

Deep-sea Fisheries Management: Challenges and Opportunities

Report of a TNC/IUCN Workshop | 18–20 January 2011 | Arlington, Virginia



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*Photo Credit: Life on the Edge 2004 Expedition.
NOAA Office of Ocean Exploration.*

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Photo Credit: NOAA Okeanos Explorer Program, INDEX-SATAL 2010.

1 | INTRODUCTION AND SUMMARY

The Nature Conservancy and the International Union for Conservation of Nature jointly organized and hosted a workshop in January 2011 to examine the management of deep-sea fisheries and to consider ways to improve such management. Experts were invited to provide information and to make suggestions to this end. The workshop was held with the agreement that all participants would be free to use the information discussed, but that neither the identity nor the affiliation of the speaker(s) would be revealed. This was done to allow for a free exchange of views.

The purpose of the workshop was to consider the management of deep-sea fisheries in the world's oceans. While most deep-sea fisheries are found beyond the continental shelf, and thus in the high seas, not all are. Much of the discussion was guided by relevant provisions of UN General Assembly resolutions 61/105 and 64/72 and the FAO "International Guidelines for the Management of Deep-sea Fisheries in

the High Seas", and thus the focus was on deep-sea fisheries in areas beyond national jurisdiction. Deep-sea fisheries may be found also within a coastal state's Exclusive Economic Zone where the continental slope drops off sharply near land. It was noted early on that paragraph 10 of the Guidelines provide that "Coastal States may apply these Guidelines within their national jurisdiction, where appropriate", thus the discussion and most outcomes are also of relevance for areas within national jurisdiction.

As participants came from a variety of backgrounds (scientific, policy, management, industry) and held a variety of views and because the purpose of the workshop was to examine and consider ways to improve management of deep-sea stocks, consensus on solutions was not the goal of the workshop. The report reflects informed discussion of the participants who have expertise with various aspects of deep-sea fisheries management. A number of

The purpose of the workshop was to examine and consider ways to improve the management of deep sea fisheries.



Deep sea bottom trawler. Photo Credit: NIWA.

The deep ocean comprises approximately 90% of the Earth's biosphere, with a high diversity of species.



A diverse assemblage of corals and sponges on a small seamount off the east coast of New Zealand. Photo Credit: NIWA.

key ideas were expressed in discussion including the following:

- The deep ocean comprises approximately 90% of the Earth's biosphere, with a high diversity of species. The average depth of the deep ocean is 3800 m; few data are available for areas below 1000 m. Fishing now takes place to a depth of 2000 m, thus resources from an ecosystem about which little is known are being exploited.
- The UN Convention on the Law of the Sea and the UN Fish Stocks Agreement provide a framework for the regulation of deep-sea fisheries.
- All States have rights and obligations under the Law of the Sea; there are States that are failing in their obligation to cooperate in the management of high seas fisheries.
- Though the relevant parts of the UN General Assembly resolutions apply only to deep-sea fisheries in the high seas (beyond national jurisdiction), the FAO International Guidelines provide that Coastal States may apply the Guidelines within their jurisdiction, as appropriate. The Guidelines are appropriate and should be applied to bottom fishing also within EEZs.
- UN General Assembly resolution 61/105 provided for four key management measures: the conduct of impact assessments, the closure of areas where vulnerable marine ecosystems are known or likely to occur, the requirement to move out of an area if there is an accidental or incidental encounter with a vulnerable marine ecosystem, and the need to ensure sustainable management of deep-sea fish stocks.
- UN General Assembly resolution 64/72 *inter alia* reiterated the need to implement the relevant provisions of resolution 61/105 and welcomed the adoption through the FAO of the International Guidelines. The resolution called for not allowing vessels to engage in bottom fishing unless assessments were first conducted. The resolution also called for the identification of locations where vulnerable marine ecosystems are known or likely to occur and the adoption of conservation and management measures to prevent significant adverse impacts on such ecosystems or to close them to bottom fishing. Appropriate protocols with respect of an encounter with a vulnerable marine ecosystem, including with respect to threshold levels and indicator species are to be adopted to prevent significant adverse impacts on vulnerable marine ecosystems. Conservation and management measures, including monitoring, control and surveillance measures are to be adopted to ensure the long-term sustainability and rebuilding where necessary of stocks. A precautionary approach should ensure that conservation and management measures are sufficient to ensure the long-term sustainability of stocks even where scientific information is uncertain, unreliable or inadequate.
- UN General Assembly resolution 64/72 *inter alia* also called on RFMOs and States to improve scientific research and data collection and sharing and to enhance efforts to cooperate to collect and exchange scientific and technical data and information related to the implementation of measures to manage deep sea fisheries in areas beyond national jurisdiction and to protect vulnerable marine ecosystems.
- There is a need for a consistency in how to implement the VME criteria in the FAO Guidelines, including the correct level or trigger to determine a VME. Though iconic species are not the same across regions, the criteria should be applied in the same way. There has been emphasis on identifying high densities of corals and sponges in determining VMEs, but this does not take into consideration low densities or other species that may constitute VMEs. Efforts should be made to integrate such data in VMEs criteria.
- With the exception of the Southern Ocean and the Northwest Pacific, in most areas impact assessments have not been completed. Many RFMOs are trying to implement the

FAO Guidelines but have not as yet identified where VMEs are or are likely to be found.

- Assessments should be open to review by relevant science working groups and by other States. Independent reviews of assessments should be welcomed
- While VMEs are to be identified through an FAO-approved process and EBSAs through a CBD-approved process, the criteria for identification of VMEs and EBSAs shared similarities and information required to identify VMEs and EBSAs was often similar or the same. However, VMEs and EBSAs themselves were not necessarily the same or co-terminous.
- The UN General Assembly resolutions call on States to not authorize bottom activities until measures are in place to avoid significant adverse impacts, but this remains largely unimplemented.
- Encounter protocols and move-on rules are often the only management measures in place to protect vulnerable marine ecosystems, but are of limited value and do not substitute for an impact assessment.
- Protection of VMEs could largely be achieved if operators followed proper assessment procedures.
- Most areas remain open to bottom fishing. Where no assessment has been done, fishing should not be allowed.
- Much work to date has focused on the protection of vulnerable marine ecosystems, but consideration is needed of the long-term sustainability of deep-sea fish stocks.
- Full formal stock assessments should show biomass and yield. However, in areas beyond national jurisdiction there are rarely sufficient data available for this, and simpler methods may be necessary. A low-end method of assessment with good data may be better than high end method with poor data. If it is not possible to assess a target species, then that species should not be exploited.
- Monitoring was different from assessment (although is generally part of a stock assessment process) but is important because it



Paragorgia coral, Welker's Seamount, Gulf of Alaska.
Photo Credit: Gulf of Alaska 2004. NOAA Office of Ocean Exploration.

can indicate if target or non-target stocks are being too heavily exploited, even if there is not a stock assessment.

- There is a need to bring together different communities, especially from the conservation and the fisheries sides, including fisheries and conservation scientists, the FAO and CBD secretariats, and within national governments from environment, fisheries, trade and other ministries.
- Marine Protected Areas are a biodiversity conservation concept and not a fisheries management concept. MPAs can be good for fisheries, but the term may not be a helpful way to engage the fisheries sector in many countries.
- Marine spatial planning on the high seas can help to avoid or minimize sectoral conflicts, for example between fishing and mining interests, which may occur more frequently in the future.
- Examination of exploitation rights in the ocean should be undertaken because rights-based management could be a way to avoid certain conflicts.

The UN General Assembly resolutions call on States to not authorize bottom activities until measures are in place to avoid significant adverse impacts, but this remains largely unimplemented.



Photo Credit: NOAA Photo Library.

- Fisheries affect the environment, but provide necessary animal protein and thus help to ensure food security. Alternatives also have impacts. Any fishery can be sustainable if sufficiently well managed.
- Data are necessary to ensure implementation of the UN General Assembly resolutions and the collection and sharing of data are implied in the duty to cooperate as expressed in the UN Convention on the Law of the Sea. There should be an assumption against fishing in areas where data are not collected or shared. Assessments should be publicly available.
- Flag States are to submit to the FAO a list of vessels flying their flag authorized to conduct bottom fisheries in areas beyond national jurisdiction. To date not all have done so.
- Industry may prefer data confidentiality, but there is a need for transparency. It was noted that data are necessary to inform good management decisions.
- There is a need for a public repository or database about the location of VMEs and of EBSAs. FAO is to establish a central repository for the VME database. The CBD, in cooperation with several organizations, is to establish a repository for EBSAs.
- The Global Ocean Biodiversity Initiative, a science-based advisory group, has as its purpose the identification of EBSAs.
- The Regular Process of Global Reporting and Assessment of the Marine Environment, including Socio-economic Aspects, a process underway under the UN General Assembly, could assist in an effort to assimilate information from a variety of sources.
- The FAO is charged with developing a Global Register of Fishing Vessels.
- The credibility of the database owner is important if the data were to be used by RFMOs. Fisheries interests may not automatically accept data and information from those with a conservation interest.
- Impact assessment as provided for in the FAO Guidelines is essentially part of a risk management process. Risk management requires examination of uncertainty and evaluation of risk. Scientific and technical experts should quantify risk, leaving decisions on the management of that risk to policymakers.
- Risk assessment and risk management should be linked. Society is much more risk intolerant to misses than to false alarms. False alarms can upset fishers and can be unhelpful. Social and economic dimensions must be included in a risk assessment dialogue.
- Capacity building is often neglected. UN General Assembly resolutions encourage the enhancement of the ability of developing states to develop their fisheries. Capacity building programs should include building capacity to conduct prior assessments to promote developing country participation in deep-sea fisheries. Capacity building has in the past been hindered by a lack of transparency.
- States do not seem to want to negotiate new rules, but may be willing to improve implementation of existing ones, including as found in the FAO International Guidelines.
- The UN General Assembly may continue to exercise a review function on a regular basis on the implementation of assessment procedures.

2 | OPENING REMARKS

The meeting was opened with welcoming remarks on behalf of TNC and IUCN, including that the organizers did not want to influence the meeting with any specific outcomes. Rather, it was hoped that the discussion would be open and lead to ideas and recommendations on how to improve management of deep sea fisheries. It was noted that over the last decade, a lot had been done to address deep-sea fisheries issues and to promote sustainable management in this area; international agreements had been adopted, management bodies had been established, and management programs had been initiated. Several States have developed research efforts to identify and protect VMEs both in their

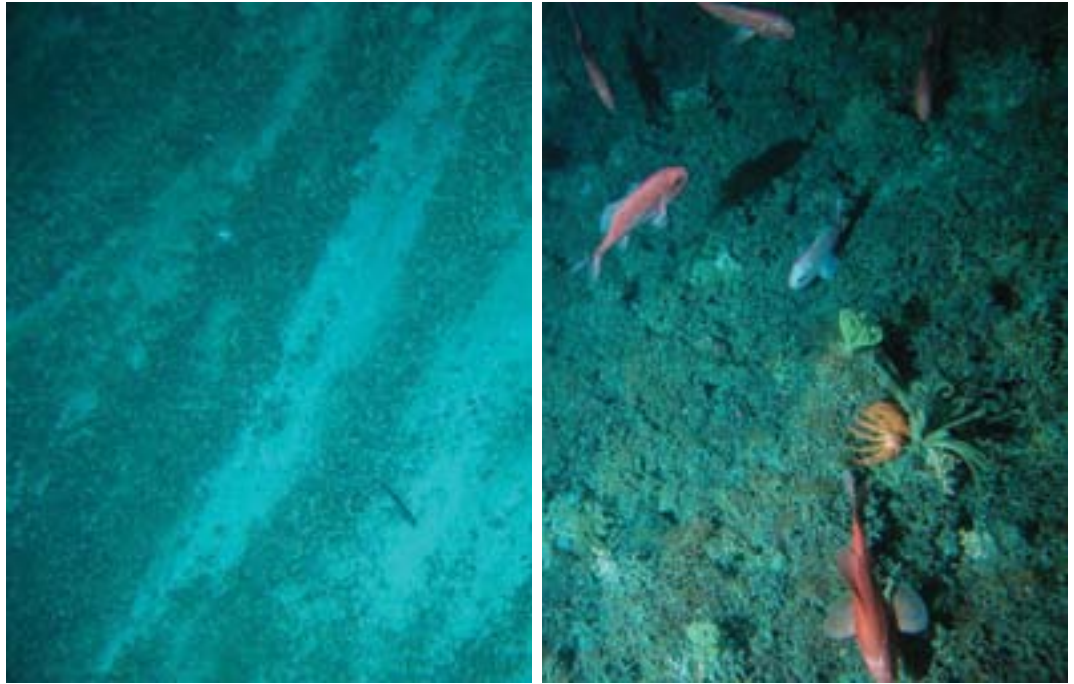
EEZs and in the high seas. Nevertheless, many gaps remained and there were huge challenges in implementing agreements and regulations. The link between national and international waters was noted, that is what happens in one area affects the other. It was hoped that the outcome would be ambitious but pragmatic. The organizers hoped to make available the outcomes of the workshop at a two-day workshop to discuss implementation of paragraphs 80 and 83 to 87 of resolution 61/105 and paragraphs 113 to 117 and 119 to 127 of resolution 64/72 on the impacts of bottom fishing on vulnerable marine ecosystems and the long-term sustainability of deep sea fish stocks, to be held in September 2011 at United Nations Headquarters.

The last decade has seen progress in promoting sustainable management of deep sea fisheries; nevertheless, gaps and challenges in implementing regulations remain.



Deep sea corals and fish in Washington's Olympic Coast. *Photo Credit: Ed Bowlby, NOAA/Olympic Coast NMS; NOAA/OAR/Office of Ocean Exploration.*

UNGA resolutions 61/105 and 64/72 addressed both, the impacts of bottom fishing on vulnerable marine ecosystems and the long-term sustainability of deep sea fish stocks.



A section of heavily trawled (left) and untrawled (right) seafloor on “Morgue seamount,” New Zealand.
Photo Credit: NIWA.

IUCN provided an overview of governance arrangements for deep-sea fisheries. It was noted that deep-sea fisheries discussions have tended to focus on bottom—contact fishing—that is the capture of fish with gear that is likely to contact the seabed, though the issue is broader as the removal of large quantities of biomass from the water column above may also have an effect on deep sea communities and ecosystems. The importance of the United Nations Convention on the Law of the Sea was noted, together with the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 Relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the United Nations Fish Stocks Agreement). Though all States have rights and obligations under the Law of the Sea, there has been a tendency to focus on the rights and not the obligations. States through the United Nations General Assembly in recent years have adopted annually two omnibus resolutions, one on Sustainable Fisheries and the other on Oceans and Law of

the Sea. The Sustainable Fisheries resolutions, most notably 61/105 adopted on 8 December 2006 and 64/72 adopted on 4 December 2009 have included language with respect of bottom fishing. Language adopted in paragraphs 80 and 83 to 87 of resolution 61/105 and paragraphs 113 to 117 and 119 to 127 of resolution 64/72 on the impacts of bottom fishing on vulnerable marine ecosystems and the long-term sustainability of deep sea fish stocks remained at the center of discussion at the workshop. Following on the resolution 61/105 to protect vulnerable marine ecosystems, the FAO adopted International Guidelines for the Management of Deep-sea Fisheries in the High Seas, and these formed also a focus of discussion. It was noted that the UN General Assembly resolution 61/105 followed on a decision adopted at the Seventh Conference of the Parties to the CBD in 2004 which inter alia called on the UN General Assembly to take urgent measures to eliminate and avoid destructive practices that affected marine biodiversity I areas beyond national jurisdiction.

3 | PRESENTATIONS AND DISCUSSION

3.1 Review of Implementation of the relevant paragraphs of UN General Assembly Resolution 61/105 and 64/72 and of the FAO Guidelines

In a presentation reviewing implementation of the relevant paragraphs of UN General Assembly resolutions 61/105 and 64/72, it was noted that resolution 61/105 addressed the need to prevent significant adverse impacts to vulnerable marine ecosystems and the need to ensure sustainability of deep-sea resources. Resolution 61/105 provided for four key management measures: the conduct of impact assessments, the closure of areas where vulnerable marine ecosystems are known or likely to occur, the requirement to move out of an area if there is an accidental or incidental encounter with a vulnerable marine ecosystem, and the need to ensure sustainable management of deep-sea fish stocks. This raised the question of what was a vulnerable marine ecosystem, how impact assessments should be conducted and what should be considered a significant adverse impact. Through the FAO, International Guidelines were subsequently developed and these provide internationally agreed terms to respond to these questions. Both resolutions refer to three distinct areas in the high seas; one where there is an RFMO which should adopt measures to protect vulnerable marine ecosystems; one where the establishment of an RFMO is under discussion and interim measures are to be adopted; and one where there is no RFMO nor one under negotiation where Flag States are to take appropriate management measures to ensure necessary protection of deep-sea habitats.

The presenter then gave an overview of measures that have been taken in various areas of the ocean, noting gaps in implementation. The North East Atlantic Fisheries Commission

(NEAFC) has closed substantial areas to deep-sea bottom fishing (including approximately 50% of high seas areas. It has received advice on corals and sponges from the International Council for the Exploration of the Sea (ICES), but has not as yet acted fully on this advice. There are few measures in place to manage the sustainability of stocks. ICES has advised that all deepwater fish stocks are currently outside of safe biological limits. The EU manages some species independently of NEAFC and has eliminated any quota for 17 species for deep sea sharks.

The Southeast Atlantic Fisheries Organization (SEAFO) has closed some areas, though there have been adjustments in these closed areas recently. There are quotas for some species though IUU fishing remains a problem. Orange roughy has been largely fished out.

The General Fisheries Commission for the Mediterranean (GFCM) has closed three areas to bottom fishing and does not allow trawl fishing below 1000 meters.

The Northwest Atlantic Fisheries Organization (NAFO) manages 11 of 25 species of fishable value. It has closed most seamounts to bottom fishing but approximately 20% of these areas can be fished on an exploratory basis. The location of some areas of corals and sponges have been identified throughout the shelf area in the Grand Banks and Flemish Cap.

The Commission for the Conservation of Antarctic Marine Living Resources has adopted a *de facto* prohibition on bottom trawling. All parties must provide an assessment consistent with paragraph 47 of the FAO International Guidelines. CCAMLR is the only management body to have adopted these measures to date. NAFO and NEAFC only require impact assessments for new areas. Others call for impact assessments where possible.

Resolution 61/105 provided for four key management measures: the conduct of impact assessments, the closure of areas where VMEs are known or likely to occur, the requirement to move out of an area if there is an encounter with a VME, and the need to ensure sustainable management of deep-sea fish stocks.

In the Northwest Pacific, Japan, the Republic of Korea and the Russian Federation have all done impact assessments, but in many areas they are inconclusive.

In the Southwest Pacific, New Zealand has defined its footprint and then closed approximately 40% of that footprint, but it has not done impact assessments *per se*. It has chosen to close representative areas of vulnerable marine ecosystems, though it is not clear how representative they are. The presenter noted that areas that had been closed were of limited interest to fishers.

In the Southern Indian Ocean, little has been done by Flag States, though there are voluntary closures adopted by industry. Assessments have not been done. An agreement to establish an RFMO has recently entered into force.

In areas where there are no RFMOs, the EU has adopted strong regulation, though it is up to member states to carry it out. The presenter could not say if this has happened, though the European Commission has concluded that most States have not done impact assessments

as required through the FAO International Guidelines. Spain was found to be in violation of the EU regulation and currently is working to improve its implementation. The Russian Federation has also a regulation for its flag vessels the fleet operating in the Northeast Pacific. The Republic of Korea has adopted a regulation for its flag vessels operating in the Southwest Atlantic, though no English translation is available.

In summary of this presentation on regions, the presenter noted again that most States have not conducted impact assessments as required by the FAO International Guidelines (there are exceptions with respect of the CCAMLR and the Northwest Pacific areas). Most areas remain open to bottom fishing. In most areas, closures have not been implemented, and where they have been, most closures are temporary in nature. There seems to have been a reluctance to close areas. In addition, the lack of information on deep-sea ecosystems has been a challenge to identifying where vulnerable marine ecosystems are or are likely to exist. Some RFMOs

Most States have not conducted impact assessments as required by the FAO International Guidelines and most areas remain open to bottom fishing.



Orange roughy caught by a deep sea trawler fishing a seamount off New Zealand. Photo Credit: NIWA.

have focused on areas where there are high densities of corals or sponges and have not taken into consideration low densities or other species that may constitute a vulnerable marine ecosystem. A move-on rule is often the only management measure in place, but it is of limited value, especially with respect of mobile gear, such as trawls. The question on sustainability of the target stocks remains largely unaddressed. The relevant UN General Assembly resolutions call on States to not authorize bottom activities until measures are in place to avoid significant adverse impacts, but this has largely not been implemented.

There was then a presentation on implementation of the FAO International Guidelines that included discussion of an FAO Workshop on the implementation of the Guidelines organized in Busan in May 2010. The presenter highlighted that all RFMOs are trying to implement the International Guidelines, but are facing technical difficulties, for example on how to interpret significant concentrations of organisms. There has been a focus on corals and sponges and to some extent there is a sense that interests from the coral and the sponge communities has hijacked discussion of what constitutes a vulnerable marine ecosystem. RFMOs have not succeeded in how to get a balanced approach on other species. There is a need for guidelines on how to implement the International Guidelines.

The presenter noted that RFMOs are either adopting closures (all short term) or move-on rules. A move-on rule does not protect static vulnerable marine ecosystems, and there should be some thoughts to alternatives options, but not much has been considered as yet. Further guidance is needed on a number of subjects, for example what is meant by “functional significance of habitat”. A “predictive habitat model” could help all RFMOs if one could be developed to predict likely locations of vulnerable marine ecosystems. Further research should then be encouraged on those areas. RFMOs would welcome a forum in which they could work together or a suite of best practices that they

could use. A number of questions still require further development, guidance and/or clarification to improve the implementation of the FAO guidelines, including:

- criteria to interpret “significant concentrations”;
- evaluation of usefulness of options for risk mitigation;
- best practices for exploratory fisheries protocols that incorporate both ecosystem considerations and industry concerns;
- indicators for VME encounters;
- guidance on conditions that may influence the effectiveness of management measures;
- development of impact assessments that are not only for corals and sponges;
- mapping of VME occurrences.

The presenter also highlighted that access to detailed information should be improved and that further efforts should be done to build capacity to implement the FAO guidelines. Scientific working groups of RFMOs should bring in other relevant experts when needed.

3.2 Discussion followed in reaction to the morning’s presentations and guided by the following questions:

- Of the policy tools presented, which are the most appropriate to address management of deep sea fisheries within an ecosystem context?
- Is it correct to focus on vulnerable marine ecosystems and potential significant adverse impacts to those ecosystems?
- Does resolution 61/105 have the necessary elements? If not, which are missing or how can the existing elements be enhanced to facilitate implementation at national and regional level?
- Which are the 3-5 top priority actions that countries/RFMOs should tackle to facilitate implementation of resolution 61/105?

RFMOs are trying to implement the FAO International Guidelines, but are facing technical difficulties and a general lack of capacity.

Encounter protocols generally include triggers for corals and sponges, but triggers for other species and ecosystems are needed.



Deep sea squid in the Southern Ocean.
Photo Credit: Alex Rogers-NERC ChESSO project.

Many were of the view that there was a need for guidelines on how to implement the FAO International Guidelines. Much remained unresolved, for example what was a significant concentration. Several participants were of the view that too much emphasis had been placed on the role of corals and sponges in identifying vulnerable marine ecosystems to the detriment of the significance of other species. Encounter protocols generally included triggers for corals and sponges; there was a need for triggers based on criteria for other species and ecosystems. Additional guidance was needed on the functional significance of habitats and life history traits of other species. Additional consideration was needed of the long-term sustainability of deep-sea fish stocks as much of the work to date on the UN General Assembly resolutions had focused only on the protection of vulnerable marine ecosystems. RFMOs needed advice from a wider group of experts, but how could that be accomplished? RFMOs would benefit from a coordinated effort to develop, test and document the integration of GIS data, mapping software for ecosystem features and fishing footprints, but how could that be done? How could one develop and test predictive habitat models and life history models for vulnerable marine ecosystems?

It was noted also that while the UN General Assembly resolutions themselves applied only to deep-sea fisheries in the high seas (beyond national jurisdiction), the FAO International Guidelines provide that Coastal States may apply the Guidelines within their jurisdiction, as appropriate. Many participants were of the view that the Guidelines are appropriate and should be applied to bottom fishing within EEZs. Some were of the view that under the UN Fish Stocks Agreement, Coastal States would have an obligation to apply the International Guidelines to areas within their jurisdiction for straddling fish stocks.

Participants discussed the need to bring nongovernmental biodiversity and fisheries stakeholders closer together. An example could be through collaboration on parallel or

joint work such as the application under the CBD of criteria to identify ecologically and biologically significant areas and through the FAO International Guidelines of vulnerable marine ecosystems, as both use much of the same criteria. It could be helpful to bring the scientists working on each subject together. It was encouraging that the FAO and CBD secretariats seem to be collaborating more now. Some participants highlighted that ownership of the debate by the fisheries stakeholders is very important. Harmonizing terminology is also an important element to consider. Target 6 of the CBD revised strategic plan could serve as an example as it includes key operational phrases from both communities that may help them to reach common ground. It was noted that the fishing community is suffering from “biodiversity fatigue” and often automatically reacts negatively to biodiversity language, in particular “marine protected area” as it sees MPAs as areas that are determined by others and imposed on them, usually restricting fisheries access, with no chance for input from fishers. It was also noted that it would be helpful if States sent the same representatives to both conservation and to fisheries meetings, thus ensuring that they are aware of what they agreed to in other fora.

Missing within the UN General Assembly resolutions was reference to the recovery of previously impacted areas. Some States argue that where heavy fishing has taken place, vulnerable marine ecosystems are now gone and thus bottom fishing (trawling) should continue. However, remnants of the vulnerable marine ecosystems may remain and these could recover. Options for setting aside areas for recovery could be considered. Some participants also raised the point that it is not always clear what should be done in areas subject to scientific uncertainty.

3.3 Possible actions and recommendations identified in the discussion included:

- Revise the concept of vulnerable marine ecosystems so that it includes deep-sea fish assemblages as well as sponges and corals.

- The sustainability of deep sea fisheries should again be a main focus of action (as opposed to the current focus on conservation of vulnerable marine ecosystems).
- Encourage the use of economic instruments and other incentives to facilitate fisheries sustainability in EEZ and beyond, for example through the use of secured access rights (responsible access). Ways to bring legal and sustainable fish to market to enhance their value should be explored.
- A focus on the rule of law to build a culture of compliance should be encouraged. The cost of compliance should be placed in relative terms to the value of these fisheries. It was to be noted that the economic value of the deep sea fisheries in ABNJ is very small compared to the other high seas fisheries.
- More should be done to include representatives of developing countries in decision-making. They often feel that decisions are imposed on them and they are not a part of the process.
- Further developing international standards for the implementation of the ecosystem approach might be useful, as the concept remains elusive and often not well understood.
- The role of fisheries to ensure food security must not be overlooked or undervalued.
- UN General Assembly resolution 61/105 includes the necessary elements, but should be seen as dynamic and subject to adjustment. (Note: Resolutions once adopted can be superseded by newer resolutions. End Note)
- Consideration should be given on reversing the focus on how one should not fish to ways that one should fish to promote sustainability.
- RFMOs should be more effective in requesting that member States release historical fishing data to help to evaluate fisheries and information on where vulnerable marine ecosystems are known or likely to exist.

3.4 Case Studies of current approaches to management of deep sea fisheries

In the next session of the workshop several case studies of current approaches to management

of deep sea fisheries, both within and beyond national jurisdiction, were presented. Examples were drawn from the Atlantic, Southern Indian, Southern and North Pacific Oceans as well as from around New Zealand. Among points made by presenters were that traditional fisheries management of establishing total allowable catch limits based on achieving maximum sustainable yield is not suitable for deep sea fisheries. Managing for sustainability of deep-sea fisheries requires low effort and catch levels to match the low productivity of the relevant target species. Adaptive approaches and quick management decision-making may be necessary to react quickly to new information. Protections should be in place before fishing takes place, but good data are necessary and this requires cooperation with individual fishers. Good data are required to determine a vulnerable marine ecosystem and what should be protected. There are still challenges in defining management units for deep sea fisheries. Collaboration to create a global seamount dataset would be helpful to improve the analysis of risk and to help guide priority areas.

On vulnerable areas, it was noted that bathymetry can provide a model for habitat that is highly vulnerable to damage, and thus allow for a risk assessment. States, such as Spain, have made habitat mapping efforts in order to identify and protect VMEs in the high-seas in the Atlantic. It was noted that with respect of the Northeast Atlantic Ocean, NEAFC has requested that ICES advise on areas suitable for closure to protect cold-water corals. In the Hatton Bank, based on Spanish and UK surveys of the seabed and an ICES recommendation, NEAFC has closed approximately 16,000 km² to bottom fishing. In the Northwest Atlantic Ocean, VMEs areas have been closed by NAFO based on survey data from the European Union, Spain and Canada. In 2009, NAFO scientists launched an international multidisciplinary research programme on VMEs (NEREIDA international program) lead by Spain. The program is expected to produce analyses that can be used to refine the

A bizarre deep-sea fish, perhaps a new species to science. Photo Credit: NOAA Okeanos Explorer Program, INDEX-SATAL 2010.



RFMOs should be more effective in requesting that member States release historical fishing data to help evaluate deep sea fisheries.



Deep-sea hydrothermal vent systems are attracting considerable interest from commercial mining companies. *Photo Credit: NOAA Okeanos Explorer Program, INDEX-SATAL 2010.*

Many areas may be closed to fishing but not to mining; a comprehensive multiobjective approach to managing deep sea ecosystems is needed.

boundaries of the current closed areas and to identify other areas where VMEs occur. In the Southwest Atlantic, VMEs have been identified based on the results of a Spanish habitat mapping program. It is worthy to note that a proposal of protected area (~41,300 km²) in the Southwest Atlantic high-seas was recently presented to the European Union. In the Southeast Atlantic, VME surveys have been undertaken in the high-seas by Spain in collaboration with Namibia. The results of these studies are contributing significantly to the identification of VMEs in the SEAFO area.

A presenter noted that deep-sea high seas fisheries can be sustainable. All types of fishing gear have impacts. Bottom trawling provides 25 million tons of fish annually. If there were no bottom trawling this source of food would have to be replaced with something else, which would also have impacts, for example an expansion of agriculture and animal husbandry would affect rainforests. Though the effects of bottom trawling may be undeniable, there is not always an alternative gear available. It was noted that industry itself had established some closed areas in the Southern Indian Ocean.

A speaker illustrated that certain seamount closures were not necessarily based on scientific advice and also noted that many areas may be closed to fishing but not to mining and that a comprehensive multiobjective approach to manage deep sea ecosystems is needed. Among points made for other regions were that one must take account of inter-annual variability. *Notothenia rossii* (Antarctic cod) were fished and became depleted within three to four years of being fished in the Southern Ocean. Forty years later the species has not fully recovered. This fishery highlighted the risk of common access. IUU fishing had been huge in the Southern Ocean, yielding up to 2.5 times that of legitimate fishing in the mid-1990s, but was now estimated to have been reduced to just under 50% of legitimate fishing. IUU fishing is economically damaging to legitimate fishers. Krill remains an underexploited species in the Southern Ocean as most of the fishing has been for deep-water species, but a new technology of krill pumping could change that. In addition, the future impacts of climate change should be integrated in fisheries management.

Fisheries management experience in CCAMLR, which provides that there can be no legal fishing without first conducting an impact assessment, offers several lessons learned that are of important relevance to deep sea fisheries management overall:

- Clear operational objectives should be mandated;
- Management should be realistic, dynamic, flexible & monitorable;
- Good tractable science is needed to address large uncertainties;
- Minimizing potential conflict with proactive management & pre-agreed decision rules;
- On-site scientific observation is needed to collect good information;
- Wide Monitoring, Control and Surveillance is needed to ensure compliance enforcement;
- Formal industry development to mirror management data;
- Relevant transboundary effects need to be considered;

- IUU Activity compromises management and should be taken into account; and
- Legal, reported and regulated activity is responsible.

For the Northwest Pacific an interim measure was agreed that freezes the footprint of fishing effort. No country should allow fishing without a prior assessment. It may be necessary to seek agreement on a best practice for prior assessment (rather than a perfect practice for prior assessment) as some may seek to do a poor assessment in order to fish. It was suggested that for the area that may represent a gap between areas included within the South Pacific RFMO and the North Pacific arrangement, Parties to both agreements could call for a closed zone and then ask that the UN General Assembly endorse that closed zone.

3.5 Discussion followed and was guided by the following questions:

- How do we resolve the disparities on implementation of UN General Assembly resolution 61/105 amongst RFMO?
- How big is the problem of deep sea fisheries/vulnerable ecosystems within waters subject to national jurisdiction?
- What are the incentives, both at national and regional level, to improve management of deep sea fisheries and protect vulnerable ecosystems? What are the incentives to implement the FAO guidelines?
- How much capacity building is required at national level, and which areas of capacity building should be prioritized?
- What are the incentives and/or opportunities to increase political will to address deep sea fisheries management and vulnerable ecosystem protection?

3.6 In the discussion, various points were made and issues raised, including:

- Each region should be divided into four: a) areas with no VMEs; b) areas where VMEs are known (these are to be closed to fishing); c) areas where VMEs may occur (measures

are to be in place to ensure that assessments are done before fishing is allowed), and d) large areas with scattered VMEs (how are fisheries to be managed here?). In areas where there are no RFMOs, Flag States should start planning early and before fishing interests are expressed.

- Should fish themselves be included in the implementation of the VME definition? Should stock, status and structure be known before fishing is allowed?
- A formal risk assessment for a fishery should consider the possible presence of VMEs and other habitat considerations, and should consider the possibility of bycatch issues. An assessment should highlight gaps and concerns and propose management actions to address these. The FAO International Guidelines (para. 47) addressed these issues.
- The issue of whether the international community has actually defined VMEs was raised. It was noted that perhaps elements of a VME have been identified, without actually providing a definition. Such elements include fragility (the ecosystem will be lost because it is not robust); vulnerability; the impact, that is the direct effect of fishing and other activities (cf. mining); and the ecological consequences of potential effects (including cumulative) on the VME.
- It was noted that the FAO International Guidelines have addressed some elements, though perhaps not perfectly, and it may not be possible to do more at this point as governments are unlikely to wish to re-negotiate the International Guidelines. The elements to be addressed include:
 - » Succession—removal or fracture of the life-history of organisms
 - » Impact on the productivity
 - » Impact on the dispersal—where the species is and where it is likely to go
 - » Association between target species and VME (i.e., ecosystem context)
 - » Gear impact (some gear will have more impact than others)
 - » Habitat distribution

Species caught as bycatch in a mid-water trawl. Photo Credit: NOAA Photo Library.



A formal risk assessment for a deep sea fishery should consider the possible presence of VMEs, as well as by-catch issues and other ecosystem considerations.

Data confidentiality is hindering implementation of the UN General Assembly resolutions.

- » Cumulative effect of the dynamic of the fleet
- » Management action will be driven by all of the above
- The point was made that the encounter protocol was meant to be a safety net, to be applied when other measures were insufficient, but that it is now used to avoid those other measures, most notably prior assessment.
- It would be welcomed if some dimensions of the VME encounter process could be disentangled and clarified. A vulnerability index had been discussed at a meeting in Paris in 2010 and it would be helpful to explore information on that. Other ideas on improving the use of encounter protocols included specifying the duration of the tow because shorter tows would allow for the more effective localization of VMEs and the avoidance of significant adverse impacts. It was also suggested that the use of video equipment on tows would permit a better understanding of the location of vulnerable marine ecosystems, though some thought this would be impractical.
- Though States do not seem to want to negotiate new rules, there seems to be a willingness to improve implementation of existing ones, including as found in the FAO International Guidelines.
- Data confidentiality is hindering implementation of the UN General Assembly resolutions. Consideration should be given to examples, including outside of fisheries, where data confidentiality issues have been successfully managed. Standards and criteria for assessment and handling of data in the North Pacific may provide an example of a way forward.
- As data are necessary to ensure implementation of the UN General Assembly resolutions and the collection and sharing of data are implied in the duty to cooperate as expressed in the UN Convention on the Law of the Sea and the UN Fish Stocks Agreement, there should be an assumption

that fishing should not be allowed in areas or in cases where such data are not collected or shared.

- In paragraph 122 of resolution 64/72 States are called upon to make assessments publicly available. This may cause confidentiality problems for industry, but is necessary for transparency.
- Flag States are to submit to the FAO a list of vessels flying their flag authorized to conduct bottom fisheries in areas beyond national jurisdiction, and relevant measures they have adopted to implement the UN General Assembly resolutions. However, to date not all Flag States whose vessels are authorized to conduct such fisheries have done so.

3.7 Improving data availability, identifying and prioritizing requirements for data reporting

The next session of the workshop focused on data, information and uncertainties. A presenter noted that the deep ocean comprises approximately 90% of the Earth's biosphere, with a high diversity of species. The average depth of the deep ocean is 3800m; we have much data to 1000m and little data beyond that level. But fishing now takes place to a depth of 2000m, thus we are exploiting resources from an ecosystem about which we know little. There is also a great deal of geographic variability with respect to data sampling, with much less sampling in the central and southern Indian Ocean, the South Atlantic and much of the Pacific. Sampling of benthic and pelagic systems could be accomplished at a cost of £1-3 m per project and require up to an additional five years to analyze and publish the results. One could also gather information from management data, trawl surveys, acoustic data. One could gather data from the fishing industry about what is being caught and where, or a trawl by trawl collection of data but this raises confidentiality issues. If one looks at NEAFC, there is no management in place for many fisheries and

70% of fishing vessels in some areas report catches of a single species only, thus one must conclude that there is unreported and misreported fishing, and information about by-catch and associated species, critical to evaluate fishing effects on ecosystem, is missing. The presenter said that accurate identification of all catch and bycatch by species was needed. Assessment of stock by structure, also genetic, length, weight, age and reproductive studies was needed.

Assessment of tropic linkages (gut contents, lipid biomarkers) was needed. One can use modeling methods and can identify more than 90% of seamounts, but may include inaccuracies. Management approaches should be precautionary and adaptive, with set precautionary harvest levels and appropriate biological reference points based on scientific assessment of stocks. Move-on rules should be based on scientifically determined trigger levels. With an adaptive management approach, revision would be incorporated as necessary. The presenter said that spatial protective measures to include areas closed to bottom fishing where damage may accumulate was needed. Marine protected areas were needed to improve the management of multispecies fisheries. MPAs need careful placement to ensure maximum benefit with minimal closures. More sectoral conflicts in the future, for example between fishing and mining interests can be expected. Marine spatial planning on the high seas to avoid or minimize such conflicts will be needed. Ownership and exploitation rights in the ocean should be examined. Rights-based management could be a way forward but would need a legal framework to apply in the high seas. Enforcement was also an issue to be addressed through technology, port state measures, intelligence, aggressive prosecution and severe penalties for infractions.

Another presenter said that stock assessments were perhaps overrated because of the difficulty in collecting data. There was a perverse incentive in that the more likely a potential provider thought that data were to be shared, the more likely that provider might seek to restrict such data. The presenter suggested

that one should reverse management areas by not talking about marine protected areas but rather about fishing areas; that rather than close certain areas to fishing, all areas should be considered as closed unless they were opened to fishing as fishing areas. The presenter talked about international efforts to identify ecologically or biologically significant areas (EBSAs), as agreed at the CBD Conference of the Parties in 2008. The Global Ocean Biodiversity Initiative (GOBI) had as its purpose the identification of EBSAs. It was a science-based advisory group and not an advocacy body and would advise regional workshops. GOBI was also looking at the use of Particularly Sensitive Sea Areas (PSSAs) through the International Maritime Organization (IMO) and reserved areas through the International Seabed Authority. The FAO is to establish a database of vulnerable marine ecosystems, but that does not appear yet to have happened. Some are concerned that there will be a proliferation of databases (rather than one central database) of marine areas that are in some way protected.

Another presenter said that ocean life must be valued for its resources. Fisheries affect the environment, but on a global level fisheries provide animal protein with a lower impact than does either agriculture or aquaculture. Any fishery can be sustainable if there is sufficient information to manage it appropriately. The problem is often that there is not sufficient knowledge of the biology of the species and of ecosystem processes, especially with respect of the deep sea. In order to ensure robust stock assessments and benchmark reference points, the following were necessary:

- Knowledge of stock structure
- Stock size (biomass)
- Natural mortality
- Life history (life span, age at maturity)
- Relationship of stock size and recruitment
- Environmental effects (cf. temperature and recruitment)
- Fisheries parameters (mortality, effort, age and length at capture)

Fisheries management approaches should be precautionary and adaptive, with appropriate harvest levels and biological reference points.



Orange roughy can form high density aggregations. Photo Credit: NIWA-MFish.

There is often insufficient data to determine stock structure, but molecular genetics is helping. For stock size, the following are helpful: trawl surveys, time series, acoustic surveys, egg surveys for abundance indices, historic data, natural mortality, catch records, age, and growth rates. Fishing of some species with low fecundity and a long life span may never be economically viable and sustainable (deep-sea sharks), but others may be (blue ling, perhaps orange roughy). Ecosystem-based models need to be developed that could serve as an alternative to single species stock assessments. Ecosystem based models include an analysis of fishery survey trends and ecological risk assessment. One example is the so-called 'productivity-susceptibility' analysis that provides a range of scores or attributes to determine the vulnerability a species to fishing. The presenter suggested that it was a mistake to ask a stock assessment scientist to model wider ecological impacts of a fishery; rather this is the task of ecologists. The presenter said that data on deep-water biodiversity and on vulnerable marine ecosystems was much improved over the past ten years because of the use of television (video) surveys and remotely operated vehicles (ROVs). VMEs are important to fisheries as they may serve as spawning

grounds and nursery areas. Data from Vessel Monitoring Systems (VMS) are needed to assess patterns of fishing effort; while the data exists, often it is not easy to obtain or publish. There was a need for haul by haul information, which could be obtained either through official log book records or from tally book schemes of fishers. One could conduct integrated marine assessments by weighting sustainability of fisheries on a basis of their impacts on the ecosystem. It would be helpful to use economic information to weigh against impacts on bycatch and habitat. Monitoring of closed areas was important. The presenter raised the issue of whether maximum sustainable yield could lead to long-term truncation of age and size structure of the stocks and thus might not be sustainable. The presenter said that deep-sea fish stocks could be sustainably exploited at very low rates.

3.8 Discussion followed and was guided by the following questions:

- What data are necessary to sustainably manage deep-sea fish stocks? Which deep sea stocks currently have sufficient information for sustainable management within an ecosystem context?
- Which are the major data gaps and how can they be minimized?
- How can accessibility to deep sea fisheries data and ecosystems be improved?
- How can proprietary data issues be resolved? Do issues related to data limitations and accessibility apply equally within and beyond national jurisdiction?
- Can the effects on deep-sea fish stocks of I,U,U fishing be estimated with any accuracy?

In the discussion, various points were made and issues raised, including:

- Marine Protected Areas are becoming a panacea suggestion. They are often designed as for biodiversity conservation but not as a fisheries management tool and if an MPA is needed to manage fisheries, then the management is already broken. Using

Ecosystem-based models need to be developed as an alternative to single species stock assessments.



A deep-sea shark called a prickly dogfish swims by Pisces V at Rumble V volcano.
Photo Credit: New Zealand-American Submarine Ring of Fire 2005 Exploration, NOAA Vents Program.

the term MPA may not be a helpful way to engage the fisheries sector in many countries.

- MPAs can contribute to fisheries management, both with respect to target and non-target species. There are studies that show that MPAs benefit fisheries. However, there is a need to further document and understand what an MPA can and cannot do in fisheries management. Understanding the limitations of MPAs is critical, and it is noted that MPAs need to be complemented with strong fisheries regulations.
- States are failing in their duty to cooperate in the management of fisheries. Some thought this reflected greed. It would be better to avoid consideration of changes to UN Convention on the Law of the Sea; rather an emphasis should be put on the duty to cooperate. A good legal interpretation and precedent of what duty to cooperate implies would be helpful.
- Adaptive management should be geared to no surprises. There should be a pre-commitment to research, a pre-notification procedure and so on.
- It should be agreed that without data there will be no fishing.
- With respect of deep-sea stocks less is known and the chances of damage are higher. The UN General Assembly has decided that without data there should not be fishing and States have accepted this.
- Funding is difficult to obtain for formal stock assessments. One can rely on fishers' data. There is a need to move towards monitoring and improve fishery survey design.
- Fisheries data are massively underutilized. Observers are needed to collect samples and catalogue by-catch. Fishermen can help identifying the closures and methods to reduce by-catch.
- A question was raised with respect of stock assessments. Does one have the best information? Is the type of management matched to the needs and the data you have?
- A stock assessment should show biomass and yield. Monitoring of stocks was a

different process that should indicate when one is hitting target and non-target stocks too heavily. However, monitoring may not be enough if the structure of a stock, its virgin biomass and other data are not known or understood.

- A stock assessment should show biomass and yield. For stock size (determining abundance indices), trawls surveys, acoustic surveys, and in some cases egg surveys can be useful. Time series of survey indices are especially powerful. Historic catch data and detailed catch and effort information can enable CPUE analyses. Biological parameter estimates are also necessary to inform evaluation of fishery sustainability.
- Monitoring of stocks was a different process that should indicate when one is hitting target and non-target stocks too heavily. However, monitoring may not be enough if the structure of a stock, its virgin biomass and other data are not known or understood. Monitoring the relative abundance of fish species (both target and bycatch) by means such as CPUE can indicate the effects the current level of catch is having on stock status. This can reduce the need for estimates of biomass in order to make management decisions. For example if the CPUE is stable or increasing (taking into account changes in effort and spatial distribution of the fishery) then current catch levels may be appropriate.
- Considerations of natural variability or environmental reasons (pollution, shipping, climate change, etc) should be included in risk and stock assessments.
- A low-end method of assessment with good data is better than a high end method with poor data. If it is not possible to assess a target species then this species should not be exploited.
- There are a number of ongoing surveys, for example through acoustic studies, but they are often misunderstood as this is a difficult technical field. Some work in underway



Colorful cnidarian, Davidson Seamount, California. Photo Credit: NOAA/Monterey Bay Aquarium Research Institute.

Social and economic considerations should be included in a risk assessment dialogue.

with fishing industry on how to use acoustic survey data for stock assessment.

- Data should be shared with other States, with relevant international organizations and with other interested parties. Scientists need data to do their work.
- Concern was expressed about the quality of data, particularly when relying only on commercial data.
- It may not be possible to know the full spatial distribution of a species, but the location where it was fished must be known.
- Risk assessment and risk management should be linked, and there should be an understanding of what risks do the management decisions carry.
- How do we balance misses and false alarms? We are much more risk intolerant to misses than to false alarms. False alarms can upset fishers and can be unhelpful.
- Social and economic considerations should be included in a risk assessment dialogue. The standard scientific risk assessment typically includes ecological considerations only.
- There will be a review this year of the UN General Assembly resolutions with respect to bottom fishing. It will be helpful to focus on implementing these resolutions. States have made commitments, including to not allow their vessels to fish in the absence of prior assessment. They should fulfill their commitments.
- Some States may be of the view that they have complied with the language of the resolutions but that there has not been a proper outcome.
- The governance model for the high seas is not optimal, but it will not be easy to change it.

Comments specifically on the Global Ocean Biodiversity Initiative included:

- GOBI is not a decision making body; rather it provides data to inform regional processes.
- GOBI will provide a dynamic process and will provide information from a variety of places; its success will depend on cooperation.
- GOBI is a welcomed initiative because it will provide a collective place in which to put data, which are currently dispersed.
- Predictive modeling work being promoted through GOBI is good. More emphasis is being placed on this approach by a number of research institutions globally.
- GOBI aims to ensure quality of data through a review process.
- GOBI may have a potential conflict with fisheries managers because while GOBI looks at a number of fisheries-relevant issues, including breeding and life processes, fisheries managers look also at other issues, thus the two groups do not necessarily consider the same aspects of the marine environment.
- RFMOs tend to distrust data from sources other than their own.
- Some FAO data are not well collected or vetted; therefore GOBI data could complement FAO data. But the FAO as an intergovernmental agency answers to its members who may not agree to other standards.

4 | BREAK-OUT GROUPS

The workshop then divided into two breakout sessions, each charged to provide recommendations to improve the tools and arrangements for deep sea fisheries management, taking into account the UN General Assembly resolutions, the FAO International Guidelines and other relevant sources.

Ideas and views expressed in these sessions included:

The relevant UN General Assembly resolutions call on RFMOs and Flag States to conduct assessments to determine whether bottom fishing would be likely to have significant adverse impacts on vulnerable marine ecosystems, and if so to manage these activities to prevent such impacts, or not authorize them to proceed. A

view was expressed that if operators followed proper assessment procedures, protection for VMEs could largely be achieved. If no assessment has been done, fishing should not be allowed. Lack of political will has hindered progress on the conduct of assessments in accordance with paragraph 47 of the FAO International Guidelines. There was a view that the assessments as called for in paragraph 47 have only been done through some RFMOs, and specifically only with respect of the Southern Ocean (CCAMLR) and in the Northwest Pacific (by relevant Flag States). A concern was expressed that the quality of assessments done for the Northwest Pacific was poor. A full assessment has not been done with respect of the Northwest Atlantic though



Deep sea urchins on Rumble V Seamount, Kermadec Ridge, off New Zealand (left).
Photo Credit: NOAA-GNS-NIWA.

Stone Crab (below) Photo Credit: NIWA.



The UN General Assembly resolutions lack guidance on how to proceed if the risk assessment shows uncertainty with respect to the likely level of impact with a VME.

some members of NAFO are of the view that their efforts are adequate. Some RFMOs are requiring assessments for new and exploratory fisheries. The UN General Assembly resolutions lack guidance on what to do if the risk assessment shows uncertainty in the likely level of impact. Efforts should be undertaken to resolve such uncertainties or adapt management measures to reduce impacts.

With respect of UN General Assembly resolution 61/105 it was noted that this had been a compromise that provided for creative misunderstanding to allow continued bottom fishing while affording protection for the seafloor. Some States had favored a ban on all bottom fishing and others had opposed this approach. Some States and operators were of the view that in areas where there had been bottom trawling for thirty years (as an example), there was no need to conduct a risk assessment, as the risk of further harm was so low. There was an uneven commitment to application of the resolution language. Some were of the view that some States were unwilling to implement the UN General Assembly resolution language.

With respect to implementing paragraph 47(ii) of the Guidelines that call for “best available scientific and technical information on the current state of fishery resources and baseline information on the ecosystems, habitats and communities in the fishing area, against which future changes are to be compared;” it was noted that data may be lacking to allow for implementation. Where RFMOs exist there may be a problem with access to data and information in sufficient detail to allow for credible assessments. For example, there may be sufficient information with respect to the exploited resource, but not for associated biodiversity or habitats. Current data are often too aggregated to allow for an assessment of a baseline of vulnerable marine ecosystems. Temporal resolution of vulnerable marine ecosystems linked to daily catch records is needed. Even where data are available, there may be no RFMO in place to use the data. Flag States would need to collaborate if fishing in the

same area. It was recommended that FAO coordinate a group to serve as an intermediary broker. This group should be a fair broker, credible to industry, States and the conservation community. At the same time the group would need to be independent of States and industry and would need to maintain the confidentiality of the information.

It was recommended that RFMOs request or require data at the most detailed level possible. RFMOs would need access to raw data as it was collected and before it was aggregated. However, confidentiality issues put legal limits onto the provision of these data. FAO fisheries report number 860 contains a series of recommendations regarding this topic that could be helpful. There is a need to resolve the conflict between detailed data needs and a restriction on transparency. It was also recognized that there is a tradeoff in transparency measures—the more transparent, the less detailed the data shared by fishers. It was recommended that each RFMO attempt to resolve the conflict between confidentiality and transparency while meeting the data requirements for assessment. Conditions or management regimes, including through allocation of secure rights, may help in this regard.

With respect to the identification, description and mapping of VMEs known or likely to occur in the fishing area, as called for in paragraph 47(iii) of the Guidelines. Various States and RFMOs have taken important action (e.g. the Spanish habitat mapping programme in the high-seas of the Atlantic Ocean). Major impediments to implementation included a lack of information; a lack of standard best practices for places where information does exist; and issues of scale of what is significant in biological and ecological terms. Consistent definition of what are VME criteria was urged; and so was clarity in what is the level or trigger that determines a VME. Included within the definition of VMEs should be more than what is listed in the Annex. Iconic species are not the same across regions, however this should not prevent applying criteria in the same way.

There should be a focus on assisting States to map or visualize an area prior to permitting fishing (eg best practices). Lack of data is not an acceptable excuse for not implementing the International Guidelines. More resources were necessary to apply the Guidelines and to communicate best practice among RFMOs and States. For example, in the CCAMLR area cameras are being used to see the impact of longline fishing on benthic ecosystems. Interaction of gear with bottom is being researched in Australia. There are few fora to share this sort of information—there is a need for better communication and information sharing between RFMOs. It was recommended that RFMOs cooperate to compare notes and best practices. FAO has taken some lead on this. Though the FAO can convene, State agencies and researchers need to participate. The UN General Assembly should call on the FAO to organize more of these workshops to exchange ideas and information.

With respect to risk assessment of likely impacts by the fishing operations to determine which impacts are likely to be significant adverse impacts, as called for in paragraph 47(vi) of the Guidelines, particularly impacts on VMEs and low-productivity fishery resources, concern was expressed that a lack of guidance has resulted in some States describing work as a risk assessment when it was not. The view was expressed that though paragraph 47 referred to impact assessment, it really called for a risk management process. Risk management required examination of uncertainty and evaluation of risk. Scientific and technical experts should quantify risk, leaving decisions on the management of that risk to policymakers. CCAMLR was introduced as an example. The CCAMLR Scientific Committee was in a dialogue with political managers and this had been very effective. A good political-science nexus or interface facilitates dialogue between political managers and scientists. This should be promoted as it can be immensely effective for good management outcomes.

On risk management it was considered that paragraph 47 of the Guidelines provided some guidance. Scientists and technical experts should identify potential risks and managers and policymakers should then be responsible for managing those risks for society. Some were of the view that managers may be too risk averse leading to false alarms, for which there are also consequences. There was the possibility that costs could be inflicted on industry that would not produce any significant ecological benefit. The view was also expressed that there may be a science-policy disconnect in which scientists answer the question correctly, but it is the wrong question that has been posed. Thus, it was important to pose the right question. Confidence in risk assessment would be undermined by trying to bring about a specific outcome. The view was expressed that scientists should provide a variety of scenarios to policymakers. There was a need for a good nexus between science and policy.

There was a recommendation to review existing risk assessment protocol standards and adapt them to deep sea fisheries. It was reported that the International Organization for Standardization has adopted standard ISO/IEC 31010:2009 on “Risk management—Risk assessment techniques” which could help to establish what a risk assessment should include. The World Trade Organization has phytosanitary standards that provide for risk assessment and could also serve as a model. Once this review was completed, the FAO could be invited to convene a workshop on the subject. It was suggested that such work would be suitable for support through the GEF International Waters focus on deep-sea fisheries that FAO has been invited to coordinate.

With respect to the proposed mitigation and management measures to be used to prevent significant adverse impacts on VMEs and ensure longterm conservation and sustainable utilization of low-productivity fishery resources, and the measures to be used to monitor effects of the fishing operations, as called for in paragraph 47(vii) of the Guidelines, there was a

Sladinea fish are found in underwater canyons off Hawaii, New Zealand and the West Coast of the United States.
Photo Credit: NIWA.



Where RFMOs exist there may be a problem with access to data and information in sufficient detail to allow for credible assessments of the fisheries and associated biodiversity and habitats.

recommendation that assessments should be open to review by relevant science working groups and other relevant States. Independent review in addition to review by the relevant RFMO of assessments would be welcome and would be in conformity with paragraphs 81–83 of the Guidelines. Flag States would have to incorporate into mitigation measures any recommendation from reviewers in their mitigation measures. It was noted that the FAO has convened workshops to review the progress with respect of implementation of paragraph 47(vii) and some Flag States have adopted mitigation measures with respect of VMEs, but not with respect of low-productivity fishery resources, which also should be done, both for targeted species and for bycatch.

There was a recommendation that a central repository for data and VMEs be established into which RFMOs would be encouraged to share data. There have been experiences of global efforts to pull data together for other taxa, which could provide an example. This topic could be discussed at the Aberdeen conference 2011 with industry.

There was a view that an assessment of how well the RFMO has implemented the UN General Assembly resolutions 64/72 and 61/105 be part of any RFMO performance review. Some were of the view that the UN General Assembly should continue to exercise a review function on a regular basis on the implementation of assessment procedures.

The issue of a potential role for court action, including through the International Tribunal for the Law of the Sea, with respect of State accountability was raised. (Note: Under the UN Convention on the Law of the Sea, Parties have a right to settle disputes peacefully by any means that they choose. If that is not successful, Parties may choose dispute settlement through the International Tribunal for the Law of the Sea, the International Court of Justice, an arbitral tribunal or a special arbitral tribunal. For more information see Part XV of UNCLOS. End Note)

There was a recommendation that actions by Port States may be suitable to ensure application of language from the UN General Assembly resolutions. Some were of the view that Port States, Market States, Coastal States, and States in which resided beneficial owners of vessels should all have a role or obligation in ensuring that proper assessments were conducted. Consideration should be given to incorporation into a future resolution language calling on States to ensure an assessment applied in a consistent way to prevent significant adverse impacts on VMEs also from non-fishing activities, such as mining, oil drilling and so on. Cumulative impacts should also be considered and assessed. A cautionary note was raised that it may be a mistake to refer to Port State measures as this could undermine the use of such measures to combat IUU fishing.

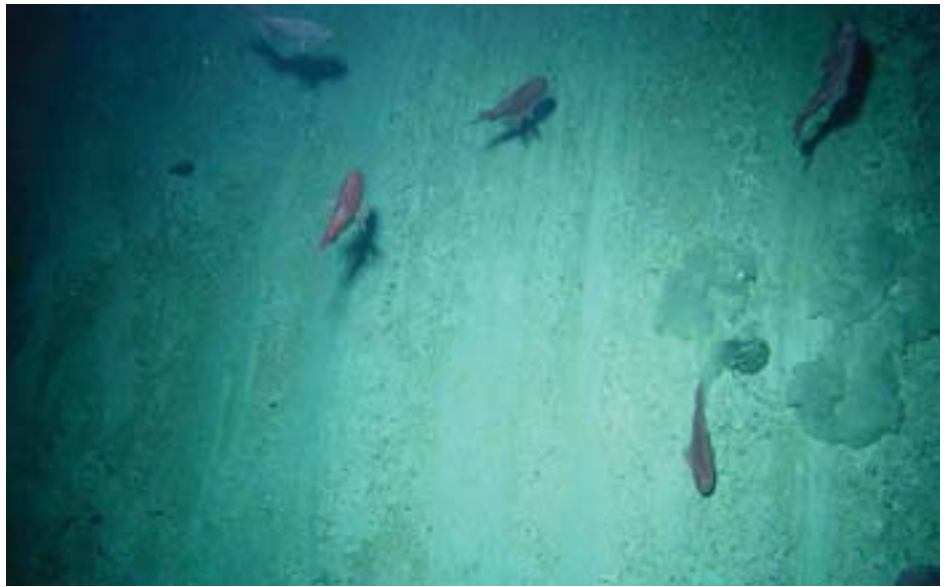
There was mention of the role that subsidies may play in the promotion of deep-sea fishing. It was noted that if fishing vessels were required to carry an IMO number, it would be easier to track them and to determine if indeed subsidies played a role in such fishing.

With respect to implementing paragraphs 70 - 72 of the Guidelines regarding encounter and move-on rules, it was noted that most RFMOs have established protocols for move-on rules. Thresholds are not always scientifically based and tend to apply only to corals and sponges. Move-on has become a substitute for assessment, which it was not meant to be, and is often used as the only tool in place of acting as a safety net to complement other measures. The use of the move-on rule is not achieving its intended outcome. There are often different threshold levels for different taxa and gear type used. There would appear to be different thresholds for different biogeographic regions. These differences do not appear to be based on science. Quantifying impact and setting thresholds is challenging; currently damage is quantified by examining what comes up in the net. This is a bad method of estimation of impact, unless it is known in advance what was on the bottom. With respect of long-line

fishing, it would appear to be a method to identify the location of a VME. It was recommended that the use of move-on rules be revised. Better operational rules for when encounters occur should be instituted, recognizing that an adequate adaptive response would depend on the taxa encountered in order to reduce the risk of continued impact on the VME. The use of the move-on rule was regarded as a potential counter incentive to conducting the necessary assessment in the first place. The move-on rule should not be considered as a primary conservation measure or a substitute for prior assessment and mapping of VMEs.

With respect of capacity building it was recognized that this issue was often neglected and there was a danger that nothing would change. It was noted that lip service is often paid to capacity building, but more needed to be done. The World Bank had looked at the issue in the 1980s and/or 1990s and a large research vessel had been provided, with most research done within EEZs, and thus not on the high seas. The World Bank might be invited to look again at this issue. UNICPOLOS 11 in 2010 had focused on capacity building. It was noted that paragraph 99 of UN General Assembly resolution 61/105 encouraged the enhancement of the ability of developing states to develop their fisheries. Capacity building programs should include building capacity to develop information about deep-sea resources and to conduct prior assessments to promote developing country participation in deep-sea fisheries. It was noted that in some areas the fishery may already be fully exploited, which is unfair to new entrants. It was noted that capacity building had to be sustainable, including through the sustainability of the technology. Capacity building in the past had been hindered by a lack of transparency with respect to what had been agreed and by whom.

Other views included a need to be realistic about donor fatigue and concerns about corruption in fisheries management. It was noted that fisheries agreements between distant



A section of heavily trawled seafloor on Morgue seamount showing tracks from trawl doors and bobbins.
Photo Credit: NIWA.

water fishing States and Coastal States have at times been opaque; there was a need for transparency. It would be helpful if fisheries agreements provided for the public availability of information about the availability of resources and how and by whom those resources were being exploited. With respect of capacity building, it was important to plan for continuity. The Benguela Current Commission was cited as a success because it planned for continuity.

There was discussion of the relationship between VMEs and EBSAs based on an assumption that VMEs would be identified through an FAO-approved process and EBSAs through a CBD-approved process. It was noted that criteria for identification of VMEs and EBSAs shared similarities. It was observed that Parties to the Convention on Biodiversity had apparently been of the view that while VMEs may constitute ecologically and biologically significant areas, such areas may not necessarily be VMEs. Many were of the view that while there may be similarities and that information required to identify VMEs and EBSAs was often very similar or the same, VMEs and EBSAs themselves were not necessarily the same or co-terminous. Information on location of the latter could

The use of the move-on rule is not achieving its intended outcome; Move-on rules should not be considered as a primary conservation measure or a substitute for prior assessment and mapping of VMEs.

serve to identify the former. It was noted that progress has been made in the identification of VMEs (e.g. the Spanish habitat mapping program). A view was expressed that occurrence records with respect of species and/or habitats from museum databases and Census of Marine Life historical studies should inform the identification of VMEs. Some were of the view that there was a difference, and this should be recognized, between what was a VME and an area with VME indicator species. Some considered a consolidated analysis of VMEs and/or EBSAs on a region by region basis to be necessary.

With respect of databases, there was a need for a public repository about the location of VMEs and of ecologically and biologically significant areas. Some suggested a central database for data on the location of VMEs, catch records and certain other data; others favored a broader central repository for all datasets. Many raw data were available, but in a still messy format; it would be necessary to consolidate data, perhaps at a regional level. It was important that science stand behind the database.

Some favored a database that would inform States but operate without State interference. It was suggested that a Census of Marine Life-effort could serve as a model to pull together the best available information on VMEs, tows and other information. The Global Ocean Biodiversity Initiative or another such body could also serve as a repository for the data. It also was noted that at the CBD Tenth Conference of the Parties in Nagoya in 2010 it had been agreed to go forward with the identification of ecologically and biologically sensitive areas as a state-driven process. Some thought that the political reality was that States would only respect a database that they ran, thus an inter-governmental process was necessary.

It was also noted that the FAO could act as the central repository for the VME database. Some were of the view that the FAO database should include VMEs; others, that it should include where VMEs are known or likely to occur. Some thought that the FAO database should also include the basis on which the

VME was listed. An FAO database could include information on tow by tow basis or information on the occurrence of specific species, but this was apparently not in the plan for it. Data and information provided to FAO from individual States could be consolidated by relevant RFMOs. All States should be urged to provide such data and information. States should be encouraged to be transparent with where and how information on VMEs was obtained. The collection and public availability of such data and information should be encouraged also to provide scientific insight for management.

A concern was expressed that the FAO as holder of information on the location of VMEs could be subject to political pressures to not list or down list certain areas. Some thought that FAO should only be expected to compile information as outlined in the FAO International Guidelines and that it was not right to expect FAO to do more. Others thought that FAO should move forward with a specific database on VMEs but should also support the development of a second database containing scientific information that would be helpful in the identification of VMEs. It was also noted that FAO was charged with developing a Global Register of Fishing Vessels.

The credibility of database owner would be important if the data were to be used by RFMOs. RFMOs would not necessarily be willing to make decisions on the basis of information drawn from a CBD database because fisheries interests would not automatically accept data and information from those with a conservation interests.

The Regular Process of Global Reporting and Assessment of the Marine Environment, including Socio-economic Aspects, a process underway under the UN General Assembly, could assist in an effort to assimilate information from a variety of sources. It was noted that the Process would review the state of marine resources and provide advice on gaps. Were there policy gaps that should be filled with respect of deep-sea fishing? The first

There is a need for a public repository on the location of VMEs and of other ecologically and “biologically significant areas.



Yellow Picasso sponges on Davidson Seamount off California. Photo Credit: NOAA/Monterey Bay Aquarium Research Institute.

cycle of the Regular Process was due to be completed in 2014, thus the Regular Process was still in a learning phase.

On the issue of political will several issues were discussed. Was the lack of impact assessment caused by the lack of capacity? Did it reflect a misinterpretation of necessity, an omission, a lack of clarity of consequences of not doing the assessments? Had some tried to do assessments, but fallen short, or found the results incomplete or inconclusive? Was there a lack of common understanding of the consequences and risk from inaction with respect to assessments? There was generally agreement that no fishing should take place if assessments had not been done, ie that failure to determine whether there would be significant adverse impacts on VMEs or fishery resources should result in no authorization to proceed with a proposed fishery. If the assessment were uncertain or incomplete, then no fishing should be authorized until such time as management measures were developed and adopted to address those uncertainties. It was also important to recognize that some States may need assistance to undertake necessary assessments.

There was a suggestion that it would be helpful if there were a joint meeting of RFMOs, to include secretariat staff and scientists, to exchange information and experience. The Kobe process with respect of the five tuna RFMOs was cited as an example of how those five RFMOs came together to exchange information and experience. However, it was noted that a joint RFMO meeting would not address areas for which no RFMO existed.

With respect of paragraph 86 of UN General Assembly resolution 61/105, some Flag States have put necessary measures into place, but not all. The view was expressed that a way forward would also include creating RFMOs for areas where there are none and alternatively declaring (perhaps through the UN General Assembly) areas without RFMOs closed to fishing in the interim.

Collaboration between RFMOs should include greater sharing of data. Significant

gaps included the lack to date of an international registry of VMEs, the lack of a central repository for sharing of information and data, including historical data, the lack of robust data for predictive modeling of VMEs. FAO has hired two persons to undertake collation of VME information and the Global Ocean Biodiversity Initiative is to contain a repository of certain data. The view was expressed that there is a need to promote cooperation and coordination to identify where VMEs occur and methods to that end. There was a need to collect new information to inform assessments about where VMEs are known or likely to be found. There was a view to recognize that VMEs consist of more than corals and sponges and that there is a need to fully implement the Guidelines to assist in identifying VMEs centered on other species. The view was expressed that VMEs may consist of more than what is described in Annex I of the FAO International Guidelines and identified through the criteria in paragraph 42 of the Guidelines.

With regard to use of encounter and move-on rules there was concern expressed that these could have an unintended and counter-productive effect, leading to harm to VMEs. Some thought that encounter and move-on rules worked effectively with some types of gear but not with other types of gear. Encounter and move-on rules should not be used as a substitute for prior assessment, which should always take place first. The upper limit trigger for any encounter and move-on rule should reflect the ecology of the species and bioregion in question. Encounter and move-on rules may lead to displacement of effort but this should not result in expansion of the fishing footprint.

Progress was welcomed with respect of stock assessments to ensure sustainability of deep-sea fish stocks, but it was noted that there was still insufficient information about many stocks. More research was needed by RFMOs and by Flag States, and there was a need for more sharing of data. Existing and new fisheries should remain limited until satisfactory assessments are done that would

allow for the establishment of sustainable take levels. All new fisheries should be exploratory until such time as independent assessments have been conducted. There was a need for further information and assessment of bycatch.

Some progress has been made with respect of the collection, exchange and publication of scientific information, though more is needed. It was noted article 119 of the UN Convention on the Law of the Sea provides an obligation on States that “Available scientific information, catch and fishing effort statistics, and other data relevant to the conservation of fish stocks shall be contributed and exchanged on a regular basis through competent international organizations, whether subregional, regional or global, where appropriate and with participation by all States concerned.” Confidentiality concerns should not be a barrier to full implementation of this article of UNCLOS and efforts to use economic incentive to deal with the confidentiality issues should be encouraged, in particular looking into the application of access rights. Efforts are also underway in other fora, for example the International Seabed Authority, the Convention on Biodiversity, to encourage the sharing,

exchange and publication of information.

A view was expressed that political will to ensure compliance was needed. Some were of the view that the U and U of IUU fishing should fall away since unreported and unregulated fishing is not consistent with the obligation to contribute and exchange scientific information, catch and fishing effort statistics, and other data relevant to the conservation of fish stocks. Others favored retaining the unified IUU concept.

A view was expressed that while the workshop had focused on deep-sea fisheries, the issue was broader and included the need to improve governance and management of the high seas and put in place a rule of law. The expansion of other activities (for example, mining) to the deep sea required management on a multi-objective basis, and marine spatial planning in off shore and high seas areas should be encouraged. One should be open to collaboration and the building of partnerships with others to develop a realistic proposal for better governance of fisheries and more broadly the conservation of biodiversity and to educate decision makers to this end.

The submersible's manipulator arm collecting a crab trap containing five deep sea galatheid crabs. *Photo Credit: Dr. Steve Ross, UNC-W. NOAA Office of Ocean Exploration.*



New and existing fisheries should remain limited until satisfactory assessments that allow for the establishment of sustainable harvest levels are conducted.

5 | EXCERPTS OF CERTAIN RELEVANT PARAGRAPHS FROM THE FAO INTERNATIONAL GUIDELINES FOR THE MANAGEMENT OF DEEP-SEA FISHERIES IN THE HIGH SEAS

Characteristics of species exploited by deep-sea fisheries

13. Many marine living resources exploited by DSFs in the high seas have biological characteristics that create specific challenges for their sustainable utilization and exploitation. These include: (i) maturation at relatively old ages; (ii) slow growth; (iii) long life expectancies; (iv) low natural mortality rates; (v) intermittent recruitment of successful year classes; and (vi) spawning that may not occur every year. As a result, many deep-sea marine living resources have low productivity and are only able to sustain very low exploitation rates. Also, when these resources are depleted, recovery is expected to be long and is not assured. The great depths at which marine living resources are caught by DSFs in the high seas pose additional scientific and technical challenges in providing scientific support for management. Together these factors mean that assessment and management have higher costs and are subject to greater uncertainty.

Vulnerable marine ecosystems

14. Vulnerability is related to the likelihood that a population, community, or habitat will experience substantial alteration from short-term or chronic disturbance, and the likelihood that it would recover and in what time frame. These are, in turn, related to the characteristics of the ecosystems themselves, especially biological and structural aspects. VME features may be physically or functionally fragile. The most vulnerable ecosystems are those that are both easily disturbed and

very slow to recover, or may never recover.

15. The vulnerability of populations, communities and habitats must be assessed relative to specific threats. Some features, particularly those that are physically fragile or inherently rare, may be vulnerable to most forms of disturbance, but the vulnerability of some populations, communities and habitats may vary greatly depending on the type of fishing gear used or the kind of disturbance experienced.

16. The risks to a marine ecosystem are determined by its vulnerability, the probability of a threat occurring and the mitigation means applied to the threat.

Significant adverse impacts

17. Significant adverse impacts are those that compromise ecosystem integrity (i.e. ecosystem structure or function) in a manner that: (i) impairs the ability of affected populations to replace themselves; (ii) degrades the long-term natural productivity of habitats; or (iii) causes, on more than a temporary basis, significant loss of species richness, habitat or community types. Impacts should be evaluated individually, in combination and cumulatively.

18. When determining the scale and significance of an impact, the following six factors should be considered:

- i. the intensity or severity of the impact at the specific site being affected;
- ii. the spatial extent of the impact relative to the availability of the habitat type affected;
- iii. the sensitivity/vulnerability of the ecosystem to the impact;



A sea lily (crinoid) at 1876 meters depth on Kawio Barat submarine volcano.
Photo Credit: NOAA Okeanos Explorer Program, INDEX-SATAL 2010.



Seamounts like this one on the Macquarie Ridge south of New Zealand can host dense concentrations of benthic invertebrates. *Photo Credit: CenSeam—NIWA.*

- iv. the ability of an ecosystem to recover from harm, and the rate of such recovery;
- v. the extent to which ecosystem functions may be altered by the impact; and
- vi. the timing and duration of the impact relative to the period in which a species needs the habitat during one or more of its life-history stages.

19. Temporary impacts are those that are limited in duration and that allow the particular ecosystem to recover over an acceptable time frame. Such time frames should be decided on a case-by-case basis and should be in the order of 5-20 years, taking into account the specific features of the populations and ecosystems.

20. In determining whether an impact is temporary, both the duration and the frequency at which an impact is repeated should be considered. If the interval between the expected disturbance of a habitat is shorter than the recovery time, the impact should be considered more than temporary. In circumstances of limited information, States and RFMO/As should apply the precautionary approach in their determinations regarding the nature and duration of impacts.

47. Flag States and RFMO/As should conduct assessments to establish if deep-sea fishing activities are likely to produce significant

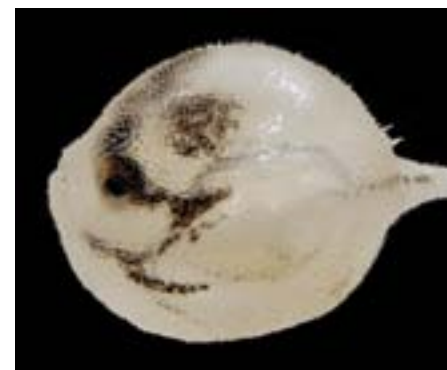
adverse impacts in a given area. Such an impact assessment should address, inter alia:

- i. type(s) of fishing conducted or contemplated, including vessels and gear types, fishing areas, target and potential bycatch species, fishing effort levels and duration of fishing (harvesting plan);
- ii. best available scientific and technical information on the current state of fishery resources and baseline information on the ecosystems, habitats and communities in the fishing area, against which future changes are to be compared;
- iii. identification, description and mapping of VMEs known or likely to occur in the fishing area;
- iv. data and methods used to identify, describe and assess the impacts of the activity, the identification of gaps in knowledge, and an evaluation of uncertainties in the information presented in the assessment;
- v. identification, description and evaluation of the occurrence, scale and duration of likely impacts, including cumulative impacts of activities covered by the assessment on VMEs and low productivity fishery resources in the fishing area;
- vi. risk assessment of likely impacts by the fishing operations to determine which impacts are likely to be significant adverse impacts, particularly impacts on VMEs and low-productivity fishery resources; and
- vii. the proposed mitigation and management measures to be used to prevent significant adverse impacts on VMEs and ensure long-term conservation and sustainable utilization of low-productivity fishery resources, and the measures to be used to monitor effects of the fishing operations.

6 | GLOSSARY

CBD	Convention on Biological Diversity
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CPUE	Catch per Unit Effort
EbM	Ecosystem-based management
EBSAs	Ecologically or Biologically Significant Areas
EEZ	Exclusive Economic Zone
FAO	Food and Agricultural Organization
GEF	Global Environment Facility
GFCM	General Fisheries Commission for the Mediterranean
GOBI	Global Ocean Biodiversity Initiative
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organization
ISO	International Organization for Standardization
IUCN	International Union for Conservation of Nature
IUU	Illegal, Unreported and Unregulated Fishing
MPA	Marine Protected Area
NAFO	Northwest Atlantic Fisheries Organization
NEAFC	North East Atlantic Fisheries Commission
PSSA	Particularly Sensitive Sea Area
RFMO	Regional Fisheries Management Organization
ROV	Remotely Operated Underwater Vehicle
SAI	Significant Adverse Impact
SEAFC	South East Atlantic Fisheries Commission
TNC	The Nature Conservancy
VMEs	Vulnerable Marine Ecosystems
UNCLOS	United Nations Convention on the Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
UNICPOLOS	UN Informal Consultative Process on Oceans and the Law of the Sea
WTO	World Trade Organization

A juvenile deep sea anglerfish.
Photo Credit: Alex Rogers.

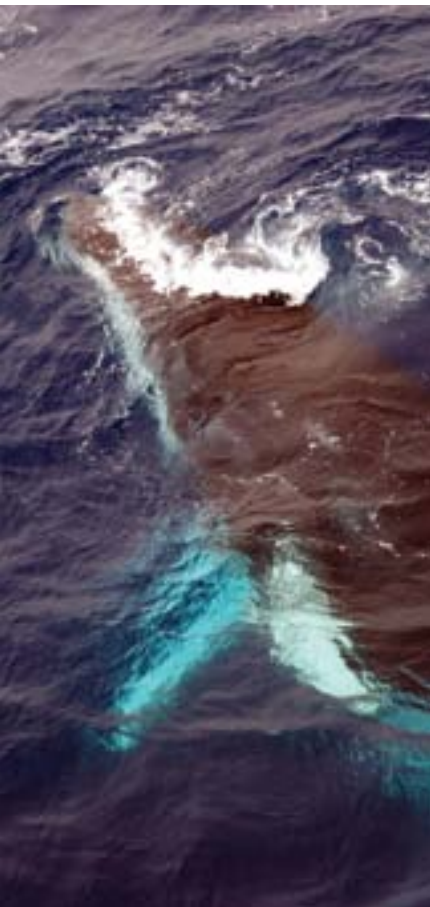


7 | AGENDA OF THE MEETING

Tuesday, 18 January 2011

- 9:00 a.m. Welcome and Introductions: TNC and IUCN (Coffee/tea will be provided)
- 9:30 a.m. Overview of governance arrangements for deep-sea fisheries, Harlan Cohen
- 9:50 a.m. Matthew Gianni: Review of Implementation of the relevant paragraphs of UN General Assembly Resolution 61/105 and 64/72
- 10:10 a.m. Jake Rice: Review of implementation of the FAO guidelines
- 10:30 a.m. Coffee break
- 11:00 a.m. Discussion (Facilitator: Harlan Cohen, IUCN)
Discussion will focus on the following questions:
1. Of the policy tools presented, which are the most appropriate to address management of deep sea fisheries within an ecosystem context?
 2. Is it correct to focus on vulnerable marine ecosystems and potential significant adverse impacts to those ecosystems?
 3. Does resolution 61/105 have the necessary elements? If not, which are missing or how can the existing elements be enhanced to facilitate implementation at national and regional level?
 4. Which are the 3-5 top priority actions that countries/RFMOs should tackle to facilitate implementation of resolution 61/105?
- 12:30 p.m. Lunch
- 1:30 p.m. Case Studies of current approaches to management of deep sea fisheries:
- Pablo Durán Muñoz: Seabed mapping for protection of vulnerable marine ecosystems in the high-seas: the experience of the Spanish Institute of Oceanography (IEO) in the Atlantic Ocean
 - Malcolm Clark: Experience from New Zealand: evolution of approaches to managing deep-sea fisheries
 - Graham Patchell: SIODFA implementation of protection of VME's in the Southern Indian Ocean from significant adverse impacts
 - Denzil Miller: An example from the Southern Ocean
 - William Gibbons-Fly: An example from the North Pacific
- 2:50 p.m. Coffee break
- 3:15 p.m. Discussion (Facilitator: Imen Meliane, TNC)
1. Discussion will focus on the following question:
 2. How do we resolve the disparities on implementation of 61/105 amongst RFMO?
 3. How big is the problem of deep sea fisheries/vulnerable ecosystems within waters subject to national jurisdiction?
 4. What are the incentives, both at national and regional level, to improve management of deep sea fisheries and protect vulnerable ecosystems? What are the incentives to implement the FAO guidelines?
 5. How much capacity building is required at national level, and which areas of capacity building should be prioritized?
 6. What are the incentives and/or opportunities to increase political will to address deep sea fisheries management and vulnerable ecosystem protection?
- 5:00 p.m. Meeting adjourns for the day

Humpback whales feed around seamounts on their migratory journeys. *Photo Credit: Alex Rogers.*



Wednesday, 19 January 2011

- 8:45 a.m. Coffee/tea will be available
- 9:00 a.m. Alex Rogers by video link: Managing uncertainties
- 9:35 a.m. Jeff Ardron: Advances in information and understanding of deep sea ecosystems
- 10:05 a.m. Francis Neat: Data and research for managing sustainable deep sea fisheries
- 10:30 a.m. Coffee break
- 11:00 Discussion (Facilitator: Carmen Revenga, TNC)
Discussion will focus on improving data availability, identifying and prioritizing requirements for data reporting under resolution 61/105.
Some questions the group may want to address include:
1. What data are necessary to sustainably manage deep-sea fish stocks? Which deep sea stocks currently have sufficient information for sustainable management within an ecosystem context?
 2. Which are the major data gaps and how to improve them?
 3. How can accessibility to deep sea fisheries data and ecosystems be improved?
 4. How to solve proprietary data issues? Do issues related to data limitations and accessibility apply equally within and beyond national jurisdiction?
 5. Can the effects on deep-sea fish stocks of I,U,U fishing be estimated with any accuracy?
- 12:30 p.m. Lunch
- 1:30 p.m. Breakout session: Recommendations for improvement in deep sea fisheries management
The group will be divided into two. Each breakout group will build upon the main elements identified in the previous sessions. The main purpose of the breakout groups will be to focus on specific recommendations to improve:
- The tools and arrangements for deep sea fisheries management such as the UNGA resolutions; the FAO guidelines etc.
 - and the implementation of these tools, taking into account lessons learned and successful experiences that could be replicated
- 3:30 p.m. Coffee break
- 4:00 p.m. Breakout session: Recommendations for improvement in deep sea fisheries management
- 5:00 p.m. Meeting adjourns for the day



Black-bellied rose fish find shelter within a mass of *Lophelia*. Photo Credit: *Lophelia II 2010 Expedition*, NOAA-OER/BOEMRE.

Thursday, 20 January 2011

- 9:15 a.m. Report from breakout groups (Facilitator: Harlan Cohen, IUCN)
- 10:30 a.m. Coffee break
- 10:45 a.m. Consolidation of recommendations and identification of next steps to carry them forward.
- 12:30 p.m. Lunch
Workshop adjourns

8 | LIST OF PARTICIPANTS

Jeff Ardron, Marine Conservation
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Juan Bezaury, The Nature Conservancy

Malcolm Clark, National Institute of Water
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Harlan Cohen, International Union for
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Pablo Durán Muñoz, Instituto Español
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Close-up view of a bubblegum coral being colonized by a parasitic zoanthid at 1588 meters depth. *Photo Credit: NOAA Okeanos Explorer Program, INDEX-SATAL 2010.*



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