also necessary for good for analyses.

New technical developments make each vessel more efficient. This increases the vessel and the fleet's capability, which increases the overall effective fishing effort. This will, of course, affect the fish stocks, but also the trend in time series on catch and effort that will not accurately reflect the trends in the stocks. It is therefore necessary for scientists and managers to have enough information to adjust for these changes.

Changes in the economics will have additional effects on fisheries and the management of high sea deep-sea fisheries. Changes in fuel prices may alter effort and practices, especially in fisheries with high fuel consumption. In addition, changes in prices in fish products will have effects on how fisheries are conducted; what fish species are targeted and which are discarded.

When information and assessments are used to manage fisheries it is important that the industry is involved in order to be informed of the rationale behind management decisions, participate in the analysis and interpretation of fisheries data, and, not least, bring forward ideas on the best measures to use. There are many examples of fishery management systems that have failed because they were not discussed properly with the appropriate industry.

To establish a system where fishers are involved in data collection, fish stock assessments and in developing management systems, it is necessary to build an environment of trust between the industry, scientists and managers. This trust must be developed through cooperation on all levels. Cooperation and trust between scientists and fishermen is not new – there has always been an important flow of information by means of both formal and informal contact between these two groups. This contact can, however, be much improved and expanded.

Good cooperation must be based on transparency. It is important for managers, the fishing industry and scientists that the policy makers, non-governmental organizations (NGOs) and the general public are well-informed on the management and functioning of these fisheries. In addition, all stakeholders must be able to trust that the data collection, assessments and the management decisions are based on responsible management. It is also important that they can trust that all problems related to the environment are dealt with responsibly.

At this meeting skippers and fleet managers from various deep-sea fisheries from the North and South Atlantic, Indian and Pacific Oceans were present. They were given the possibility to express their views on the content of the guidelines and on the management of deep-sea fisheries and their habitats. This report reflects their views on managing deep-sea fisheries and the associated ecosystems in relation to the proposed guidelines.

Nils-Roar Hareide
Workshop Facilitator
Norway

NOTE FROM THE WORKSHOP SECRETARIAT

Building on the discussion of deep-sea fisheries at the twenty-fifth session of the Committee on Fisheries (COFI), the important suggestions and recommendations that came out of DEEP SEA 2003 (Dunedin and Queenstown, New Zealand, 2003) and the output of the twenty-seventh session of COFI (2007), the Food and Agriculture Organization of the United Nations (FAO) has held two workshops, two Expert Consultations and one Technical Consultation to develop International Guidelines for the Management of Deep-seas Fisheries in the High Seas. These Guidelines are being developed for fisheries which occur beyond the limits of national jurisdiction and have two characteristics:

a) the total catch (everything brought up by the gear) includes species that can sustain only low exploitation rates, and/or suffer incidental mortality; and/or
b) the fishing gear is likely to contact the seafloor.

FAO recognizes that the deep-sea fishing industry has a breadth of sea-based experiences that can provide valuable insights into the practicality of implementing the International Guidelines as well as providing an industry focus on the contributions they can make towards ensuring that deep-sea fisheries in the high seas are harvested sustainably.

FAO, in collaboration with SIODFA (the Southern Indian Ocean Deepsea Fishers Association), organized this workshop to obtain an industry perspective on the International Guidelines and to solicit their views and advice on how to conduct fisheries research from commercial vessels and to minimize adverse impacts on benthic habitat and vulnerable marine ecosystems (VMEs).

This meeting brought together a number of skippers and fleet managers engaged in deep-sea fishing on the high seas to:

- develop a common understanding on why the technical guidelines have been prepared;
- understand the implications of the guidelines for fishing operations;
- identify areas of concern that industry has with respect to impracticalities and constraints with respect to implementation of the guidelines; and
- provide the FAO with feedback on how industry can contribute towards effective implementation of the guidelines, especially in regard to VMEs.

Twelve skippers and fleet managers from eight countries, with an accumulated deep-sea experience of over 265 years, took part in the meeting.

A clear message from the skippers and fleet managers was the importance of regulations in the deep-sea high seas fisheries. They, as members of the industry that would be affected expressed their desire to be an integral part of the management of these fisheries and noted their current capability to conduct scientific sampling of marine resources, their acquisition and use of trawl mounted cameras to observe seabed habitat where fishing is carried out, and how other instrumentation could allow them to relatively precisely control the position of the fishing gear, a process called “aimed trawling”.

The skippers noted that while a range of fishing gears are used in the deep sea, there is a lot of misinformation regarding their affects and that impacts are not only a function of the fishing gear and equipment gear, but also of the fishing practices employed and skills of the vessels crews. With the correct vessel technology, fishing equipment, electronic instrumentation and training, fishing effects on the marine environment can be minimized. As a result, they felt it was important for the deep-sea fishing industry to implement “best practices” in fishing operations.

In remarks aimed at policy-makers the skippers and fleet managers overwhelmingly felt that responsible fisheries are critical for the future of the sector and future generations. They have been disappointed in the lack of collaboration between all relevant stakeholders and emphasized the need to address this issue.

The FAO played a neutral role in these discussions, providing secretariat services to the workshop. The workshop was held over three days and included three presentations of deep-sea fishing techniques from the Northern and Southern Hemispheres.

Francis Chopin
Senior Fishery Industry Officer, FAO

Jessica Sanders
Fishery Officer, FAO

PROFILES OF THE PARTICIPANTS

Asbjørn Aasen is from Norway and was a commercial fisherman for six years and a trawl master on research vessels for 13 years. He is now working as gear technician at the Institute of Marine Research (IMR) of Norway.

Mike Blanchet is from New Zealand and has been fishing for 17 years, of which 14 years were in deepwater fisheries for orange roughy. Throughout these years he was a deckhand, then mate (four years) and skipper (eight years). He currently works for Transnamibian Fishing, the owner of MFV "Nikko Maru No.1". Member of SIODFA.

Brian Flanagan is from South Africa**.** He first became involved in fisheries in 1970 when he attended the Sea Fisheries Research Institute and then graduated with a diploma in Oceanography 1973. Thereafter, he joined Irvin & Johnson serving some 10 years as a Fleet Factory Manager and Fishing Manager. He obtained his MBA in 1985 and then joined Atlantic Fishing Group as General Manager in 1986 and then as Director from 1992 to 1996. He now owns and manages Flantrade Investments CC, which provides management services to fishing vessel owners. Member of SIODFA

Kevin Flanagan is from South Africa and has just started to work in the fishing industry. He finished a degree in marketing and human resource management and now works in a company managing deep-sea trawlers. Member of SIODFA

Phillip Gaugler is from New Zealand and has been fishing for 16 years of which 14 years have been in deepwater fisheries and 9 of those years for orange roughy in the Indian Ocean, He has been a skipper for one year and prior to this a mate for four years. Previously, he also worked as a deck hand and bosun for 11 years. He currently works for Sealords Group Ltd. Member of SIODFA.

Kristinn Gestsson is from Iceland. He has been working in the fishing industry for 38 years. He was a fisherman on trawlers and longliners and became a trawler captain in 1979. He fishes for ground fish around Iceland, redfish in the Irminger Sea and deepwater fish on the Mid-Atlantic Ridge.

Mark Hansen is from New Zealand and has been working in the fishing industry since 1977. He has held a skipper certificate since 1981. Of the 25 years he has been fishing, 12 have been on deep-sea trawlers and the remaining years on purse seiners. Member of SIODFA.

Greg Heald is from New Zealand and has been fishing for 13 years. Of those 13 years, he worked as skipper for 9 years in deep-sea fisheries. He currently works for Austral Fisheries, Perth, Western Australia. Member of SIODFA.

Yoshinobu Nishikawa is from Japan and has worked as engineer on deepwater trawlers as well as working with others aspects of the fishing industry such as labour unions and fish processing. He is now a fleet manager with responsibility for longline vessels and trawlers fishing in the deep seas and high seas for Patagonian toothfish, tunas and others. He is currently based in South Africa and works for Taiyo A&F Co., Ltd. Member of SIODFA.

Lion Petersen is from the Faroe Islands and started out as a longline fisherman in 1971. He has been a skipper since 1980. His first 12 years as skipper were on deep-sea shrimp trawlers. Since 1993 he has been conducting a deepwater fishery in the high seas for orange roughy and Patagonian toothfish, as well as for horse mackerel off Chile.

Ross Shotton is from New Zealand and has been involved in the fishing industry since childhood. He was a commercial fisherman for three years in the North Atlantic before training as marine biologist at the University of Wales, Bangor. He holds a MSc in operations research (UBS) and a PhD in Oceanography (Dalhousie). He worked as scientist in acoustic stock assessment at the Bedford

Institute of Oceanography and in economic policy for the Department of Fisheries and Oceans, Scotia Fundy. He worked for FAO for 15 years and is now Executive Director of SIODFA.

Mykola (Nikolay) Shufelyev is from the Ukraine and first starting working at sea in 1969. From 1969 to 1973 he worked as an officer on different fishing vessels in the Baltic Sea, North-east and North-west parts of Atlantic Ocean. In 1973 he graduated from Liepay Marine College and was sent to work off Sakhalin Island. From 1973-1977 he worked as Chief Mate fishing in the North-east and North-west of the Pacific and Arctic Oceans. Thereafter he worked as a Chief Mate until 1982 on vessels in New Zealand, the South-east and North-west of the Pacific Ocean and the Antarctic area. For the next six years he worked on scientific-research vessels in the Indian Ocean (from the Aden Gulf to the Antarctic Ocean, and from West Ridge to New Zealand). In 1986 he graduated from Kaliningrad Technical Institute and then worked as a captain on various scientific-research vessels in the Indian Ocean, North-east and North-west Atlantic, Antarctic, and Arctic Oceans until 1998. Until 2007 he was working as a captain on merchant vessels.

Paul Taylor is from New Zealand and has a background in marine electronics. He now works for Sealord Group Ltd., Nelson, New Zealand and has been a fleet manager for the past 18 years, primarily in deepwater fisheries. Member of SIODFA.

Graham Patchell is from New Zealand and is educated as ecologist and behaviourist. He worked as a scientist in the Fisheries Research Division in New Zealand for 11 years. For the past 20 years he has been working with the fishing industry on a variety of topics such as acoustic surveys, habitat mapping impact assessments, and new fishery developments. He has been involved in deep-sea fisheries for both orange roughy and toothfish, and has been a representative on fisheries assessment working groups in Australia, Namibia, New Zealand, and in the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). He has organized and undertaken research programmes in countries and regions such as Argentina, Chile, Australia, Namibia, the Indian Ocean, and in CCAMLR, as well as in New Zealand. He now works for Sealord Fisheries, Nelson, New Zealand and is Chief Scientist for SIODFA.

Bjarti Thompson is from the Faroe Islands. He has been involved in fisheries and fishery research since 1972. He first worked as a fisherman on longliners and then began working for the Marine Institute in the Faroe Islands where he has been employed as a scientist in gear technology for 30 years.

EXECUTIVE SUMMARY

The participants in the meeting were from the deep-sea trawl industry. This document reflects their views and opinions on the FAO International Guidelines.

The deep-sea fishing industry welcomes initiatives to establish good management systems for deep-sea fisheries in the high seas. The participants overwhelmingly agreed that good management is crucial and therefore the FAO Guidelines are important.

The participants were of the opinion that the nature of some deep-sea fisheries can often be described as boom and bust. Given this nature of these fisheries it is important to continuously collect relevant and accurate information on these fisheries, and that this information is used effectively.

The collection of data for effective management of deep-sea fisheries requires that good cooperation is established between managers, fishermen and scientists. It is vital that the industry is (i) trusted to collect data, (ii) allowed to demonstrate their capability to collect such data, (iii) involved in the data's analysis and (v) implements management measures that are generated through this process.

The industry participants agreed on the need to continuously provide fine-scale fisheries-related data, providing that appropriate confidentially rules are in place. They also agreed that observers should be allowed on vessels, but within appropriately defined regimes.

The industry was of the view that commercial vessels can be, and probably must be used for scientific surveys, particularly since many research vessels are not appropriately equipped and usually do not have sufficient experience to fish in deepwater. Additionally, due to the variability in distribution of deepwater species in time and space, the use of government research vessels is prohibitively expensive. This is particularly the case in the deep-sea aimed trawling fisheries, as well as the deep-sea longlining and gillnetting fisheries that use fishing techniques that few research vessels have the capacity or funding required to collect all necessary data.

To establish a system and agreements for the provision of detailed data between skippers, fleet managers, fishery managers and scientists, it is necessary that industry trust that information provided is not misused. It is also essential that stakeholders have long-term secure and exclusive rights in the fisheries. Further, fisheries must be closed to those who do not possess a licence, quota allocation or the necessary operational skills.

To achieve an administration structure that enables data to be collected and stored in a responsible way, it is vital that regional management bodies are established and that they implement data management protocols that guarantee the confidentiality of all data that are provided.

The participants agreed that some deep-water fishing is conducted in sensitive marine ecosystems. Both deepwater benthic and fish communities can be sensitive to exploitation activities such as fishing. The participants were of the opinion that marine habitats are affected by fishing gear and especially bottom trawls and gillnets. However, responsible skippers try to avoid areas of corals, not least because contact with the coral damages their expensive gear and the catch. Often only narrow paths on many high seas seamounts can be trawled, in which case most of the other coral is left undisturbed. The footprint of deep-sea fisheries may be, for the same reason, depending on the area and fishing practice, much smaller than is generally assumed. To get an overview of the actual fished bottom footprint for many areas, it is again important to use the data in the possession of the industry – the only way to get full, accurate information is with this industry data.

One method of minimizing bottom impacts could well be to certify skippers in deepwater aimed-trawling to ensure that the techniques used in these fisheries cause as little damage as possible.

In general participants noted that if industry provides data and research, they must receive something in return – the trade off between responsibilities and rights. Participants overall preferred quotas as an efficient effort control management tool, but recognized that quotas, like all management tools, have weaknesses and require effective enforcement to work. Participants also recognized the need for closed areas, noting that temporal closures (for spawning aggregations, etc.) can be important, particularly if there is little other management in place.

The importance of protective measures such as closed areas that apply to all potentially harmful human activities (e.g. mining, oil/gas extraction, pollution) was also noted, as there would be little benefit from fisheries closures if they were ignored by other industry sectors such as that of deep-sea mining.

Participants discussed the overall importance of regional management regimes for the effective implementation of conservation management measures. They stated that there is an urgent need for new regional fisheries management organizations and arrangements (RFMOs/As) to ratify agreements, and implement effective fisheries management measures, such as limitation of fishing effort. Furthermore, RFMOs/As should be established where there are none.

Overall, there are certain ways to reduce the fisheries impact on the habitats, such as proper training of skippers and use of good electronic navigation systems (net monitors, bathymetric mapping, and echo-sounders).

INDUSTRY PERSPECTIVE ON DEEP-SEA FISHERIES IN THE HIGH SEAS

Informal discussions organized around the topics listed in the agenda were held over the course of the three day workshop. The key questions discussed were:

- what are the views of industry on implementing these guidelines?
- how can the impact of deep-sea trawling on the environment be minimized?
- what are the opportunities and constraints associated with the fishing industry leading/participating in research of deep-sea high seas fisheries?
- what management approaches/measures/arrangements have the highest likelihood of leading to sustainable deep-sea fisheries in the high seas?
- should skippers and crews be required to take specialized training/certification for deep-sea high seas fisheries?
- what type of fishing practices and equipment would contribute towards minimal impact fishing? and
- what are the best means of monitoring the fishery?

General comments

The participants expressed concern that there is a need for good management of not only deep-sea trawl fisheries but also of all deepwater fisheries on the high seas, no matter what gear was used. Further there should be effective management of all fisheries both within and outside of exclusive economic zones (EEZs). It was pointed out that there should be compatible standards for similar fisheries being prosecuted by the same gears in different management areas. Furthermore, participants emphasized the importance of using the best available information for management of fisheries, and not simply relying on *ad hoc* measures.

General issues were recognized as including (a) the need for industry to be more proactively involved in management plans with RFMOs, (b), the lack of entitlements or rights in high-seas fisheries and the consequences for effective management, and (c) the great need for better collaboration between industry and governments.

The International Guidelines on the Management of Deep-sea Fisheries in the High Seas

The participants overwhelmingly agreed that good management is crucial and that therefore the FAO International Guidelines are necessary and important. The participants emphasized the importance of access to accurate and sufficient data, which is necessary for fishing operators to continue to operate sustainably.

It was noted that the Guidelines must be practical and implementable or risk becoming a non-functional political document. The participants, however, expressed concern that scientific activity and advocacy were often not clearly separated in discussions related to the management of deepwater fisheries or in the Guidelines' text, and therefore raised concerns over the objectivity of the document.

Participants were of the view that reference to surveys, research, biogeographic mapping, etc., in the guidelines should reflect the experience and capacity of the industry to undertake this activity. The industry is capable of collecting and do collect this information.

Skippers certification

There was agreement that there is a need to train skippers and crew in deepwater aimed trawling. This could be achieved through onboard training in the presence of well-qualified fishing masters. The participants noted that certification could require in addition, training in:

- identification of deep-sea species;
- completion of catch and bycatch logbook forms; and
- trawl gear bottom-fouling reporting.

Fishing gear impact

The participants noted that all fishing gears can cause physical impacts on the marine environment.

Participants also noted that other fleet sectors should have the opportunity to discuss the impacts of their gears in deep-sea fishing.

The following notes describe the industry commentary with respect to the use of fishing gears in deep water and physical impacts.

Gillnets

The group expressed concern over the use of gillnets in deepwater noting that the European Union and the North East Atlantic Fisheries Commission (NEAFC) had implemented a ban on the use of gillnets in water depths greater than 600 m. It was noted that gillnetter vessels affected by the ban had already moved into the Indian Ocean where they were targeting deepwater sharks and possibly other species.

The key concerns raised by participants included:

- ghost fishing of lost or abandoned nets for many years after loss;
- the ease at which gillnets can become snarled on corals and lost or abandoned;
- lack of reporting of lost gillnets;
- the difficulty of retrieving lost gill nets in deepwater; and
- targeted fishing for deepwater sharks.

It was proposed that best practices for gillnetting in the deep seas should take into account the above concerns and include, *inter alia*:

- whether targeted fishing for deepwater sharks using gill nets should be allowed when there are bycatch regulations in force for this species group for other gears in the same region;
- gillnets should be registered (i.e. mandatory marking of fishing gears), losses reported, and retrieval attempted; and
- that damaged gillnets should be retained onboard and disposed of ashore in an appropriate manner.

BIM IRELAND

Figure 1. Retrieving lost gillnets at Rockall Bank 2004

Longlines

Longlines were considered relatively benign in terms of the potential for physical damage to the benthos. It was noted that longlines would not ghost fish when lost. With respect to bycatch, participants noted that technologies and measures were available to reduce incidental capture of protected species. Participants also noted that seabird bycatch was something that could be reduced through various well-established bycatch mitigation measures. However, it is important to note that some of the targeted deepwater species cannot be harvested by longline.

It was proposed that best practices for longlining in deepwater should take into account the above concerns and include, *inter alia*, in areas where seabird interactions are likely to be encountered, bycatch mitigation measures such as tori poles, weighted lines, baskets should be considered.

Pots in deepwater

A concern related to pot fishing in deepwater was ghost fishing of lost pots. This could be reduced by using appropriate materials that would enable the pots, or a trap panel, to degrade over time or the designs to allow the target species to escape over time, to reduce ghost fishing.

Participants noted that potting also is not an alternative gear for some deepwater fish species.

It was proposed that best practices for pot fishing in deep water should take into account the above concerns and include that, *inter alia*, ghost fishing of pots should be minimized through the use of degradable panels and other escape possibilities to reduce the fishing function of lost gear to zero.

Trawling

Participants noted that there were significant technical and operational differences between mid-water trawls and bottom trawls. These include mesh size, twine diameter, length and rigging of otterboards and use of sweeps. These differences are necessary because of the fundamental difference in the way the fishing gears are set and the behaviour of the targeted fishes.

In the case of bottom trawls there is an absolute necessity for the gear to be in bottom contact for at least some part of the tow, particularly for some species. It was noted by participants that bottom trawls catch around 20 million tonnes, or 20 percent, of the global fish capture production.

Not all fish can be caught effectively, if at all, by gear other than trawls. Examples of species that can only be caught by bottom trawls are: orange roughy (*Hoplostethus atlanticus*) and roundnose grenadier (*Coryphaenoides rupestris*).

In the case of the mid-water trawl in deep-sea fisheries, the gear is typically towed a short distance above the seabed for species such as alfonsino (*Beryx* spp.) or grenadier that reside above pinnacles or seamounts. In a number of fisheries, the mid-water trawl may also be towed on flat ground where the footrope is set on a sufficiently smooth bottom.

Midwater trawls

This type of fishing is a highly specialized form of targeted fishing that can only be used for a few species of fish. It was noted by participants that prior to making any set, a skipper will survey the fishing grounds and the nature of fish aggregations using acoustic methods to determine (i) the amount of fish in the school and (ii) whether the bathymetry and nature of the fishing ground allow the gear to be safely set without risk of loss or damage. The high price of a mid-water trawl (approx. USD100 000) and their fragility means that captains will be risk averse in these situations.

In midwater trawl fisheries, an extra measure of protection noted by skippers at the meeting was the use of “weak links” in the fishing gear to reduce the possibility of the net becoming fast on sea floor structures. This weak link is inserted into the footrope (that part of the gear closest to the seabed) in a way that if an obstruction is encountered, the footrope will part at the weak link. When this occurs, the

catching function of the gear is reduced to zero and little or no further catch is obtained. This is one reason why skippers take extreme care when fishing their nets on or near the seabed.

MARK HANSEN, OCEAN EXPLORER

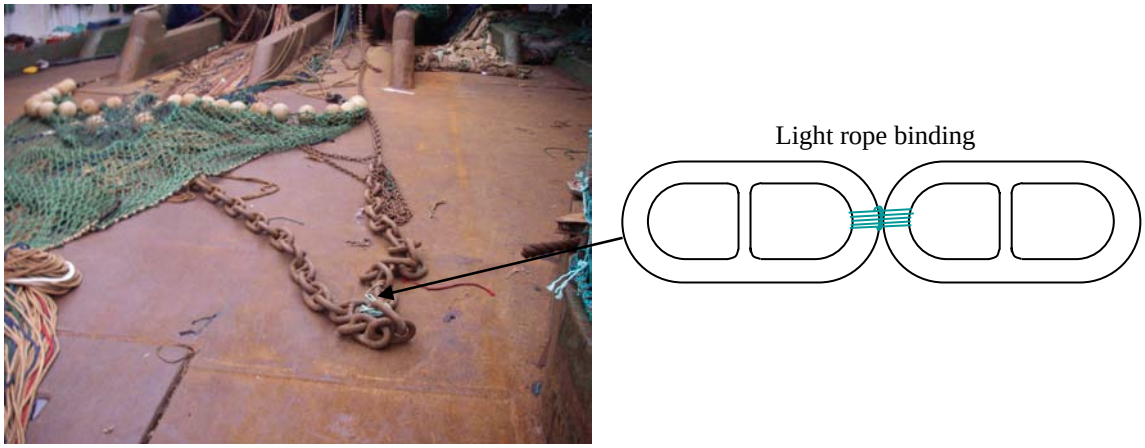

Figure 2. Weak link

Throughout the fishing operation the net opening and position of the gear in relation to the seabed is continuously monitored using acoustic trawl monitoring equipment.

Participants noted that coral is very rarely caught in mid-water trawls and the SIODFA noted the rarity of these events (SIODFA, 2007). In the Northern Hemisphere fisheries examples were cited of no corals being encountered at all when using mid-water trawls close to the seabed.

Minimizing the physical impacts of midwater trawls – industry felt that best practices include:

1. ***Equipping the net with net monitoring equipment that records and signals to the vessel in real time the net opening and proximity of the net to the seabed to enable the skipper to maneuver the trawl to prevent the gear encountering the seabed.***
2. ***Appropriate training and experience in maneuvering of the net in the water column to reduce the possibility of the gear encountering the seabed.***
3. ***In some cases installing weak links in the footrope to reduce damage resulting from unintended bottom contact.***
4. ***Bathymetric mapping systems and high-power echosounders used in conjunction with net monitors and safe fishing practices to contribute to minimizing the possibility of the gear making physical contact with the seabed.***
5. ***The fishing gear should be matched to the power of the vessel to enable the trawl to be quickly maneuvered in the water column.***

Bottom trawls

Participants were particularly concerned that the perception of bottom trawling is that it is "a destructive fishing gear". The participants noted that this was an unjustified simplification of a complex issue. For example, inexperienced skippers using poorly designed trawls without net monitoring and seabed mapping systems have a high probability of causing damage to the fishing grounds. On the other hand, experienced skippers operating vessels equipped with auto-winch controls, acoustic mapping systems, net monitors and properly designed nets can identify sites that can be trawled with minimal impact. As with any fishing gear, there are good practices and bad practices in existence. Clearly the training and experience of the skipper and crew, the net design and rigging all contribute towards fishing gear performance. The participants felt that this distinction is important together with the need to identify and eliminate bad practices and promote good practices.

Two types of bottom trawling in particular were discussed by participants namely, the conventional bottom trawling technique used without net monitoring equipment for long duration towing on

relatively smooth flat ground and the more recently developed “aimed trawling” technique used for setting the fishing gear in a precise location and at a precise depth on the top or slope of seamounts, banks and ridges.

The participants noted that precision aimed-trawling is possible when fishing vessels are equipped with the modern global positioning systems, appropriate mapping software and net monitoring systems and control systems for the vessel’s fishing equipment. Such systems allow vessels to make relatively precise repeat tows over the same area of sea floor.

It was also noted that repeat towing and the requirement for bottom trawls to be in close proximity or touching the seabed would result in bottom impacts. But, the participants also noted that the high cost of the fishing gear and monitoring equipment was just one of the reasons why selection of trawl grounds was critical and that extreme care was taken to prevent net loss. Further, skippers increasingly recognized the need to protect bottom fauna and benthic biodiversity for their own sake.

The following was also noted:

- Not all deep-sea fishing grounds have the same characteristics. While many areas are flat, others consist of small hills and knolls while others are pinnacles and seamounts. Each fishing ground type requires a different approach by the skipper if it is to be exploited.
- Midwater trawls cannot be used to catch all types of deepwater fish species and bottom contacting fishing gears are required to harvest many deep-sea species.
- In aimed trawling on seamounts and pinnacles, the trawls, once deployed, are mostly off bottom and the nets are in contact with the bottom for typically less than 10 minutes in a two-hour set.
- Not all seamounts are the same. Some may be towed from all directions while most others have features that restrict trawling to one exclusive direction and to a very limited area.
- Repeat tows on a trawl path will remove emergent benthos if it exists.
- Mapping systems enable the skipper to synthesize an accurate three-dimensional map of the area and to identify areas where trawling can be carried out without damaging the nets.
- Net monitoring systems enable the skipper to set the fishing gear down relatively precisely in a pre-determined location.
- Depending upon the topography of seamounts and ridges, only a few areas of each feature may be “trawlable”.

Minimizing the physical impacts of bottom trawls – industry felt that best practices include:

1. ***Equipping the net with net monitoring equipment that records and signals to the vessel in real time the net opening and proximity of the net to the seabed so as to reduce the possibility of the gear encountering the seabed.***
2. ***Bathymetric mapping systems and high resolution echosounders used in conjunction with net monitors and safe fishing practices to minimize the likelihood of making an adverse impact on the seabed.***
3. ***Mapping the ecological footprint of trawls.***
4. ***Aimed bottom trawling to minimize physical impacts.***

Data and research

Issues that were identified as important were (i) the collection of historical catch and effort data, (ii) the initiatives and collaboration with industry in data collection, (iii) research, (iv) training programmes for skippers and/or crew for proper collection of biological data and (v) secure data

sharing mechanisms that had the confidence of those providing data. It was recommended that these issues be highlighted and brought into the main text of the FAO International Guidelines.

Above all, participants emphasized the importance of effective cooperation between industry, resource managers and fishery administrators. This cooperation was seen as essential for effective resource management. In addition, it was noted that industry currently employs scientists who can, or do, undertake stock assessment and research related work.

Sufficient, accurate data from deep-sea fisheries is vital for assessing the status of the fishery and the exploited fish stocks. In addition, timely reporting and assessment of data is important. Participants also noted that general vessel monitoring systems (VMS) data (one data point per 60 minutes) was insufficient to usefully monitor deep-sea fishing operations, which might be as short as 10 minutes.

Participants stressed the importance of historical catch and effort data and results from past, and often forgotten, scientific and commercial fishing expeditions. It was noted that much of this data have been collected but are not available (e.g. data that remain unpublished, data collected in other languages other than English that has not been translated).These data should be collected, made available and analysed with emphasis on the availability of catch and effort data to fisheries research. Lack of funds for translation, analysis and publication, as well as lack of interagency cooperation have added to this problem.

In the view of the participants, fishing vessels should collect and provide fine-scale operations data to a secure source. Failure to observe the conditions of a licence should result in cancellation of the licence. The process should be fully inclusive (i.e. all vessels participating in a fishery) and transparent subject to appropriate safeguard of intellectual property (IP). In addition, licensing should be subject to resource availability. It was noted that if fishers refuse to give data, it may be because of lack of confidence in the governance of the fishery.

Participants noted that there has not been enough emphasis on the importance on data collected by the industry, industry experience in operational and industry-executed research. In many cases, these data cannot be collected by anyone else (e.g. in new/exploratory fisheries and in the high seas in general). Crews are, and can be trained, to collect data and in many cases do it exceedingly well. It was agreed that deep-sea fisheries could develop quickly and it should be obligatory that industry is involved in data collection and assessment from the start, as well as be given the opportunity to participate in the development of management plans.

In addition, concern was also expressed that the capability of dedicated research vessels for investigation of deepwater fisheries is often inadequate. Further, scientific fishery research is not always relevant or adequate, particularly for deep-sea fisheries. Experience has shown that ‘scientific’ research in these fisheries often has uncertain results, which emphasizes the great need for cooperation between scientists and industry in the design and implementation of surveys.

Observers

Biological observers are useful for data collection on commercial vessels, but this kind of work can also be carried out by trained members of crew. Third party observers can also be useful to audit information collected by the crew and the performance of data collectors.

However, a distinction should be made between scientific observers and those on board to ensure compliance with regulations. Observers for compliance purposes should be the responsibility of the flag State and/or the RFMO/A.

All fishing vessels should freely allow observers. The observer program should be within an appropriate RFMO/A framework. Failures in governance hinder this process.

Data security

Information on fishing grounds and positions where there are the best possibilities for catching fish is extremely valuable to fishermen. It is therefore important to handle this information in a sensitive manner to prevent other vessels from fishing on the same grounds. This makes it important that information given by the industry to scientists and managers is treated in a sensitive manner. Clearly then, data security in high seas fisheries, especially for fine-scale data, is critical to the commercial viability of the parties involved in the fishery. Concerns were raised that data security and intellectual property (IP) were not sufficiently addressed in the guidelines.

Data that are made available through RFMO/A requirements should only be available for review under the RFMO/A's rules on data confidentiality. Simply being an interested party should not provide an entitlement to access to data. In deep-sea fisheries on the high seas where fine-scale data have been collected, sharing of these data does not present a problem provided that there are appropriate security provisions in place to prevent unauthorized third party access to this information.

RFMOs data handling protocols should respect the data security and confidentiality requirements of the fishery as the responsible data repository.

Management tools

The participants discussed Annex 2 and the paragraphs in the general management tools section (paragraph 72) of the FAO International Guidelines. In general, participants noted that if industry provides data and undertakes research, they should receive something in return, which could be in the form of entitlements. Participants overall preferred quotas as an efficient effort control management tool, but recognized that quotas, like all management tools, have weaknesses and require good enforcement for efficacy and are only one type of management tool. In addition, the species composition of the fishery should be reflected in the quota structure.

Participants also recognized the need for closed areas, noting that temporal closures (for spawning aggregations, etc.) can be important, particularly where there is little other management in place. The importance of protective measures such as closed areas that apply to all potentially harmful human activities (e.g. mining, oil/gas extraction, pollution) was also discussed.

Participants discussed the overall importance of management regime structures for the effective implementation of management measures. They stated that there is an urgent need for new RFMOs to ratify their agreements, as is the case in the Southern Indian Ocean, and focus on good and effective fisheries management that provides for sustainable fisheries management. Furthermore, RFMOs should be established where there are none.

Participants noted the importance and strength of the following types of effort and catch controls:

Effort controls:

- licences/limited entry
- no subsidies
- closed areas (rotating closures)
- tradable/transferable entitlements
- strengthened RFMOs
- RFMOs that have the authority to license vessels

Catch controls:

- weekly reports to flag States or RFMOs
- observer coverage
- suitable logbooks
- unloading and transshipments verification
- catch documentation schemes

- validated conversion factor for processed product
- landings of fish by species names, product form and quantities

Discards/offal

The issue of fish waste and offal discharged by fishing vessels processing was discussed and the following points were made:

- Offal and waste discharge, where possible, should take place away from the fishing grounds to prevent the accumulation of offal and waste in any one area.
- The industry realizes that there are problems of high discard rates in some deep-sea fisheries, namely:
  - the deepwater bottom trawls on flat grounds (not seamounts) in the NE Atlantic targeting black scabbard and roundnose grenadier (40–70 percent discards), and
  - deepwater longlining for deepwater sharks (30–40 percent discards)
  - Aimed trawling for aggregating species such as orange roughy, alfonsino, and cardinal fish has low discard rates (0–5 percent discards in Indian Ocean and the NE Atlantic).

The participants welcomed initiatives to increase utilization of discarded species.

MESSAGES TO POLICY-MAKERS AND THE PUBLIC

All participants in the meeting were asked to express their opinion on the three questions noted below. Here is a summary of the main points that were stressed by the trawl industry representatives.

What is the most important point you would like to present to policy-makers regarding your deep-sea fishery?

- The fishing industry, and other users of the high seas, have a significant contribution to make to the management of deep-sea fisheries. This needs to be recognized and greater efforts made for effective collaboration.
- Many who are in the industry are responsible long-term operators who are making informed, not ad hoc, decisions about where to fish and how to operate in the fishery.
- It is absolutely necessary to regulate fisheries, but the management structures need to be operationally practical. For example, there needs to be integration or coherency between different management regimes in different areas and observer coverage should be based upon issues in the particular fishing area, i.e. if fishing is clean – without significant discards or bycatch and a VMS signal is being sent back on a regular basis, then 100 percent observer coverage is unnecessary.
- Fish is an important food source for the world. There should be no disparity in terms of the way that resources on the land and sea are managed.
- Operators are trying to be proactive within the industry and are setting up management structures where they are not currently in place, taking an active role on all the issues, many of which have been discussed at this workshop.
- If the fisheries are abused now, then there will be no jobs (or profits) in the future. Responsible, sustainable fishing will result in jobs in the sector and sustainable supply of food in the future.
- It is vital to ensure resource sustainability and therefore accurate rates of sustainable harvest.
- Management systems must be implemented immediately where needed, or we risk loosing all the resources in the near future.
- There is a need for an overall management institution that regulates all aspects of activities on the high seas; not only for fisheries including gear and ship specifications, licensing, discards, but other activities as well such as controlling pollution, etc.

- All human endeavours affect the environment. In the view of the participants, deep-sea fisheries have been singled out and demonized – while this may be justified in some cases, in other cases this is not so – alas there often appears to be no interest in determining the tactual situation. An unbiased examination into the activities of the responsible operators would yield different conclusions.

What do you feel is the biggest problem to resolve regarding your deep-sea fisheries?

- The media seems unfairly biased towards environmental groups and industry opinion is not seen as transparent and is therefore not included in the dialogue. There is a need for a balanced approach.
- Illegal fishing. When pirate operators illegally fish in the sea it affects everyone – that which is illegally taken from the sea affects all of society and results in negative affects on other fishers, stock assessments, and general management.
- In many cases, such “bad actors” (illegal fishers) give all fishers a bad reputation.
- There is little understanding of how fisheries are being undertaken in the deep seas and what is actually taking place. It will be important in the future for the industry to ensure that it is more transparent and to make information available. It is also important that those involved in “good practices” provide the public, etc., with information so as not to be perceived as “bad actors”.
- Distribution of misinformation discredits the industry. Lack of accurate information about the status of stocks is another serious problem.
- Misguidance, lack of trust and poor understanding between policy makers, the public and the industry all need to be addressed and resolved.
- There is a need to weed out rogue operators and to keep fisheries at sustainable levels.
- The lengthy period of time it takes to develop a management regime and the often unbalanced public perception of the industry contribute to the general problems in the sector.
- There is a lack of rights in high-seas fisheries: this leads to a lesser sense of responsibility for husbandry of the resources.

How do you see the reputation of deep-sea fishing on the high seas being improved?

- There needs to be better contact between the fishing industry and the media. Fishers, most of all, are concerned with the destruction of fishing grounds and have the least incentive to destroy these areas. They would like these resources to be maintained and to be available for future generations.
- There are, of course, bad practices or bad operators on the seas that operate with short-term profit motives. It is in the interest of 'good actors' to make these issues public as it is important to deal with the problems and not hide them.
- Industry needs to be more proactive in showing the media and the public what steps are currently being taken to manage the fishery and have a reduced impact. Those who are doing their best to be responsible need to do a better job in communicating with the public, and more specifically, with consumers. In this regard, certification of fisheries may be an important step.
- It is crucial that industry “get its own houses in order” such as is being done by SIODFA where the fishers themselves form part of the process. This meeting is a good step. Another important initiative is the Manuka Vision (2005) that has largely been ignored.

ABSTRACTS OF PRESENTATIONS

Faroese quest for orange roughy

Bjarti Thomsen, Faroese Fisheries Laboratory

In 1991 orange roughy (*Hoplostethus atlanticus*) from the North East Atlantic entered the fresh fish market in France as a new commercial species. At that time the Faroese fleet was in crises due to dwindling fish stocks in the Faroese area and therefore Faroese explorative fishery for orange roughy was initiated in 1992. Based on private and governmental funding considerable resources were allocated to these explorations up to 1998. Orange roughy was well known from New Zealand and information on temperature and depth where this species could be found and the special aimed-trawling technique was copied from this area. Orange roughy was found on deep-sea banks and pinnacles in the western and southern area in Faroese waters, on the Hatton Bank area and on the Mid-Atlantic Ridge between the EEZs of Iceland and the Azores. The total length of orange roughy ranged between 15 and 75 cm and few specimens were below 50 cm. Orange roughy in this fishery seems to mature at 50 cm length and 25 years of age. The largest catches have been taken in the spawning season from late January to early March. Successful commercial fishing relies on trawling several areas each fishing trip as orange roughy seems to be scared away after a few tows on the same fishing ground. Annual catches peeked in 1996 at around 1 300 tonnes, but have been much lower later years. Based on the results from the Faroese explorative fishing Faroese vessels have been the only vessels that have had success in fishing these resources in the international waters of the North Atlantic. In the exploratory fishery for orange roughy, large catches of cardinalfish (*Epigonus telescopus)*, roundnose grenadier (*Coryphaenoides rupestris)* and black scabbard fish (*Aphanopus carbo)*. Bycatch species have included sharks, Baird's smooth-head (*Alepocephalus bairdii),* alfonsino (*Beryx* spp.*),* wreckfish (*Polyprion americanus*) and a few other species. An experimental deep-sea long-line fishery for wreckfish did not discover commercial quantities of this species.

Fishing in North Atlantic international waters is difficult because of extreme weather conditions and difficult bottom topography. To protect sensitive habitats, NEAFC, the regional managing body, has initiated regulations and some pinnacles are closed for bottom fishing activities.

Aimed trawling in the Indian Ocean

Graham Patchell, SIODFA

The presentation focused on high seas deep-sea trawling in the Indian Ocean and the two types of trawl fisheries – bottom trawling and midwater trawling. It was noted that bottom trawling is a method used worldwide to harvest species that live close to or on the bottom, and the method harvests about 25–30 million tonnes of seafood each year. The presentation described the difference between normal bottom trawling and the highly-targeted trawling used in deep seas, and the technologies used by the vessels to minimize bottom habitat impact.

The presentation discussed the approach of the Southern Indian Ocean Deepsea Fishers Association (SIODFA) in developing sustainable fisheries, the major stock assessment results from acoustic surveys undertaken by all vessels, and the data collection programmes on habitat impact. These include verification of trawl footprint, VMS reporting, and recording of coral and shark bycatch.

The minimal adverse impact on most types of habitat encountered in the Indian Ocean was described and supported by direct evidence from heavily fished features of a smaller structure in New Zealand waters.

The programme introduced by SIODFA to maintain high-seas biodiversity through introduction of Benthic Protected Areas was discussed, as well as the proposed FAO guidelines for deep-sea fishers. The report notes that the protocols proposed are similar to those adopted by SIODFA, with identification of vulnerable marine ecosystems and evaluation of the risk of any significant adverse impacts. It is recommended that this approach should be adopted by all RFMOs, rather than a

precautionary approach through moratoria or substantially reducing the historical footprint without evaluating available biodiversity information.

Reducing bottom impact in trawl fisheries
Asbjørn Aasen, Institute of Marine Research
Fishing activity is coming under increasing political pressure due to its physical habitat impact, therefore a number of techniques have been developed or are under development to help mitigate the general environmental impact of commercial fishing practice. The presentation focused on what the Institute of Marine Research (IMR) in Norway is working on in terms of bottom impact reduction in trawl fisheries, listed below.

- Development of a pelagic trawl for gadoids (cod , saithe and haddock).
- The DEGREE-project which is based cooperation between eight European countries. The main objectives are to develop new fishing techniques that have a lower impact on benthic habitats and to quantify the potential reduction of the physical impact as well as the negative effects on benthic communities. We have together with the Faroese Fisheries Laboratory constructed a new ground gear made of vertical plates and bobbins that are always rolling in towing direction of the trawl, the weight is much lower than the traditional rockhopper gear and the catch experiments indicate that the catching efficiency is maintained.
- VMS data was introduced in many countries for surveillance and enforcement purposes, but for scientists it is also valuable fleet data which can open up a number of new approaches in fishing fleet dynamics.

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ANNEX I

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ANNEX II

Agenda and timetable

Date	Time	Activity
Day 1	9:00-–9:15	Welcome and opening remarks – FAO
	9:15–9:45	Introduction of Facilitator and objectives of the workshop [FAO]
	BREAK	
	10:00–11:00	The rationale for management of deep-sea fisheries on the high seas and status of management guidelines [FAO]
	11:00–12:00	Moderated discussion: “What are the views of industry on implementing these guidelines?”
	12:00–13:00	LUNCH
	13:00–14:00	Aimed trawling in Atlantic Ocean deep-seas fisheries – A case study by Bjarti Thomsen – [Faroese Fisheries Laboratory (FFL)]
	14:00–15:00	Aimed trawling in Indian Ocean deep-seas fisheries – A case study by Graham Patchell [Sealord, New Zealand]
	15:00–15:30	REFRESHMENT BREAK
	15:30–17:00	Moderated discussion: “How can the impact of deep-sea trawling on the environment be minimized?”
Day 2	8:30–10:30	Moderated discussion: “How can the impact of deep-sea trawling on the environment be minimized?”
	10:30–10:45	REFRESHMENT BREAK
	10:45–12:00	Research needs for high seas deep-seas fishing [FAO] Moderated discussion: “What are the opportunities and constraints associated with the fishing industry leading/participating in research of deep-sea high seas fisheries?”
	12:00–13:00	LUNCH
	13:00–15:00	Moderated discussion: “What are the opportunities and constraints associated with the fishing industry leading/participating in research of deep-sea high seas fisheries?”
	14:00–15:00	Capacity in deep-sea high seas fisheries [FAO] Moderated discussion: “What management approaches/ measures/arrangements have the highest likelihood of leading to sustainable deep-sea fisheries in the high seas?”
	15:00–15:30	REFRESHMENT BREAK
	15:30–17:00	Training and certification for deep-seas high seas fisheries [FAO] Moderated discussion: “Should skippers and crews be required to take specialized training / certification for deep-sea high seas fisheries?”
Day 3	8:30–12:00	Fishing gear and technology [FAO] Moderated discussion: “What type of fishing practices and equipment would contribute towards minimal impact fishing?”
	12:00–13:00	LUNCH
	13:00–15:00	Monitoring of operations [FAO] Moderated discussion: “What are the best means of monitoring the
	15:00–17:00	Wrap up

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