**DRAFT* February 9, 2007*

HIGH SEAS MPAs AND DEEP-SEA FISHING[1]

by

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Summary

Experiences in coastal and offshore waters under national jurisdiction have shown marine protected areas (MPAs) to be an important tool for biodiversity conservation and ecosystem-based oceans and fisheries management. Spatial and temporal closures established as a fisheries management tool are here considered as a subset of MPAs. If properly designed and managed, MPAs can help protect, recover and maintain fish stocks, population size distribution, trophic complexity, ecosystem resilience, habitat structure, biological diversity as well as species' feeding, breeding, spawning and nursery grounds. MPAs are not a panacea however: their goals are most effectively achieved when human activities, including destructive practices, are controlled in the context of effective ecosystem-based management both within and outside the MPA. Further studies and adaptive management would assist in improving MPA design and effectiveness.

International law sets forth clear obligations for States to protect and preserve the marine environment and to conserve marine resources and biodiversity. Governments at the World Summit on Sustainable Development set a target of 2012 for the development of representative networks of MPAs, consistent with international law and based on scientific information. To assist in implementing these obligations and targets, the United Nations, the Parties to Convention on Biological Diversity, the FAO's Committee on Fisheries and the Review Conference for the Fish Stocks Agreement have called for greater use of MPAs in fisheries management to improve fisheries and to protect biodiversity. Efforts are now underway to develop agreed criteria and biogeographic classification systems for representative MPA networks. At the regional level, there are active programs for developing MPAs in areas beyond national jurisdiction in the Northeast Atlantic, the Mediterranean and the Southern Ocean. Several RFMOs have also recently closed areas to protect seamounts or cold water corals or to prevent deep-sea fisheries from expanding into new or deeper waters. More comprehensively, CCAMLR uses rules on new and exploratory fisheries to control and restrict fisheries absent adequate data and is initiating work towards a system of MPAs.

In taking measures including MPAs in the deep sea, it will be important to account for the heightened susceptibility of many deep-sea fish species to rapid depletion and the vulnerability of most deep-sea ecosystems to rapid damage. Even a small numbers of tows from bottom contacting trawl gear can cause significant impacts to seamount communities. Intense fishing with other gears may have a severe cumulative impact. Most deep seabed habitats will be very slow to recover, and their loss is predicted to result in reduced abundance and diversity of fish as well as other species. Despite the absence of data on many aspects of deep-sea ecosystems, it is already possible to draw on a variety of sources to identify key species and/or habitats of concern. Predictive modelling can aid in identifying the spatial distribution of key features such as stony corals. Data already available for some areas of the deep seas include: historic and current catch and bycatch data; bathymetry from bottom swath mapping; oceanographic monitoring (e.g. drifters, etc.), satellite/remote sensing, altimetry and sediment thickness.

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[1] This document was prepared for the Expert Consultation on Deep-sea Fisheries in the High Seas which took place in Bangkok, Thailand from 21–23 November 2006.

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The author gratefully acknowledges the expert assistance of Malcolm Clark, Harlan Cohen, Robert George, Sarah Gotheil, Andrew Hurd, J. Anthony Koslow and Alex Rogers in reviewing various drafts of this report. The author also thanks the participants of the FAO Experts Consultation on Deep Sea Fisheries in Bangkok, Thailand (November 2006) for their comments.

Protection of vulnerable deep-sea ecosystems may require a combination of management tools, including a major reduction in effort in fisheries using bottom contacting gears, improved spatial management to prevent overlap with vulnerable areas, closing areas to bottom contacting gears (i.e. MPAs), and substitution or modification of gears to reduce contact with the benthos. The effectiveness of such measures will depend of how effort is redistributed, the scale of the areas protected, and the relative effectiveness of any substituted gear.

Several major governance and legal issues at the global and regional levels could hinder the effectiveness of High Seas MPAs as a deep-sea fisheries management tool. These include: substantive and implementation gaps in the regime in UNCLOS and the CBD for protection of marine biodiversity in areas beyond national jurisdiction, the current lack of RFMOs competent to manage deep-sea fisheries in 75 percent of the high seas, and the inconsistent implementation of ecosystem-based and precautionary management measures by those RFMOs that do have the legal competence. Some of these issues will be addressed if the 2006 UNGA Resolution on Sustainable Fisheries is effectively implemented. However, the lack of a binding global agreement such as the UN Fish Stocks Agreement for discrete deep-sea fish stocks on the High Seas means that there are neither binding conservation, governance, enforcement or dispute resolution rules, nor are there formal mechanisms to review management effectiveness.

In developing plans for High Seas MPAs with respect to deep-sea fisheries, there will be a need for: science-based criteria and transparent processes for identifying areas appropriate for fishing as well as for MPAs (including vulnerable marine ecosystems); rules and research so that information and understanding can precede exploitation; and finer-scale management and reporting so that experts can identify what and where has been fished and what and where can be protected. At the same time, many marine experts suggest that MPAs need to be vastly scaled up in number and size to protect deep-sea biodiversity at ecosystem, species and genetic levels. Improved cooperation between, among and within regional fisheries and marine environmental bodies, intergovernmental and non-governmental organizations, governments, the research community, and the deep sea fishing industry will be essential.

1. INTRODUCTION

Marine protected areas (MPAs) are now widely accepted as an important tool to conserve marine biological diversity and productivity, including ecological life support systems. They have the potential to make a significant contribution to modern fisheries management, which recognizes the need to protect biodiversity to preserve ecosystem structure, functions and processes upon which fisheries – and all marine life -- depend. This report focuses on MPAs in the water column and on the seabed beyond areas of national jurisdiction (the "High Seas"[3]) with respect to deep-sea fisheries management. It builds upon the outcomes and background reports from a recent FAO workshop on MPAs for Fisheries Management, held in Rome in June 2006.[4] Annex I contains a list of acronyms used in this report.

[3] Technical definitions used herein are based on the legal background report prepared for the FAO MPA Workshop by Young, T.R. 2006. The Legal Framework for MPAs and Successes and Failures in Their Incorporation into National Legislation, at page 11.

[4] Key Points from the FAO Workshop on the Role of MPAs in Fisheries Management 12-14 June 2006, FAO Summary Dated 4 July 2006. Five reports were prepared for the FAO MPA Workshop: 1) Martin, K., Samoilys, M.A., Hurd, A.K., Meliane, I., and Lundin, C.G. 2006. Experiences in the Use of Marine Protected Areas with Fisheries Management Objectives: A Review Of Case Studies, 2) Botsford, L.W., Micheli, F. and Parma, A.M. 2006. Biological and Ecological Considerations in the Design, Implementation and Success of MPAs; 3) Pomeroy, R.S., Mascia, M.B., and Pollnac, R.B. 2006. Marine Protected Areas: The Social Dimension; 4) Christie, P. and White, A.T. 2006. Best Practices in Governance and Enforcement of Marine Protected Areas: An Overview; 5) Young, above ft. 2.

Although the topic of MPAs as they relate to deep-sea fishing on the high seas is vast, this report specifically addresses the following issues:

1. Use of MPAs in coastal areas, in particular as it relates to fisheries management;
2. Rationales and views expressed for the creation of High Seas MPAs;
3. Present status of High Seas MPAs;
4. High Seas MPAs and Deep-sea Fishing: Special considerations related to deep-sea species/habitat specifications (benthic) and conservation;
5. High Seas MPAs and Deep-sea Fishing: Special considerations related to deep-sea fisheries management;
6. RFMO involvement in High Seas MPAs and deep water fisheries;
7. High Seas MPAs: Deep-sea fisheries and compliance;
8. High Seas MPAs and Deep-sea Fishing: Governance and legal issues at the global level;
9. High Seas MPAs and Deep-sea Fishing: Governance and legal issues at the regional level; and
10. Next steps for High Seas MPAs and Deep-sea Fisheries.

2. SUMMARY ON THE USE OF MPAs IN COASTAL AREAS, IN PARTICULAR AS IT RELATES TO FISHERIES MANAGEMENT

In coastal areas, MPAs are frequently used to improve biodiversity conservation and fisheries management as well as for other cultural, socio-economic, spiritual, aesthetic, historic and intrinsic reasons. These reasons may include protecting natural quality environments for their non-use benefits to present and future generations. The discussion below will focus on MPAs and their role in fisheries management and biodiversity conservation, as biodiversity conservation is now recognized as an inextricable component of responsible fisheries management.[5]

A commonly accepted definition for MPAs, used in the Convention on Biological Diversity (CBD) Programme of Work on Marine Biodiversity, provides:

> *any defined area within … the marine environment, together with its overlaying waters and associated flora, fauna and historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings.*[6]

MPAs have a wide variety of names, such as specially protected areas, marine reserves, preserves, sanctuaries, wilderness areas, specially managed areas and parks. They can be equally varied in purpose, from strict protection from all human use to zoned multiple use areas. The World Conservation Union (IUCN) has provided a category system to differentiate the varying levels of management that such areas may be afforded.[7] The degree of regulation is not necessarily the same throughout the area; indeed most

5 1995 FAO Code of Conduct for Responsible Fisheries. As noted in the Introduction: "This Code sets out principles and international standards of behaviour for responsible practices with a view to ensuring the effective conservation, management and development of living aquatic resources, with due respect for the ecosystem and biodiversity."

6 CBD Conference of the Parties, Decision VII/5, note 11. IUCN uses a slightly different definition of a marine protected area: "any area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment." Kelleher, G. (ed.), 1999. Guidelines for Marine Protected Areas. IUCN, Gland, Switzerland and Cambridge, UK.

7 The six IUCN Categories for Protected Areas (PAs) are:
Category I.A Strict Nature Reserve/Wilderness Area (Science/Research): PAs managed for scientific and research purposes;

large MPAs are zoned into different area categories. The Tasman seamount reserve in southeast Australia is an example of an MPA for deep-sea biodiversity that is zoned vertically so restrictions on fishing vary by depth, as opposed to horizontally.[8]

Regardless of name, size, design or purpose, all MPAs have in common the goal of providing an enhanced level of protection than exists in surrounding waters or seafloor. Fisheries closed areas such as those used for stock restoration or habitat recovery are sometimes excluded under MPA definitions, as their primary purpose is not biodiversity conservation and their protection may be temporary or seasonal.[9] Increasingly though, and for the purposes of this paper, fisheries closed areas are included in the general category of MPAs, as these areas generally provide a higher level of protection than their surroundings. The objectives and design of the MPA will ultimately determine its conservation and fisheries benefits. It is recognized however that the process of identification, selection, design and management may greatly differ if the MPA is designated pursuant to fisheries or conservation legislation, or if the area is within a nation's territorial sea, EEZ or continental shelf or on the High Seas. Management plans are rarely adopted for fisheries closed areas, whereas they are a common tool for most other MPAs. Individual nations can establish and enforce MPAs within their zones of national jurisdiction, whereas High Seas MPAs require international cooperation; consultation; and consent.

MPAs are now widely accepted as an important tool to conserve the biological diversity and productivity of the oceans and as an essential component in the implementation of an ecosystem approach to oceans and fisheries management.[10] Unlike conventional fisheries management tools that depend on control of

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Category I.B Strict Nature Reserve/Wilderness Area (Protection): PAs managed for wilderness protection purposes;
Category II National Park: PAs managed for ecosystem protection and recreation;
Category III Natural Monument: PAs managed for conservation of specific natural features;
Category IV Habitat/Species Management Area: PAs managed for species/habitat/ecosystem conservation through management intervention;
Category V Protected Landscape/Seascape: PAs managed for landscape/seascape protection and recreation; and
Category VI Managed Resource Area: PAs managed for sustainable use of natural ecosystems.
IUCN/WCPA, 1994. Guidelines for Protected Area Management Categories; Young, above ft. 2 (Appendix 1).

8 See Young, above ft. 2; Martin et al., above ft. 3; Kimball L. 2005. The International Legal Regime of the High Seas and the Seabed Beyond the Limits of National Jurisdiction and Options for Cooperation for the Establishment of Marine Protected Areas (MPAs) in Marine Areas Beyond the Limits of National Jurisdiction. Secretariat of the Convention on Biological Diversity, Montreal, Technical Series no. 19. Available at: http://www.biodiv.org/doc/publications/cbd-ts-19.pdf.

9 Area closures, as described in Martin et al., "are fisheries management tools, often used in combination with other measures within a target-species based management, to support the management of a fisheries resource, or as a restoration tool for a fishery that has been over-exploited. They can encompass areas closed to all fishing activities, areas closed to fishing for single species, or areas with gear or vessel restrictions - both as temporal or permanent measures to manage fishing effort. Area closures usually aim at stock enhancement or recovery, but also include recovery for sensitive habitats and avoidance of specific vulnerable species. Broader ecosystem objectives are increasingly taken into account. Although generally aiming at enhancing the stock of a particular fisheries resource, area closures can also yield positive results for several other associated or dependent species." Martin et al above ft. 3. It should be noted however that areas closed for stock enhancement purposes may cause other species to increase or decline.

10 Ecosystem-based management for the oceans has been defined as: "an integrated approach to management that considers the entire ecosystem, including humans. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the services humans want and need. Ecosystem-based management differs from current approaches that usually focus on a single species, sector, activity or concern; it considers the cumulative impacts of different sectors. Specifically, ecosystem-based management:

- emphasizes the protection of ecosystem structure, functioning, and key processes;
- is place-based in focusing on a specific ecosystem and the range of activities affecting it;
- explicitly accounts for the interconnectedness within systems, recognizing the importance of interactions between many target species or key services and other non-target species;
- acknowledges interconnectedness among systems, such as between air, land and sea; and
- integrates ecological, social, economic, and institutional perspectives, recognizing their strong interdependences.

Scientific Consensus Statement on Marine Ecosystem-Based Management Prepared by scientists and policy experts to provide information about coasts and oceans to U.S. policy-makers. Released on March 21, 2005, available at: http://compassonline.org/files/inline/EBM%20Consensus%20Statement_FINAL_July%2012_v12.pdf.

effort or take, large scale MPAs or networks of MPAs may be better suited to protecting the structure, functions and processes that underpin ecological life support systems. MPAs also have the potential to protect us from our own ignorance and prevent significant harm, a critical component of a precautionary approach.

The Heard Island and McDonald Islands (HIMI) Marine Reserve established by Australia in the sub-Antarctic provides a useful example of an MPA designated as part of a comprehensive management scheme for fisheries and biodiversity that encompasses large deep-sea areas.[11] The HIMI Marine Reserve is designed to:

- protect nursery grounds e.g. Antarctic cods and icefishes nearshore, toothfish, rattails/grenadiers (macrourids) and skates in deeper waters;
- establish/maintain refuges from fishing;
- create a reference area to determine impact of fishery on different types of habitats; and
- assist research programmes to obtain a better understanding of the impacts of fisheries on marine environment and food-web.

MPAs can also be an important tool for restoring damaged seascapes and for enhancing the recovery of over-fished stocks. In recent years more vigorous efforts have been undertaken by fisheries management bodies around the world to create MPAs for the purposes of re-establishing lost biodiversity, trophodynamic integrity and fish density and biomass.

In coastal waters, studies by the US National Research Council and others have demonstrated that effectively managed MPAs can contribute to conservation and sustainable use of marine biodiversity and resources by safeguarding areas that are:

- vital to maintaining viable populations of threatened or endangered species;
- important for species and genetic diversity;
- critical breeding, nursery and feeding habitats such as seagrass beds, mangroves and coral reefs;
- of adequate size to encompass representative examples of marine life and ecosystems to ensure their long-term viability;
- unique, rare or have other outstanding values or features;
- spatially complex and slow to recover, such as benthic habitats like maerl beds, corals reefs, and sponge beds;
- spawning sites for species, for example groupers, subject to commercial fishing pressure when the animals congregate in large numbers to spawn;
- offshore nursery areas, migratory corridors or other vulnerable population bottlenecks; and
- reference sites for long-term research and monitoring.[12]

Fisheries-related benefits of effectively designed and implemented MPAs are thought to include:

- protection of specific life stages (larval nursery grounds);
- protection of critical functions of an exploited population (feeding grounds, spawning grounds);

11 Gotheil, S. 2006. Heard Island and McDonalds Islands Deep-Sea Fishery, Case Study prepared for IUCN Global Marine Program.
12 National Research Council Committee on Ecosystem Management for Sustainable Marine Fisheries (NRC), 2001. Marine Protected Areas: Tool for sustaining ocean ecosystem. NRC: USA, 288 pages; Martin et al., above ft. 3.

- spillover of an exploited species;
- dispersion center for larval recruitment of an exploited species;
- protection of habitat and genetic diversity;
- ecological offsets – to compensate for environmental damage elsewhere;[13]
- restoration of fisheries productivity by promoting the recovery of populations of species, recolonisation of areas by previously scarce organisms, increase in size and age of individuals, and recovery of habitat and thereby increasing structural complexity;[14] and
- protection of components of ecosystems that are not protected by other forms of fisheries management.

Theory and modelling simulation, as well as a growing amount of actual experience, support the idea that MPAs can help meet these fisheries-related objectives. However, further efforts are required to test how to maximize these benefits in practice. Just as with other fisheries management measures, MPAs must be carefully planned, designed and implemented if they are to achieve their objectives. Many MPAs have had little or no baseline data for comparison, or were too small or too recent to demonstrate the effects of protection.[15] Good monitoring and evaluation procedures are also essential to learn from the results.

The contrasting combination of the physical connectivity of seawater combined with the increasingly known genetic isolation of marine species means that networks of MPAs are well-suited to support marine ecosystem health within single ecosystems as well as across ocean basins. Networks of protected places can help maintain biological connections between interdependent MPAs. A common example is where larvae from one MPA support populations of one or more species within other MPAs or spawning, breeding or key feeding sites for migratory species.

Coastal experience has also demonstrated the value of a representative approach to MPAs that seeks to protect not just what is known to be of value today, but also what may turn out to be important tomorrow. For example, tropical coral reef communities in many parts of the world are now doing better where adjacent mangrove, seagrasses and coral rubble have been protected, though their importance to coral reef ecosystems may not have been and may still not be fully understood.[16]

Representative systems of MPAs seek to provide protection for examples of all major ecosystem components in conjunction with their characteristic habitats and species within and across each bioregion. Authorities in Australia are now developing a "bioregionalization" or biogeographic understanding of ecological communities, to help them achieve their goal of a "comprehensive, adequate and representative system" of MPAs.[17] It will also serve as a cornerstone for ecosystem-based management. Bioregionalization can be done even absent detailed knowledge by taking advantage of available information on fish fauna and other well-known species groups, depth, temperature, salinity, bottom type and complexity. Groups of experts in carefully designed processes have frequently been used to bring

13 T. Ward and E. Hegerl, 2003 Marine Protected Areas in Ecosystem-based Management of Fisheries. A report for the Department of the Environment and Heritage, Australia.
14 Gell, F.R. and Roberts, C.M. 2003. The fishery effects of marine reserves and fishery closures. WWF: Washington DC, USA, 90 pp; Sweeting, C.J. and Polunin, N.V.C. 2005. Marine Protected Areas for management of temperate North Atlantic Fisheries – lessons learned in MPA use for sustainable fisheries exploitation and stock recovery. A report to DEFRA. 64 pp; Botsford et al., above ft. 3.
15 Sainsbury, K and Sumalia, U.R., 2003. Incorporating ecosystem objectives into management of sustainable marine fisheries, including "best practice" reference points and use of marine protected areas, in: Responsible Fisheries in the Marine Ecosystems (Sinclair, M. and Valdimarsson, G. (eds.)), FAO, Rome (Italy) 343-361.
16 Wilkinson, Clive (ed.) 2004. Status of Coral Reefs of the World. Vol. 1. p.103.
17 Environment Australia 2003. The Commonwealth Marine Protected Areas Program. ISBN 0642549184; Australian Government. 2006. Marine Bioregional Planning.

together such information. Currently, these efforts can be complemented by complex computer programs such as MARXAN, which can generate a wide variety of network options to achieve the most cost-effective and ecologically efficient results.

Strictly protected areas where no extractive activities are allowed (no-take areas) may provide added value for fisheries management as reference sites for measuring the effects of fisheries-induced changes, and also as sustainability indicators and reference points.[18] Strictly protected areas are also promoted as an important insurance policy as they provide a hedge against uncertainty (including resource assessment uncertainty), risk of fisheries collapse, and provide greater resilience in the face of ecological and social change by maintaining structure, function and processes of ecosystems and biodiversity.[19]

In the face of increasing oceanic changes, including warming temperatures, shifting circulation patterns and sea water acidification, MPAs are increasingly promoted as a vital precautionary tool to maintain ecosystem health and resilience. As has been suggested by experience with tropical coral reefs, areas that are protected from other external pressures will most likely be better able to withstand such changes.[20] Improving the conservation of marine ecosystems through reforming fisheries management and through representative MPA systems are now viewed by some experts as two essential safeguards to preserving ocean life.[21]

The importance of embedding MPAs in a larger framework for integrated coastal management and/or ecosystem-based management has also been confirmed in coastal areas.[22] Likewise, MPAs for fisheries management are most effective when part of a suite of other measures to improve fisheries sustainability and eliminate destructive practices (e.g. effort reductions, gear restrictions, monitoring and compliance mechanisms). Otherwise the problems may just be shifted elsewhere.[23]

The actual choice, size and spacing of MPAs will depend on the characteristics of the specific ecosystem targeted as well as on conservation and management objectives. It is widely acknowledged that optimal MPA design for fisheries management is subject to considerable uncertainty due to limited knowledge and poor understanding of many aspects of fish biology and ecology. This lack of certainty may sometimes be an impediment to action, but as has been demonstrated elsewhere, management can evolve and adapt as experience and knowledge grow. Moreover, as indicated by Botsford *et al.* (2006) such uncertainty is also a problem affecting fisheries management generally, which additionally has considerable additional problems due to "implementation uncertainty."[24]

Some guidance exists for developing MPAs in data poor situations. For example, Botsford *et al.* (2006) conclude that in such situations "reserves [i.e. no-take MPAs], probably in combination with some form of

18 Sainsbury and Sumalia, above ft. 14.
19 Worm, B., Barbier, E.B., Beaumont, N., Duffy, J.E., Folke, C. Halpern, B.S., Jackson, J.B.C., Lotze, H.K., Micheli, F., Palumbi, S.R., Sala, E. Selkow, K.A., Stachowicz, J.J., and Watson, R (2006). Impacts of Biodiversity Loss on Ocean Ecosystem Services. Science, Vol. 314, pp. 787-790. In this comprehensive study, the authors reported that marine biodiversity loss caused by overexploitation, pollution and habitat destruction is increasingly impairing ocean ecosystem services necessary to provide food, maintain water quality, and recover from perturbations. Based on a mega-analysis of the impacts of 44 fully protected marine reserves and 4 fishery closures, they concluded that marine reserves and closures were an important way to build resilience to reverse these trends.
20 Schubert, R., Schellnhuber, H.-J., Buchmann, N., Epiney, A., Griesshammer, R., Kulessa, M., Messner, D., Rahmstorf, S., Schmid, J. 2006. The Future Oceans – Warming Up, Rising High, Turning Sour, WGBU German Advisory Council on Global Change. WBGU, Berlin, 110 pp; Grimsditch, G.D. and Salm, R.V. 2006. Coral Reef Resilience and Resistance to Bleaching. IUCN, Gland, Switzerland. 52pp.
21 Id.
22 Christie and White, above ft. 3.
23 ICES WGDEC 2005. Report of the Working Group on Deepwater Ecology (WGDEC), 8-11 March 2005. ICES Headquarters, Copenhagen. ICES CM 2005/ACE:02. 76p.
24 Botsford et al., above ft. 3.

effort limitation, tend to be more advisable when many species are taken by the same gear and when the resources have a persistent spatial structure due to low mobility of the individuals."

Similarly, experience in areas with complex habitats and relatively sedentary species or periodic aggregations of species suggests that MPAs would also be an appropriate and useful tool for deep-sea fisheries management, despite the dearth of knowledge. A recent review of case studies from Northeast Atlantic temperate waters found that area closures, if combined with effort removal, generally lead to increases in associated fauna, habitat complexity and enhanced survival in fish species.[25] The review also concluded that MPAs play an important role in preventing damage by fishing gear especially to biogenic, slow-growth-recovery habitats (as e.g. maerl beds, deep-water corals, sponge communities). In contrast, habitats subject to frequent natural disturbance are unlikely to benefit from MPAs.

Fragmentation of ecosystems and habitats may present a significant threat to deep-sea biodiversity as it does in tropical rainforests. Many marine experts suggest that MPAs need to be vastly scaled up in size and number to maintain foodchain structure, productivity and flows and to safeguard biodiversity at ecosystem, species and genetic levels.[26] Experts may need to investigate the appropriate size and scale of MPAs and MPA networks and systems to ensure comprehensiveness, adequacy and representativity.

As revealed in the discussions at the FAO workshop on MPAs and the background discussion papers, several important lessons have been learned that would be valuable in the deep-sea context as well:

- MPAs require political will as well as supportive legal and jurisdictional frameworks.[27]
- It may be necessary to harmonize legislation between sectors and to ensure institutional coordination, consultation and cooperation among agencies with relevant interests.[28]
- Zonation schemes may be advantageous in locations with sufficient capacity for enforcement of detailed, spatially explicit regulations.[29]
- Involvement of stakeholders both within and beyond MPA boundaries is key. MPAs with community and industry support are generally more successful as it is easier to secure compliance.[30]

An important area for further study is whether stakeholder relations in offshore fisheries may be different from those in coastal areas. In coastal areas, local communities and fishers often have a direct interest in safeguarding a specific area or region, as options for fisheries expansion are limited by time and fuel costs. Is the equation changed in the open ocean, and particularly on the High Seas, where fishers are free to move on to new areas or resources?[31] Is there less economic incentive for High Seas fishers to support sustainable management of the fishery? To secure effective enforcement of High Seas MPAs, persistent problems of illegal, unregulated and unreported (IUU) fishing activities and non-compliance by some RFMO member states will need to be considered and addressed. As will be described in Section 7 below,

25 Department for Environment Food and Rural Affairs (DEFRA). 2006. The potential role of Marine Protected Areas (MPAs) for fisheries management purposes: Fisheries Directorate's summary of the main conclusions emerging from three desk studies. Web-source: http://www.defra.gov.uk/fish/science/index.htm.
26 See Sainsbury and Sumalia, above ft. 14.
27 Young, above ft. 2. Christie and White, above ft. 3. Strong traditions and cultural norms may replace the need for a legal base among local users, but may not provide adequate protection from outsiders.
28 Martin et al., above ft. 3
29 Christie and White, above ft. 3.
30 Martin *et al*., above ft. 3.
31 F. Berkes, T. P. Hughes, R. S. Steneck, J. A. Wilson, D. R. Bellwood, Crona, C. Folke, L. H. Gunderson H. M. Leslie, J. Norberg, M. Nyström, P. Olsson, H. Österblom, M. Scheffer, B. Worm, 2006. Globalization, Roving Bandits, and Marine Resources. Science Vol 311 17 March 2006 1557-1558.

significant new efforts may be necessary to enhance compliance and secure enforcement with deep-sea fisheries conservation and management measures.

3. OVERVIEW OF MAIN RATIONALES AND VIEWS EXPRESSED FOR THE CREATION OF HIGH SEA MPAs

On the High Seas, the main rationales for creation of MPAs are similar to those described above for coastal areas. In addition, MPAs are viewed as an important vehicle for implementing the "shared obligations of all countries to protect against the destruction of marine species and ecosystems, and the collapse of shared fisheries."[32] Under the international law of the sea as reflected in UNCLOS, all nations are entitled to exercise their high seas freedoms consistent with their obligations to protect the marine environment, to conserve natural resources, and to cooperate with other States for these purposes.[33] The UN Fish Stocks Agreement further elaborates on these duties by requiring the use of best scientific information available and the application of the precautionary approach to protect biodiversity in the marine environment.[34]

The high level of support by most governments for High Seas MPAs today was presaged by commitments made at the 2002 World Summit on Sustainable Development (WSSD) to significantly reduce the rate of loss of biodiversity by 2010 (para. 44), and to promote ocean conservation and sustainable development (paras. 30-32). In specific, world leaders committed to:

> *30(d) Encourage the application by 2010 of the ecosystem approach,*
>
> *32(a) Maintain the productivity and biodiversity of important and vulnerable marine and coastal areas, including in areas within and beyond national jurisdiction,*
>
> *32(c) Develop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive fishing practices, the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012 and time/area closures for the protection of nursery grounds and periods, proper coastal land use and watershed planning and the integration of marine and coastal areas management into key sectors…*

One of the primary driving forces for High Seas MPAs is concern by many states, scientists, conservation organizations and the public over the impacts of fishing activities on marine biodiversity. Evidence of declines in fish stocks, ecosystem shifts and collapses, bycatch of vulnerable long-lived species such as albatrosses, leatherback and loggerhead sea turtles, sharks and marine mammals, and destruction of benthic habitats by bottom dragging gear were perceived as not being addressed effectively by traditional fisheries management tools or organizations in line with public expectations or with the biodiversity protection and impact minimization requirements of the UN Fish Stocks Agreement (articles 5(g) and 5(f)) or of the FAO Code of Conduct for Responsible Fishing (article 6.6).

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32 Young, above ft. 2, at page 11.

33 On the high seas, all states are entitled to enjoy the freedoms of navigation, overflight, laying of submarine cables and pipelines, construction of artificial islands or installations, fishing, and marine scientific research, subject to the conditions laid down in UNCLOS and other rules of international law. The duties to protect the marine environment, including rare or fragile ecosystems as well as the habitat of depleted, threatened and endangered species and other forms of marine life, and to cooperate on a global or regional basis for the protection of the marine environment, are stated in UNCLOS Articles 192, 194.5 and 197. The duties to conserve living resources in the high seas and to cooperate for these purposes are specified in UNCLOS Articles 116-120. Thus UNCLOS imposes specific conditions on the exercise of these high seas freedoms. Kimball above ft. 7.

34 Young, above ft. 2 at page 13, citing Fish Stocks Agreement articles 5(b)(c)(d).

With respect to deep-sea fisheries, MPAs – in conjunction with gear restrictions and effort controls – are viewed as an important vehicle for protecting vulnerable deep-sea ecosystems. Mounting concern over the impacts of deep-sea bottom trawling on seamounts, cold water corals and other vulnerable ecosystems resulted in a United Nations General Assembly (UNGA) resolution in 2004 (UNGA 59/25) that urged States and regional fisheries management organisations (RFMOs) to take urgent action to protect seamounts, cold water corals and hydrothermal vents from destructive fishing practices, including bottom trawling that has adverse impacts on vulnerable marine ecosystems.[35] In 2006 the UN Secretary General released a report on the Impacts of Fishing on Vulnerable Marine Ecosystems: Actions taken by States and regional fisheries management organizations and arrangements.[36] This report concluded that: "Some States have undertaken, or are in the process of undertaking, extensive efforts to protect some fishery habitat areas within their national jurisdiction, in particular through the establishment of protected areas. However, this is not the case in the high seas, though deep-sea habitats in these areas are extremely vulnerable and require protection."[37]

In response to these concerns, in November 2006 the UNGA called on States and RFMOs to take measures to "prevent significant adverse impacts on vulnerable marine ecosystems" or to refrain from fishing.[38] The relevant paragraphs of this UNGA Resolution on Sustainable Fisheries are further described in Section 3 and attached in Annex II.

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35 In Res 59/25, the UN General Assembly:

> 66. Calls upon "States, either by themselves or through regional fisheries management organizations or arrangements, where these are competent to do so, to take action urgently, and consider on a case-by-case basis, and on a scientific basis, including the application of the precautionary approach, the interim prohibition of destructive fishing practices, including bottom-trawling that has adverse impacts on vulnerable marine ecosystems, including seamounts, hydrothermal vents and cold-water corals located beyond national jurisdiction, until such time as appropriate conservation and management measures have been adopted in accordance with international law;
>
> 67. Calls upon regional fisheries management organizations or arrangements with the competence to regulate bottom fisheries to urgently adopt, in their regulatory areas, appropriate conservation and management measures, in accordance with international law, to address the impact of destructive fishing practices, including bottom-trawling that has adverse impacts on vulnerable marine ecosystems, and to ensure compliance with such measures;
>
> 68. Calls upon members of regional fisheries management organizations or arrangements without the competence to regulate bottom fisheries and the impacts of fishing on vulnerable marine ecosystems to expand the competence, where appropriate, of their organizations or arrangements in this regard;
>
> 69. Calls upon States to urgently cooperate to establish new regional fisheries management organizations or arrangements, where necessary and appropriate, with the competence to regulate bottom fisheries and the impacts of fishing on vulnerable marine ecosystems in areas where no such relevant organization or arrangement exists;
>
> 70. Requests the Secretary-General, in cooperation with the Food and Agriculture Organization, to include in his next report concerning fisheries, a section on the actions taken by States and regional fisheries management organizations and arrangements to give effect to paragraphs 66 to 69 above in order to facilitate discussion of the matters covered in those paragraphs; (UNGA 59/25, para. 66-70).

36 UN Sec. Gen. 2006. The Impacts of Fishing on Vulnerable Marine Ecosystems: Actions taken by States and regional fisheries management organizations and arrangements to give effect to paragraphs 66 to 69 of General Assembly resolution 59/25 on sustainable fisheries, regarding the impacts of fishing on vulnerable marine ecosystems Report of the Secretary-General July 2006 A/61/154 (hereinafter UN Sec. Gen. Impacts of Fishing Report).

37 Id., para. 203.

38 UNGA 61/L.38. Paragraph 83 contains the key operative language:

> 83. Calls upon regional fisheries management organizations or arrangements with the competence to regulate bottom fisheries to adopt and implement measures, in accordance with the precautionary approach, ecosystem approaches and international law, for their respective regulatory areas as a matter of priority, but not later than December 31, 2008:
>
> A. To assess, on the basis of the best available scientific information, whether individual bottom fishing activities would have significant adverse impacts on vulnerable marine ecosystems, and to ensure that if it is assessed that these activities would have significant adverse impacts, they are managed to prevent such impacts, or not authorized to proceed;
>
> B. To identify vulnerable marine ecosystems and determine whether bottom fishing activities would cause significant adverse impacts to such ecosystems and the long-term sustainability of deep sea fish stocks, inter alia by improving scientific research and data collection and sharing, and through new and exploratory fisheries;
>
> C. In respect of areas where vulnerable marine ecosystems, including seamounts, hydrothermal vents and cold water corals, are known to occur or are likely to occur based on the best available scientific information, to close such areas to

The UN Fish Stocks Agreement Review Conference in May of 2006 also emphasized the need for RFMOs to take significant steps to reduce fishing impacts on marine biodiversity and to incorporate the ecosystem and precautionary approaches more fully into all types of fisheries management measures. The Review Conference urged States and RFMOs to develop management tools, *to include marine protected areas*, to effectively conserve and manage straddling and highly migratory fish stocks and discrete high seas fish stocks and to protect habitats, marine biodiversity and vulnerable marine ecosystems in accordance with the best available scientific information and consistent with international law.[39]

A second driving force is the desire to improve biodiversity conservation through an ecosystem approach to oceans management.[40] Representative networks of MPAs and other area-based management measures are widely viewed as key tools – though not the only ones – to improve integrated conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction.[41] Thus High Seas MPAs were endorsed at both the CBD Conferences of the Parties[42] and at the UN *Ad hoc* Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction (hereinafter UN High Seas Working Group). Discussions continue as to how best to implement High Seas MPAs in the context of a wider ecosystem approach to High Seas management and within the framework of UNCLOS. As some states fear that High Seas MPAs may impinge on high seas freedoms, it is acknowledged that such MPAs should be established consistent with international law and in the context of best available scientific information, the precautionary approach and the ecosystem approach.

A third major driver is the desire to improve the results of conventional fisheries management by implementing an ecosystem approach to fisheries management.[43] Fisheries managers and others hope that observed declines in global fish stocks and damage to associated habitats can be prevented or reversed by moving beyond traditional single species management to also incorporate action to protect ecosystem processes, structures and functions through new tools such as MPAs.

At its 26th session in March 2005, FAO's Committee of Fisheries (COFI) recommended that FAO develop technical guidelines on the design, implementation and testing of MPAs and agreed that FAO should assist its members to achieve the World Summit on Sustainable Development (WSSD) goal with respect to representative networks of MPAs by 2012.[44] As a result, FAO hosted a workshop in June 2006 on MPAs, and some RFMOs are also initiating measures (see Section 6 below). The November 2006 UNGA Sustainable Fisheries resolution specifically "encourages accelerated progress to establish criteria on the

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bottom fishing and ensure that such activities do not proceed unless it has established conservation and management measures to prevent significant adverse impacts on vulnerable marine ecosystems; and

D. To require members of the regional fisheries management organizations or arrangements to require vessels flying their flag to cease bottom fishing activities in areas where, in the course of fishing operations, vulnerable marine ecosystems are encountered, and to report the encounter so that appropriate measures can be adopted in respect of the relevant site.

39 UNFSA 2006. Report of the Review Conference on 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 A/CONF.210/2006/15.

40 See the Scientific Consensus Statement on Marine Ecosystem-Based Management, ft. 9 above.

41 Report of the United Nations Ad hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction A/61/65, para 59-62 (hereinafter UN High Seas Working Group Report).

42 CBD Decision VII/5 February 2004 calls for effectively managed and ecologically based MPAs that contribute to a global network, building on national and regional systems. It also notes that MPAs beyond national jurisdiction are extremely deficient in purpose, numbers and coverage. CBD Decision VIII/24 March 2006 calls for the CBD Executive Secretary, Parties and other States to cooperate to develop scientific and technical information, including scientific and ecological criteria, relevant to High Seas MPAs.

43 Martin et al., above ft. 3.

44 FAO Committee on Fisheries, 2005. COFI Report, para. 103.

objectives and management of marine protected areas for fisheries purposes."[45] It further welcomes the proposed work of FAO on the technical guidelines and urges coordination and cooperation among all relevant international organizations and bodies.

Within the fishing industry, views have been changing with regard to MPAs. Many who were initially opposed to MPAs at the national level now see them as valuable tools for improving sustainability and for protecting habitat. In at least one instance MPAs have also served to broaden domestic support for expenditure on effective enforcement against illegal, unreported and unregulated (IUU) fishing.[46] For example, industry support for the Heard Island and McDonald Islands (HIMI) Marine Reserve in the sub-Antarctic waters of Australia resulted in establishment of one of the largest MPAs on the planet.[47] In New Zealand, after years of contesting the government's designation of 19 seamounts as protected areas, seafood industry leaders proposed their own "Benthic Protected Areas" encompassing 31 percent of New Zealand's EEZ. In the Southern Indian Ocean, an industry alliance, the Southern Indian Ocean Deepwater Fishers Association[48] (SIODFA), recently agreed to prohibit trawling by their companies' vessels in 11 areas of the Southern Indian Ocean to protect benthic biodiversity and sites of outstanding scientific interest.[49]

Some in the fishing industry and a few countries still perceive MPAs as a threat to their economic interests and their freedom to fish without restraint. They may also perceive MPAs and the new focus on biodiversity conservation as a threat to their dominance in decision making within fisheries management arenas. According to Molenaar, some States fear that biodiversity conservation or non-utilization of marine living resources may become superior to the socio-economic interests of utilization.[50] Others assert that there is a pressing need to improve the current balance between biodiversity conservation and socio-economic considerations to meet the requirements in UNCLOS, CBD and the Fish Stocks Agreement to protect and preserve the marine environment and to conserve and sustainably use marine living resources.

It should also be noted that some scientists and others have questioned whether MPAs are the right way to protect deep-sea habitats beyond national jurisdiction, as too little is known about their ecology, function and locations to identify which areas should be protected.[51] They also note the ICES's Working Group advice in 2005 on the danger of relying on incomplete information, since decisions to close areas to bottom trawling may inadvertently divert trawling to similarly sensitive habitats that are currently

45 UNGA 61/L.38, 2006 Resolution on Sustainable Fisheries, para. 92.
46 Graham, A., 2006. Personal observation.
47 Gotheil, above ft. 10.
48 Austral Fisheries Pty Ltd, Perth, Australia; Bel Ocean II Ltd, Port Louis, Mauritius; Sealord Group, Nelson, New Zealand; TransNamibia Fishing Pty Ltd, Walvis Bay, Namibia.
49 Industry initiatives to declare "benthic protected areas" are a welcome step. However, some have raised concern over the selection process. When New Zealand's National Institute of Water and Atmospheric Research (NIWA) assessed the industry proposed Benthic Protected Areas (BPAs) in New Zealand's EEZ using advanced reserve selection software, their report concluded that "…despite their large geographic area, the focus of this proposal on existing areas that have both very low fishing value and low fish diversity, makes it a poor option for the long-term protection of demersal fish diversity in New Zealand's EEZ." Leatherwick, J., Julian, K., and Francis, M. 2006. "Exploration of the use of reserve planning software to identify potential Marine Protected Areas in New Zealand's Exclusive Economic Zone" NIWA Client Report HAM2—6-064. An NGO analysis of the Southern Indian Ocean BPAs indicated that much of the voluntarily closed areas were in depths below 2 000 m where bottom trawling was unlikely to occur. Deep Sea Conservation Coalition, 2006. http://www.savethehighseas.org/publicdocs/Indian-Ocean-map.pdf. It is suggested that this concern underscores the necessity of having a clear and open process for selection and designation of MPAs, one that is based on the best available science, data that are shared by all, and includes industry and conservation organizations as part of the process, with the support of governments that can patrol and enforce the applicable regulations.
50 Molenaar, E.J. 2005. "Addressing Regulatory Gaps in High Seas Fisheries" in The International Journal of Marine and Coastal Law special issue on High Seas Fisheries Governance Moving from Worlds to Action (Gjerde, K.M. (ed.), vol 20, nos. 3-4. pp. 533-571. A few countries may remain opposed to High Seas MPAs based on concerns that they may inhibit the high seas freedom of navigation.
51 ICES WGDEC, above ft. 22.

unmapped.[52] Instead they support an immediate interim prohibition of deep sea bottom trawling for the High Seas. Some scientists further caution that deep-sea ecosystems such as seamounts, corals and sponges warrant complete protection because of their value as "ecosystem engineers" and biodiversity reservoirs (see Section 4).

In response, some States and industry representatives now view MPAs as the less restrictive and hence preferable alternative to a global gear restriction, even a temporary one.

4. PRESENT STATUS OF HIGH SEAS MPAs: OPPORTUNITIES AND MAIN HURDLES

As noted above, there is a high level of support among many countries for High Seas MPAs as a tool for implementing ecosystem-based oceans and fisheries management, provided they are established consistent with international law and based on the best available science and the precautionary approach.

Yet additional effort to meet the 2012 target for representative networks is required at a variety of levels and in a variety of arenas. As was recognized at the UN High Seas Working Group, there is a need for further work within the framework of UNCLOS to develop an integrated approach to establishing, managing and enforcing High Sea MPAs, recognizing the existing role and mandate of such bodies as FAO, the International Maritime Organisation (IMO) and the Convention on Biological Diversity and of regional seas conventions.[53]

Work is already underway to develop criteria for the identification of ecologically and biologically significant areas, representative systems of MPAs, and biogeographic classification systems. As previously mentioned, the FAO has been charged with developing technical guidelines for the design, establishment and management of MPAs for fisheries management purposes and has already sponsored one workshop on this topic.[54] The Canadian government in December 2005 hosted an experts' workshop on criteria to identify ecologically and biologically significant areas.[55] The Autonomous University of Mexico, in cooperation with the Australian and Canadian governments, UNESCO and its Intergovernmental Oceanographic Commission (IOC), and the World Conservation Union (IUCN), convened a workshop in January 2007 on biogeographic classification systems for the open ocean and deep seabed. The Portuguese government is planning a workshop in October 2007 to further develop criteria for High Seas MPAs and representative systems and networks of MPAs. All these workshops will feed into discussions at relevant UN, CBD and regional processes.

With respect to deep-sea fisheries and MPAs, the November 2006 UNGA Resolution on Sustainable Fisheries[56] calls on States and RFMOs to assess the impacts of all types of bottom fishing on the high seas, and within 1-2 years to prohibit any high seas bottom fisheries which cannot be managed to prevent "significant adverse impacts" to vulnerable marine ecosystems. The resolution further calls on States to close areas of the high seas to all bottom fishing where vulnerable marine ecosystems are known or *likely* to occur, unless or until they are able to regulate such fisheries to prevent significant adverse impacts on vulnerable marine ecosystems. Also, the UNGA called for development of standards and criteria for identifying vulnerable marine ecosystems and the creation of a global database of information on vulnerable marine ecosystems in the High Seas. MPAs may be one of the means that states and RFMOs

52 Id.
53 UN High Seas Working Group Report, above ft. 40.
54 Key Points from FAO Workshop on MPAs, above ft. 3.
55 Rice, J. 2006. Report Of The Scientific Experts' Workshop On Criteria For Identifying Ecologically Or Biologically Significant Areas Beyond National Jurisdiction– 6-8 December 2005, Ottawa, Canada, Fisheries & Oceans Canada www.biodiv.org/doc/meetings/ cop/cop-08/information/cop-08-inf-39-en.doc.
56 UNGA 2006 Res. 61/L.38.

prefer to "prevent significant adverse impacts on vulnerable marine ecosystems." The global database on information regarding vulnerable marine ecosystems could make a significant contribution towards identifying potential areas for MPAs.

At the same time, the International Seabed Authority (ISA) is fostering efforts to identify criteria for "preservation reference zones" and MPAs on the deep seabed with regard to seabed mining activities. Research coordinated through the ISA has been critical in fostering efforts to fill many of the data gaps on deep seabed ecosystems. Rapid advances in understanding the diversity, distribution and abundance of deep-sea life and how it changes over time are being fostered by coordinated research projects such as the Census of Marine Life (CoML) and the Hotspot Ecosystem Research on Margins of European Seas (HERMES) project.

The IMO has recently adopted revised guidelines for the identification and designation of Particularly Sensitive Sea Areas (PSSAs). While shipping is unlikely to directly affect deep seabed ecosystems, it may have impacts through shipwrecks containing potentially harmful cargoes (e.g. the Prestige) and through operational discharges of ship-board wastes, including deliberately discarded fishing gear. The PSSA Guidelines may provide a useful tool for identifying areas in need of a higher level of protection from the impacts of shipping, including on the High Seas.[57]

Though it is acknowledged that the UNGA has the central role in legal developments regarding High Seas MPAs, the CBD parties and Secretariat maintain an active interest and role in progressing High Seas MPAs. The 8th CBD Conference of the Parties (COP) in March 2006 agreed that the CBD has a key role in supporting the UNGA work by providing scientific and as appropriate, technical information and advice relating to marine biodiversity, the application of the ecosystem approach and the precautionary approach and delivering the 2010 target [for achieving a significant reduction in the rate of loss of biodiversity].[58] At the 9th COP in 2008, CBD parties will consider progress with work identified in its decisions relating to conservation and sustainable use beyond national jurisdiction, including MPAs. Also the 9th COP will consider further supporting action as required, in cooperation with competent international bodies.[59] The 8th CBD COP further invited the UNGA to establish a timely follow-up process to the first UN High Seas Working Group to continue discussion on ways to enhance conservation and sustainable use of biodiversity beyond national jurisdiction. In November 2006, the UNGA approved a second meeting of the Working Group in 2008.

The 2008 UN High Seas Working Group will provide an important forum for discussing MPAs and the wider issue of High Seas biodiversity conservation. It will focus on five topics with respect to marine biological diversity beyond areas of national jurisdiction:

- The environmental impacts of anthropogenic activities;
- Coordination and cooperation among States as well as relevant intergovernmental organizations and bodies for conservation and management;
- The role of area-based management tools;
- Genetic resources beyond areas of national jurisdiction; and
- Whether there is a governance or regulatory gap, and if so, how it should be addressed.[60]

57 IMO Res. A.982(24) adopted on 1 December 2005. Revised Guidelines For The Identification And Designation Of Particularly Sensitive Sea Areas.
58 UNEP/CBD/COP/VIII/24.
59 Id., at paras. 8 and 9.
60 2006 UN General Assembly Oceans and Law of the Sea Resolution 61/L.30. Relevant paragraphs are in Annex III.

The UN High Seas Working Group will be in a good position to address governance and regulatory gaps in the high seas legal regime that may hinder the establishment of High Seas MPAs. As noted by Young (2006), UNCLOS provides the general framework for regulating activities on the high seas, but it lacks specific regulatory measures that could govern MPA establishment and management at the international level.[61] To address this gap, the European Union has proposed an implementing agreement to UNCLOS. According to the 2006 UN High Seas Biodiversity Working Group Report, some of the goals of such an agreement could be to more explicitly incorporate the principles of ecosystem management and precaution into High Seas biodiversity conservation, to develop mechanisms to establish and enforce MPAs, to develop requirements under UNCLOS and the CBD for environmental impact assessments, and to enhance cooperation and coordination among international organizations and bodies. Some nations do not see the need for a new instrument to support MPA establishment, on the grounds that existing regulatory regimes are sufficient to provide at least sector-specific protection.[62] For example, many RFMOs are now empowered to adopt biodiversity conservation measures, including closed areas. Thus progress on a comprehensive system of MPAs might be hindered by lack of a specific international agreement, but it would still be possible to designate MPAs with respect to fisheries activities via RFMOs, given political will.

At the regional level, Parties to the OSPAR Convention for the protection of the Northeast Atlantic have committed to developing an ecologically coherent network of MPAs by 2010 that includes a large section of the Northeast Atlantic beyond national jurisdiction. OSPAR has already developed MPA criteria and management guidelines.[63] Progress within the OSPAR Region on High Seas MPAs has been slow as some members maintained that absent an agreement at the international level, OSPAR lacked the competence to establish and manage High Seas MPAs. The Mediterranean has a specific legal agreement that enables designation of MPAs beyond national jurisdiction. This agreement provided the basis for designation in 2001 of the Pelagos Sanctuary for Mediterranean Cetaceans straddling areas within and beyond national jurisdiction.[64]

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the Committee for Environmental Protection of the Antarctic Treaty have recently considered means to work on the bioregionalization of the Southern Ocean and on the development of scientifically-based principles and criteria for MPAs. CCAMLR's mandate, unlike many RFMOs, specifically calls for it to promote conservation of all Antarctic marine living resources. Conservation is defined to include "rational use" as well as the obligations to maintain ecological relationships and to prevent or minimize the risk of changes in the marine ecosystem that are not potentially reversible over two or three decades. [65]

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61 Young, above ft. 2 and Kimball, above ft. 7 provide a comprehensive overview of the international legal regime regarding high seas MPAs.

62 UN High Seas Biodiversity Working Group Report, above ft. 40.

63 Kimball, above ft. 7.

64 Id.

65 ARTICLE II of CCAMLR provides:

1. The objective of this Convention is the conservation of Antarctic marine living resources.
2. For the purposes of this Convention, the term 'conservation' includes rational use. Any harvesting and associated activities in the area to which this Convention applies shall be conducted in accordance with the provisions of this Convention and with the following principles of conservation:
   (a) prevention of decrease in the size of any harvested population to levels below those which ensure its stable recruitment. For this purpose its size should not be allowed to fall below a level close to that which ensures the greatest net annual increment;
   (b) maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources and the restoration of depleted populations to the levels defined in sub-paragraph (a) above; and
   (c) prevention of changes or minimization of the risk of changes in the marine ecosystem which are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of the introduction of alien species, the effects of associated activities on the marine ecosystem and of the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources.

At the scientific level, progress towards MPAs may be stymied if efforts to obtain data and understanding are not rapidly escalated and do not precede expansion of deep-sea fisheries into new areas. CCAMLR has strict rules to control new and emerging fisheries, and to prevent them from expanding in effort or area when adequate information is lacking. Similar controls have been adopted with respect to specific areas within NEAFC, NAFO and SEAFO, but are not applied outside these temporarily protected areas (see Section 9).

Promising new approaches are being developed to identify sensitive benthic habitats for priority protection as well as to scope out biogeographic regions and classification systems. These systems are based on modelling the environmental preferences of specific groups of species inhabiting vulnerable areas. Using one of these approaches, known as Environmental Niche Factor Analysis, scientists within the Census of Marine Life (CoML) Census of Seamounts (CenSeam) programme have predicted what seamounts globally are likely to be favourable for the growth of stony corals.[66] These data can be overlayed on information relating to the occurrence of commercially valuable fish species, identifying areas where fisheries are likely to impact on stony coral communities. Using such methods, scientists can "fill in gaps" in our knowledge of the distribution of species in vulnerable habitats, helping managers to direct conservation efforts at areas likely to be sensitive to environmental impacts of fishing.

Efforts to develop seamount classification systems based on biological and physical factors are progressing but nevertheless remain hampered by lack of basic data.[67] Brodie and Clark (2003) describe the initial process used to identify 19 seamounts as candidate MPAs in New Zealand. The biophysical criteria used were: representativeness, comprehensiveness, ecological importance and uniqueness, productivity, vulnerability and naturalness. Scientists divided the region into four basic biogeographic regions, and then refined the regions based on other factors likely to influence species distribution in and around the seamount. These included: depth in the water column; elevation; area; gradient, water mass at depth; sediment types (e.g. ooze, coral, rocky, often heterogeneous on any single seamount); and geological association. Scientists were unable to develop a biologically focused classification for all known New Zealand seamounts because they had insufficient data to classify almost 50 percent of them.

Computer tools and the use of proxies as surrogates for data can help overcome some of the data deficiency problems in developing representative MPA systems. Scientists at the University of York have laid out another approach for identifying potential areas to serve as part of a proposed global network of strictly protected marine reserves on the High Seas.[68] The network developers used existing data from a wide variety of sources, including expert advice, and fed the data into the computer program MARXAN to determine the optimal configuration for the marine reserve network. The selected sites were chosen according to a set of defined principles: the coverage of 40 percent of biogeographic zones, bottom types,

66 Clark, M.R., Tittensor, D., Rogers, A.D., Brewin, P., Schlacher, T., Rowden, A., Stocks, K., Consalvey, M. (2006). Seamounts, deep-sea corals and fisheries: vulnerability of deep-sea corals to fishing on seamounts beyond areas of national jurisdiction. Census of Marine Life on Seamounts (CenSeam) Data Analysis Working Group, UNEP, UNESCO IOC, CoML and NIWA. UNEP-WCMC, Cambridge, U.K. Limited data on octocorals prevented their inclusion in the study.

67 Brodie, S. and Clark, M. 2003. The New Zealand Seamount Management Strategy – Steps towards Conserving Offshore Marine Habitat. In Beumer, J.P., Grant, A., Smith, D.C. (eds). Aquatic Protected Areas: what works best and how do we know? Proceedings of the World Congress on Aquatic Protected Areas, Cairns, Australia, August 2002. Australian Society of Fish Biology, pp. 664-673; Rowden, A.A., Clark, M.R. and Wright, I.C., 2005. Physical characterisation and a biologically focussed classification of "seamounts" in the New Zealand region", New Zealand Journal of Marine and Freshwater Research. Data on sediment type and surface complexity are key, but data may also be needed on association, origin, depth at peak, depth at base, elevation, slope, area, Chl. a, distance to continental shelf, wintertime SST, annual amplitude of SST, spatial SST gradient and summertime SST anomaly. Intensive sampling remains required to test the biological meaningfulness of the proposed New Zealand classification system and to ensure that it does not underestimate biological diversity.

68 Roberts, C.M., Mason, L. and Hawkins, J.P. 2006. Roadmap to Recovery: a global network of marine reserves. Greenpeace 2006. Available at:http://oceans.greenpeace.org/en/our-oceans/marine-reserves/roadmap-to-recovery

fauna and oceanographic features. Similar approaches have been used elsewhere to design MPAs and MPA networks, including in the Great Barrier Reef Marine Park.

As evidenced by the industry–led initiative to ban bottom trawling in specific areas in the Southern Indian Ocean, the fishing industry may possess the most detailed geophysical, fisheries and bycatch information upon which to identify potentially vulnerable areas. However, to date such information has not been made widely available. To solve the issue of information insufficiency, the fishing industry, together with all other data holders such as national marine scientific research institutions, could be requested to share their data through the new global database on vulnerable marine ecosystems called for in the 2006 UNGA resolution. Additionally, the burden of proof to establish where it is safe to fish might be placed on the fishers themselves, as they are in the best position to obtain and make available the necessary information.

It is clear that significant cooperative efforts using information from all available sources will be essential. At the same time, there is a need for an agreed process to be in place in all regions and/or at the global level for identifying MPAs and establishing protective measures (See Section 8). To enhance confidence in High Seas MPAs, mechanisms for transparent, science-based and participatory decision-making for their selection, monitoring, management and enforcement will need to be established. To implement effectively an ecosystem-approach to the High Seas, mechanisms are also needed to ensure conservation and sustainable use outside of the MPAs.

5. HIGH SEAS MPAs AND DEEP-SEA FISHING: SPECIAL CONSIDERATIONS RELATED TO SPECIES/HABITAT SPECIFICITIES (BENTHIC) AND CONSERVATION

The current state of knowledge with respect to deep-sea benthic habitats and species as they relate to deep-sea fishing has been summarized in the comprehensive report of the UN Secretary General of the Impacts of Bottom Fishing. Rather than once again summarizing the extensive literature on the topic, the relevant paragraphs from the UN report are extracted below, followed by some supplemental information:

> *29. Among all the fishing gears currently used particular concern has been raised over the adverse impacts of bottom trawling on vulnerable marine ecosystems and their associated biodiversity. Bottom trawling raises two main issues. One concern, common to all fishing gear, is the sustainability of the exploitation of target fish stocks due to excess fishing effort or capacity. The second is the ecosystem impacts of trawl fisheries deriving from: (i) the inadequate selectivity of trawl nets and consequent impact on target species (through capture of juveniles) and non-target species whether discarded or not; and (ii) their physical impact on the bottom, and its fauna and the resulting damage to vulnerable ecosystems as critical habitats for marine biodiversity.*
>
> *32. While there is some evidence to suggest that bottom-set longlines, bottom-set gillnets, pots and traps (including when "ghost fishing"), all may be impacting the deep-sea, bottom trawling and dredging appear to be having the most obvious disruptive impact due to their widespread use and their contact with the bottom.*
>
> *50. Deep-sea habitats are particularly sensitive to anthropogenic disturbance due to the longevity, slow growth, low reproductive rates and endemism of the individuals that structure the habitat, their susceptibility to increased sedimentation, their fragility and limited ability to recover from physical fragmentation. A large number of studies have documented the effects of mobile fishing gear on benthic habitat, including the loss of habitat complexity, shifts in community structure, and changes in ecosystem processes.*

52. A number of studies provide evidence of damage to deep-sea benthic communities. For example, damage to benthic invertebrates on seamounts by fishing activities has been well documented. Also impacted are deep-water precious corals which often occur in the area of seamounts. With their slow growth rates and often low levels of recruitment, if depleted, coral community recovery could take centuries. ….

53. Some species of sponges appear so fragile that they totally disintegrate when hit by the pressure wave from trawl gear.

The design and implementation of MPAs for deep-sea fisheries may also benefit from considering other attributes of deep-sea life and processes. Some of these are highlighted below.

Only 4 percent of the seafloor consists of mid-ocean ridges, seamounts and submarine canyons, making them quite rare in contrast to the extent of abyssal plains and sedimented slopes.[69] The steep angles and generally faster currents along ridges, seamounts and canyons keep the surfaces clear of sediment, providing habitats suitable for growth of large sessile suspension feeders, including a wide variety of soft, stony and reef building corals, sponges, hydroids and echinoderms (feather stars and crinoids). These erect species in turn provide structural complexity and habitat for a wide variety of other species, such that many scientists consider them as "ecosystem engineers", vital centres of ecological activity similar to trees in a forest.[70]

Fish species richness and abundance are often far greater on seamounts, coral reefs and other complex benthic habitats than on the surrounding seabed.[71] Video surveys of Lophelia reefs in the Northeast Atlantic revealed that far more fishes (80 percent abundance) and more fish species (92 percent) are associated with *Lophelia* reefs than the adjacent seabed, and that 17 of the 25 species recorded were of commercial importance. Costello *et al.* (2005) conclude that the loss of reefs would result in a reduced abundance and biodiversity of fish due to habitat loss, while calling for further research.

The protruding mass of seamounts interacts with currents, which generally serves to concentrate local food supplies. Thus benthic and pelagic communities are often of high biomass compared to surrounding areas. Almost 800 species have been observed in and around seamounts, though not all are directly seamount associated.[72] The best known seamount associated species are: orange roughy, alfonsinos, pelagic armourhead, oreos, and rockfishes, which may form dense aggregations over seamounts to spawn or feed.[73] Pelagic predators have also been found in increased numbers in the water column around seamounts, including species of tunas, billfishes, sharks, marine mammals and seabirds. These pelagic fish primarily use seamounts as feeding grounds, but may also use the areas for spawning and nursery grounds and possibly as navigational markers.[74]

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69 Glover, A.G. and Smith, C.R. 2003. The deep-sea floor ecosystem: current status and prospects of anthropogenic change by the year 2025. Environmental Conservation 30(3): 219-241.
70 Clark et al., above ft. 65.
71 Costello, M.J., McCrea, M., Freiwald, A. 2005. Role of cold-water Lophelia pertusa coral reefs as fish habitat in the NE Atlantic. In: Cold-water Corals and Ecosystems (A. Freiwald and J.M. Roberts (eds.)). Springer-Verlag, Berlin Heidelberg, pp. 771-805.
72 Froese, R. and Sampang, A. 2004. Taxonomy and biology of seamount fishes. In: Seamounts: Biodiversity and Fisheries (eds. T. Morato and D. Pauly). Fisheries Centre, University of British Columbia, Canada. Fisheries Centre Research Reports, 12 (5), 25-31; Morato, T., Cheung, W.W.L. and Pitcher, T.J. (2004) Additions to Froese and Sampang's checklist of seamount fishes. In: T. Morato and D. Pauly (eds.), Seamounts: Biodiversity and Fisheries. Fisheries Centre Research Reports 12 (5) Appendix 1: 1-6. Fisheries Centre, University of British Columbia, Canada.
73 Morato, T. and Clark, M. in press. Seamount fishes: ecology and life histories. In: Seamounts: Ecology, Fisheries and Conservation (eds. T.J. Pitcher, P.J.B Hart, T. Morato, R.S. Santos, and M.R. Clark). Blackwell.
74 Allain, V., Kirby, D., and Kerandel J. 2006. Seamount Research Planning Workshop Report, 20-21 March 2006. Oceanic Fisheries Program, Secretariat of the Pacific Community, Noumea, New Caledonia. WCPFC-SC2-2006/EB IP-5, pp. 56.

The depths of greatest coral diversity and abundance may frequently coincide with the preferred range for seamount fisheries, i.e., in the upper 1 500 m. A recent report by the CenSeam Data Analysis Working Group reveals that most cold water corals occur between 250 m to 1 500 m, with some species (octocorals) prevalent down to 2 000 m. The diversity of corals is generally greatest on the peaks and upper slopes of seamounts, where the currents are strongest.[75] This is also the area of greatest intensity of fishing on seamounts.[76] The preferred depth range for alfonsino is between 250 m and 750 m and for orange roughy between 700 m and 1 200 m depth.[77] Recent efforts to model stony coral distribution also show that geographic areas where fisheries take place for alfonsino and orange roughy also coincide with areas which are favourable for the occurrence of these corals (e.g. SW Indian Ocean).[78]

Trawling that contacts the bottom is widely recognized as the most destructive form of deep-sea fishing with regard to impacts to the seafloor habitats and benthic communities. Large-scale destruction of deep-sea coral reefs and coral and sponge beds has been recorded from many parts of the world.[79] On seamounts, the entire framework of a cold-water coral reef along with the associated fauna can be removed. Suggestions by New Zealand commercial fishers that the impact of fishing can be restricted to the "trawl corridor" (preferred tow path), leaving adjacent areas on the same seamount unaffected, have not been upheld by research to date.[80] O'Driscoll and Clark (2005) observed that targeted seamounts usually showed at least some trawling in all directions. O'Driscoll and Clark further note that even a small number of tows may lead to significant impact. A single trawl can sweep the seafloor over a width of 100-200 m (doorspread). On a small seamount the threshold level of five tows in a given direction may represent a significant fraction of the total seabed area.[81] The intensity of trawling on seamounts is often quite high. Clark and O'Driscoll (2003) reported that between several hundred and several thousand trawls may be carried out on small seamount features in the New Zealand orange roughy fishery.[82] O'Driscoll and Clark (2005) documented that bottom trawling off New Zealand averaged 130 km of trawled seafloor *per square kilometer* of seamount.

Initial coral bycatch can be extremely high, and then decreases as only rubble may remain. Anderson and Clark (2003) estimated that for the orange roughy fishery in the South Tasman Rise, total coral bycatch (comprising a large number of species but dominated by reef-forming *Solenosmilia variabilis*) was 1 750 tons per year in the first years of the fishing in 1997 - 1998; by 2000 - 2001 coral bycatch was 100 ty^{-1}.[83] The loss of corals and other structurally important animals could lower survivorship and recolonisation of the associated fauna, and hence would have major long-term implications for seamount ecosystems. In highly insular faunas, it could also mean the loss of many potentially endemic species.

The impact of trawling on seafloor biota differs depending on the gear type used. As noted by the CenSeam Data Analysis Working Group, the most severe damage has been reported from the use of bottom trawls in the orange roughy fisheries on seamounts off southern Tasmania and New Zealand and on cold water coral reefs in the North Atlantic.[84] Midwater trawls used for alfonsino fisheries may have

75 Clark et al., above ft. 65.
76 Clark, M. R, and O'Driscoll, R.L,. 2003. Deepwater Fisheries and Aspects of Their Impact on Seamount Habitat in New Zealand; Journal of Northwest Fisheries Science, 441- 458.
77 Australia Department of Environment and Heritage, 2006 (report on Orange Roughy for listing as endangered species)
78 Clark et al., above ft. 65.
79 Freiwald, A., Fossaa, J.H., Grehan, A., Koslow, T., Roberts, J.M, 2004. Cold Water Coral Reefs. UNEP-WCMC, Cambridge, UK.
80 O'Driscoll, R.L. and Clark, M.R., 2005. Quantifying the relative intensity of fishing on New Zealand seamounts" New Zealand Journal of Marine and Freshwater Research, 2005, Vol. 39: 839-850.
81 Id.
82 Clark and O'Driscoll, above ft. 75.
83 Anderson, O. F. and Clark, M. R. 2003. Analysis of bycatch in the fishery for orange roughy, Holplostethus atlanticus, on the South Tasman Rise. Marine and Freshwater Research 2003, 54, 643-652.
84 Clark et al. above ft 66; see also Fossaa J.H., Mortensen P.B., Furevik D.M., 2002. The deep-water coral Lophelia pertusa in Norwegian waters: distribution and fishery impacts. Hydrobiologia 471:1-12; Reed, J. K., Shepard, A. N., Koenig, C. C., Scanlon,

only a small impact on seamount benthos if they are deployed well above the seafloor. However, in many cases the gear is considered most effective when fished very close to, or even lightly touching, the bottom. Thus, scientists predict that the effects of the alfonsino fisheries on the benthic fauna would likely be comparable to that of the orange roughy fisheries.[85]

Intense fishing with other gears such as long-lines and gillnets may also have severe cumulative negative impacts in deep-seabed environments. Recovery rates for the sessile organisms rising above the deep seafloor from any type of intense disturbance will be very low as they grow slowly and live in an environment where natural disturbances are rare.[86]

The impacts of bottom trawling are not limited to organisms living on hard surfaces. In the Northeast Atlantic, most deep-water bottom trawling and a considerable proportion of static gear fishing occurs in areas of soft bottom sediments.[87] According to Dr. John Gordon, chair of the ICES Study Group on the Biology and Assessment of Deep-Sea Fisheries Resources between 1995 and 2000, the effect of fishing activity on these areas has been largely ignored although photographic evidence at depths between 700 and 1 300 m in the Rockall Trough shows the presence of trawl marks on the seabed in 2 to 12 percent of all photographs.[88]

Organisms found on soft sediments such as sea fans (octocorals), hydrocorals (stylasterids) sponges (*Phylum Porifera*) and xenophyophores are also highly sensitive, according to an ICES working group report.[89] Like the better known stony corals, these organisms generally serve to increase habitat complexity and provide refuge for a large variety and number of species.[90] The physical disturbance by the trawl doors and the net being dragged along the seabed will destroy and disturb fauna living on the surface and will also plough the soft sediments and disturb and probably kill the infauna. These effects will be accentuated by trawls using heavy rockhopper gear. The fine sediments resuspended by the trawl may well smother the seabed fauna over wide areas.[91] Sediment clouds raised by bottom trawls clog the filters of suspension feeders. Sponges are especially sensitive as they cannot sort particles but must use energy to filter all particles and pass them through the digestive process.[92]

Scientists are now able to produce relatively detailed bathymetry of seamounts with the use of GPS satellite navigation, multibeam swath-mapping, and recently available satellite altimetry data, but few seamounts have been mapped or sampled in detail. Though there is often a regional similarity between seamount biota, individual or clusters of seamounts may potentially harbour a high degree of endemism.[93]

K. M. , and Gilmore, R. G. Jr. 2005. Mapping, habitat characterization, and fish surveys of the deep-water Oculina coral reef Marine Protected Area: a review of historical and current research. Freiwald, A. and Roberts, J. M. Cold-Water Corals and Ecosystems. 443-465. Berlin, Springer-Verlag.

85 Clark et al. above ft 65; Clark and O'Driscoll above ft. 75.

86 ICES WGDEC, above ft. 22.

87 Gordon, J.D.M. DEEP WATER DEMERSAL FISHERIES, A report for JNCC. Available at: http://www.jncc.gov.uk/page-2525-theme=default

88 Gordon, above ft. 86.

89 Xenophyophores are macrofauna-sized agglutinated protists, closely related to Foraminerifera. They can range in size from 10 cm to 25 cm. As they are very fragile, they are easily damaged by trawled gears and the sediment plumes they create. ICES WGDEC, above ft. 22 at p. 58.

90 In addition to deep-sea scleractinian corals, the study also describes seven other sensitive deep-sea habitats (three geological features - hydrothermal vents, cold seeps and slopes of oceanic islands, and four biological - xenophyophore fields, sponge grounds, fire corals and non-sclereractinan corals). Only vents and cold seeps were found not to be vulnerable to bottom fishing as no fishing presently occurred there. ICES WGDEC above ft.22 at 56.

91 Gordon, above ft. 86

92 ICES WGDEC, above ft. 22 at 60; Fossaa, J.H. and Tendal, O.S. "Discovering deep-water sponges" (ICES article), www.ices.dk/marineworld/sponge.asp; Gage, J.D. Roberts, J.M., Hartley, J P., and Humphery, J.D. 2006. Potential impacts of deep-sea trawling on the benthic ecosystem along the northern European continental margin. American Fisheries Society.

93 Koslow, J.A., Gowlett-Holmes, K., Lowry, J.K., O'Hara, T., Poore, G.C.B. and Williams, A. (2001) Seamount benthic macrofauna off southern Tasmania: community structure; Marine Ecology Progress Series, 213. pp. 111-125; Stocks, K.L. and

Many factors, including relative age and degree of isolation, habitat complexity and depth, are thought to influence biotic composition and biogeographic affinity of seamounts. However, efforts to develop seamount classification systems have not yet found ways to pick up this fine scale diversity and potential endemism.[94] Recent analyses of the occurrence of corals on seamounts have revealed that many species are confined to single oceans or to single regions within oceans. Only relatively few species of corals occur on seamounts globally or have a wide distribution encompassing several oceans. Interestingly, many of these are reef-forming species or are associated with cold-water coral reefs (e.g. *Solenosmila variabilis*, *Madrepora oculata*, *Lophelia pertusa*, *Desmophyllum dianthus*).[95]

The ecosystem effects of deep-sea fishing have also been poorly studied. Some deep-sea ecologists are concerned about the impacts of removal of large quantities of biomass (fish populations, both target species and 'bycatch') from the food web of 'food-poor' or low energy environments characteristic of the deep sea.[96] Such impacts could significantly disrupt food web and trophic level interactions amongst bottom dwelling communities and should be further investigated.[97]

In sum, there is still limited understanding of the factors that influence the biodiversity and abundance of life of seamount and other deep-sea habitats. Research on the ecology and biogeography of deep-sea benthic species and ecosystems remains critical. Its absence continues to confound approaches to develop a methodology for identifying vulnerable ecosystems or representative, special or unique areas as candidates for MPAs. Relatively few areas have been sampled sufficiently to characterize the communities, their diversity, endemism and biogeography. The relevant scales for endemism and for the bioregionalization of seamount fauna are still poorly understood. Dedicated field sampling is required to elucidate these issues, but future programs must be carefully designed, given the vast number of seamounts in the world's oceans—on the order of $10^4 – 10^6$.

6. HIGH SEAS MPAs AND DEEP-SEA FISHING: SPECIAL CONSIDERATIONS RELATED TO FISHERIES MANAGEMENT

The history of deep-sea fisheries management has caused many scientists to question whether deep-sea fisheries can be conducted on a sustainable basis.[98] Experts have agreed on the need for a highly precautionary approach[99], but the record of its application by fisheries managers is patchy at best. This suggests that unless standards and expectations for deep-sea fisheries management are raised, fisheries

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Hart, P.J.B (in press). Biogeography and biodiversity of seamounts. In: Seamounts: Ecology, Fisheries and Conservation (eds. T.J. Pitcher, P.J.B Hart, T. Morato, R.S. Santos, and M.R. Clark). Blackwell.

94 Rowden et al., above ft. 66.

95 Clark et al., above ft. 65.

96 Gordon, above ft. 86.

97 Koslow, J.A., Boerhlert, G.W., Gordon, J.S.M., Haedrich, R.L., Lorance, P. and Parin, N. 2000. Continental Slope and Deep Sea fisheries, implications for a fragile ecosystem, ICES Journal of Marine Science, 57: 548-557.

98 Glover and Smith, above ft. 68. Koslow et al., 2000 above ft. 96; Clark, M.R. 2001. Are deepwater fisheries sustainable? – the example of orange roughy (Hoplostethus atlanticus) in New Zealand. Fisheries Research 51 (2001) 123-135; Large, P.A., Hammer, C., Bergstad, O.A., Gordon, J.D.M., Lorance, P. 2003.Deep-water Fisheries of the Northwest Atlantic: II Assessment and Management Approaches. J. Northw. Atl. Fish Science, Vol. 31: 151-163; Merrett, N.R. and Haedrich, R.L. 1997. Deep-Sea Demersal Fish and Fisheries. Chapman & Hall, London; Lack, M, Short, K., and Willock, A. 2003. Managing Risk and uncertainly in Deep Sea fisheries: lessons from Orange Roughy. TRAFFIC Oceania and the WWF Endangered Seas Programme (www.panda.org/downloads/marine/OrangeRO.pdf).

99 The need for a highly precautionary approach has been repeatedly stressed by scientists, including at the 2003 Conference on the Management and Governance of Deep Sea Fisheries, held in Queenstown, New Zealand, organized by the Ministry of Fisheries, New Zealand and the Department of Agriculture, Fisheries and Forestry of Australia, with the technical cooperation of the FAO Fisheries Department. (www.deep sea.govt.nz) (Queenstown, New Zealand 1-5 December, 2003) ("DEEP SEA 2003") and at the Woods Hole 2004 Symposium on Deep-sea Fisheries: Ecology, Economics and Conservation, convened by the Woods Hole Oceanographic Institution and the New England Aquarium (Woods Hole, Massachusetts, USA, 12-14 September 2004) Report available at: http://www.whoi.edu/institutes/oli/activities/symposia_deepsea.html.

managers may be unlikely to adopt non-traditional conservation measures such as MPAs. In addition to broadening their mandate, RFMOs may also need to expand their expertise to encompass ecosystem-based management and biodiversity concerns. Political will is another essential ingredient.

6.1 Vulnerability of deep-sea fisheries to overfishing

According to the FAO report on deep-sea fisheries prepared for the 2005 COFI meeting:

> *Deep sea fishery resources are particularly vulnerable to overexploitation due to their low productivity - the fish reproduce slowly and take a long time to grow to maturity. Not enough is known about the population biology of deep-sea stocks and the impacts of fishing on sea-bottom habitats, making responsible management difficult. Compounding matters is the fact that many deep-water species are found on the high seas, where governance is particularly complex.*[100]

As acknowledged in the UN Secretary General's Report on the Impacts of Bottom Fishing (para 44):

> *"…Most fisheries on seamounts often follow "boom and bust" cycles. Most of these aggregating species are easily fished towards depletion, sometimes within one season. For many species, the recovery of such stocks takes several decades."*

Glover and Smith (2003) have predicted that given current management practices, most if not all deep-sea fisheries will be commercially extinct within 10-20 years.[101] In Australia, orange roughy have been proposed for listing as an endangered species, having shown an overall decline in catch rate by around 90 percent since peak landings between 1989 and 1992.[102] According to the report of the Australian Threatened Species Scientific Committee, one or two seasons of heavy, unregulated fishing of spawning aggregations can quickly render the species commercially unviable.[103] One controversial study of five deep-sea species in Canada found them to meet IUCN criteria for listing as "critically endangered".[104] Only two of the five were target species, indicating the high vulnerability of many non-target species. Deep-sea sharks are thought to be exceptionally vulnerable due to their limited range and low fecundity. In the Northeast Atlantic, leafscale gulper shark and the Portuguese dogfish have both declined by 80 percent in 10 years.[105]

6.2 Application of scientific advice into decision-making

Experience in the Northeast Atlantic may provide some insight into past difficulties of ensuring science-based management for deep-sea fisheries. ICES and other experts have been warning of the need to change deep-sea fisheries management practices since 1994 when French vessels started bottom trawling on the slopes of the Rockall Trough. ICES scientific advisors have continually warned that a "cautious approach should be adopted to exploitation and that fishing effort should be kept at a low level until sufficient information was gathered from existing fisheries to enable scientifically-based management

100 FAO report 2005/6 prepared for COFI 2005. Deep Sea Fisheries; see also The State of the World Fisheries and Aquaculture (SOFIA), FAO Fisheries Department, Food and Agriculture Organization of the United Nations, Rome, 2004 at pp. 91-99.
101 Glover and Smith, above ft. 68.
102 Australia, 2006 Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on Amendments to the list of Threatened Species under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
103 Id.
104 Devine, JA, Baker, KD, and Haedrich, RL, 2006. Deep-sea fishes qualify as endangered
A shift from shelf fisheries to the deep sea is exhausting late-maturing species that recover only slowly. Nature, Vol. 439l5, p. 29.
105 ICES WGDEC, above ft. 22

decisions." In 1998 it was estimated that many deep-water stocks were beyond safe biological limits.[106] In 2002 Gordon observed that:

> *There is general agreement amongst scientists, the fishing industry and the politicians that the deep-water stocks are seriously overexploited but political imperatives dictate that uncertainties and inconsistencies in the scientific assessment and advice are used to postpone the urgent action that is required.*[107]

In 2004 and again in 2005 ICES strongly advised a "complete overhaul of deep-sea fisheries" in the Northeast Atlantic.[108] Specifically, ICES advised that no new fisheries for deep-sea fish should be allowed, and existing deep-sea fisheries should be reduced to low levels until research suggests increased harvests can be sustainable. In 2005, ICES also advised zero catch of depleted deep-sea shark species such as leafscale gulper shark and the Portuguese dogfish. No further reductions in effort were agreed beyond the 2004 decision to reduce effort by 30 percent from the previous highest levels, pending further information from ICES. In November 2006, NEAFC adopted a 6-month ban on orange roughy fisheries for the first half of 2007 with a full review planned in June 2007, and agreed to reduce current levels of overall deep-sea fishing effort by 5 percent.

To enable the establishment of MPAs for biodiversity conservation purposes, let alone develop effective and ecologically coherent systems and networks of MPAs, future decision-making will need to be guided by a more precautionary approach. Review and assessment of the performance of RFMOs, as called for by the UN Fish Stocks Agreement review conference, could provide an important means to improve the capacity and willingness of RFMOs and their member states to implement precautionary and ecosystem-based measures, including MPAs.

6.3 The boom and bust nature of most seamount fisheries means that fishers frequently expand their operation into new areas

The targeting and rapid decline of spawning aggregations on seamounts means that the fishery must frequently expand to new seamounts.[109] In New Zealand, active searching for pristine seamount habitat meant that by 2000 about 80 percent of the known seamounts in fishable range had been fished.[110] Clark (1999) describes how in the 1980s the fishers moved sequentially eastwards along the Chatham Rise, one seamount at a time.[111]

This pattern of boom and bust fishing and the ability to rapidly move on to new areas creates a challenge with respect to the establishment of MPAs to protect vulnerable ecosystems. Though the history of rapid serial depletion of many deep-sea fish stocks and RFMO standards for evidence to close fisheries once they are underway may be considered as two separate problems, what they have in common is that if high levels of scientific evidence are required to close an area, then without restrictions on expansion, there is a high likelihood that the seamount habitat will be fished before it can be identified, assessed and protected.

106 Gordon, above ft. 86
107 Gordon above ft. 86; see also Large et al. above ft. 97.
108 ICES WGDEC, above ft. 22
109 Clark, M.R. 1999. Fisheries for orange roughy (Hoplostethus atlanticus) on seamounts in New Zealand. Oceanologica Acta 22(6). 593-603; O'Driscoll and Clark, above ft. 79.
110 Clark and O'Driscoll above ft. 75
111 Clark 1999, above ft. 97.

6.4 The lack of knowledge of benthic habitat means that closure of some areas may shift fishing into new, as yet unmapped, areas that may be similarly vulnerable or more significant biologically

The ICES Deep Sea Ecology Working Group in 2005 stressed the danger of relying on incomplete datasets to close areas since decisions to close areas to bottom trawling may inadvertently divert trawling to similarly sensitive habitats that are currently unmapped.[112] The ICES Working Group noted an urgent need for mapping and sampling of seamount ecosystems, cold-water corals and other vulnerable deep-sea habitats along continental margins and deep ocean areas of the outer continental shelf below the high seas and on the seabed area beyond national jurisdiction. This can be a quandary, as ICES has also advised that the only proven way of preventing damage to deep-water biogenic reefs from fishing activities is through spatial closures to towed gear that potentially impacts the bottom.[113]

6.5 Need for a combination of management tools to reduce the impacts of mobile bottom contacting gear

A Canadian experts' meeting in 2006 identified the advantages and disadvantages of a range of fisheries management tools to reduce the impacts of mobile bottom contacting gear:[114]

- major reduction in effort in fisheries using mobile bottom contacting gears—effectiveness depends on how remaining effort is distributed spatially and temporally;
- spatial management of effort taking into account the spatial distribution of benthic habitats and communities—effectiveness depends on how effort is redistributed and the timeframe over which it is applied;
- implementation of areas where use of those gears is not permitted—highly effective in protecting long-lived sedentary species such as large deep-water corals and sponges, but in larger contexts depends on what happens to effort that is excluded by areas closed;
- substitution of another gear type or modification of gear type to reduce contact with benthos and seafloor—effectiveness depends on nature and relative effectiveness of new or modified gear.

Building on this analysis, this author suggests that protection of vulnerable deep-sea ecosystems may require a combination of management tools, including a major reduction in effort in fisheries using bottom contacting gears, improved spatial management to prevent overlap with vulnerable areas, closing areas to bottom contacting gears (i.e. MPAs), and substitution or modification of gears to reduce contact with the benthos. Effectiveness will depend of how effort is redistributed, the scale of the areas protected, and the relative effectiveness of any substituted gear.

6.6 Problems of illegal, unregulated and unreported (IUU) fishing activities

Illegal, unregulated and unreported fishing is a pervasive and serious problem for all high seas fisheries. High seas deep-water fisheries are unregulated or poorly reported in many areas, so information on fishing areas, fishing effort, and on target and bycatch species is generally poor. Such data are a prerequisite to managing these fisheries. The problems of unregulated and unreported deep fisheries are compounded by the current absence in 75 percent of the high seas of RFMOs with competence to manage deep-sea bottom

112 ICES WGDEC, 2005 above ft. 22.
113 ICES 2002. Report of the ICES Advisory Committee on Ecosystems, ICES Cooperative Research Report No. 254. December 2002. pp. 28-33.
114 DFO, 2006. Impacts of Trawl Gears and Scallop Dredges on Benthic Habitats, Populations and Communities Canadian Science Advisory Secretariat Science Advisory Report 2006/025.

fisheries or to establish MPAs (see Sections 6 and 9). While some nations regulate their vessels engaged in deep-sea bottom fishing on the high seas at least with respect to catch data, most do not. [115] The absence of an RFMO or other arrangement makes it difficult to establish and enforce a High Seas MPA that would be respected by all relevant fishing states and vessels. The recommendations of the UN Fish Stocks Agreement Review Conference and the report of the High Seas Task Force have outlined a range of actions that states can adopt to address the overall problem of IUU fishing activities in the high seas. An essential first step for deep-sea fisheries is the adoption of binding interim measures among those fishing outside of RFMO areas, establishment of regional agreements or arrangements, or the expansion of the mandates of existing RFMOs. Another option is establishment of a global mechanism with the competence to act in their absence. Measures to enhance compliance and enforcement of High Seas MPAs are discussed in Section 7 below.

6.7 Difficulty of limiting access to deep-sea fisheries on the high seas

In emphasising the importance of RFMOs for ensuring sustainable fishing and protecting marine biodiversity, the Fish Stocks Agreement seeks to limit access to fishing in areas covered by an RFMO to only those states which are members of the RFMO or similar arrangements, or which agree to apply its conservation and management measures (Fish Stocks Agreement art. 8.3). To be able to effectively contain expansion of deep-sea bottom fisheries, all deep-sea fisheries on the high seas will need to be made subject to similar terms. Otherwise it may prove difficult to prevent further "boom and bust" fishing and to reduce deep-sea fisheries to the appropriate levels of effort required to ensure sustainability.

6.8 Need for management at finer temporal and geographical scales

One feature particular to deep-sea fisheries may be their small spatial scale, as they often focus on specific benthic features such as seamounts and deep-sea corals, where fish abundance and biodiversity are greatest.[116] As ICES has recommended, systems will need to be developed and implemented for recording effort and catches at a finer temporal and geographical scale than is the case at present. At the same time, management actions will need to be implemented that take into account this finer scale spatial resolution.[117] As revelation of areas where substantial catches of fish are being taken may increase the number of vessels fishing particular features, such information may have to be restricted to fisheries managers and enforcement officers. In addition, further information on fishing strategies is required from commercial fishing companies. This is to assess what areas of the seabed are actually fished and what constitutes fishable ground and non-fishable ground.

7. RFMO INVOLVEMENT IN HIGH SEAS MPAs AND DEEP-WATER FISHERY MANAGEMENT

Though discrete high seas fish stocks (i.e. high seas stocks that are neither anadromous, catadromous, highly migratory nor straddling) are not specifically covered by the Fish Stocks Agreement, the Agreement sets forth a common standard for fisheries management. The 2005 UN General Assembly Resolution on Sustainable Fisheries (A/RES/60/31) encourages "States, as appropriate, to recognize that the general principles of the Fish Stocks Agreement should also apply to discrete fish stocks in the high seas." At the Fish Stocks Review Conference it was agreed that "RFMOs with competence to regulate straddling fish stocks may also have the necessary competence to conserve and manage high seas discrete stocks. There is no obstacle for such RFMOs to adopt management measures in respect of such stocks in

115 UN Sec. Gen. Impacts of Fishing Report, above ft. 35 at para. 103-105
116 Brodie and Clark above ft. 66.
117 ICES WGDEC, above ft. 22.

accordance with the general principles set forth in the [Fish Stocks] Agreement."[118] Many States and several RFMOs have in practice been applying parts of the Fish Stocks Agreement to discrete fish stocks.[119]

The UN Sec. Gen. Impacts of Fishing Report reviews the actions of states and RFMOs with respect to deep-sea fisheries management and measures taken to address vulnerable marine ecosystems. This section updates that report where possible.

The actions taken by states and RFMOs since 2004 should be read in the context of the requirements of articles 5 and 6 of the Fish Stocks Agreement, including the duties to prevent overfishing, protect biodiversity in the marine environment and to not allow the absence of adequate scientific information to be a reason for postponing or failing to take conservation and management measures.[120] Most of these Fish Stocks Agreement provisions are also incorporated in Article 6 of the FAO Code of Conduct adopted in 1995.

Though deep-sea fisheries occur in many ocean regions, of the 50 regional fisheries bodies, only five are competent to regulate discrete and straddling high seas bottom fisheries.[121] Specific RFMOs that can exercise competence over deep-sea fisheries are the Commission on the Conservation of Antarctic Marine Living Resources (CCAMLR); the General Fisheries Commission for the Mediterranean (GFCM); the Northwest Atlantic Fisheries Organization (NAFO); Northeast Atlantic Fisheries Commission (NEAFC) and the South East Atlantic Fisheries Organization (SEAFO).

The most comprehensive and precautionary approach to deep-sea fisheries and MPAs has been adopted under CCAMLR for the Southern Ocean. This could serve as a model for other regions. In 2006, the CAMLR Commission adopted a Conservation Measure that continues a temporary prohibition on high seas bottom trawling in the Convention Area with a review scheduled in 2007 with respect to relevant criteria for determining what constitutes significant harm to benthos and benthic species. This follows a 2005 decision to initiate action on a comprehensive system of MPAs. In 2005 CCAMLR agreed on the need to develop a strategic approach to MPA design and implementation throughout the CCAMLR area, in harmony with measures taken under the Antarctic Treaty and the Madrid Environmental Protection Protocol.[122] CCAMLR agreed on some basic parameters for MPAs with the general goal of maintaining biodiversity and ecosystem processes that could include the protection of:

- representative areas;

118 UN FSA Review Conference Report above ft. 38. Annex, para 16

119 Molenaar, E.J. (report for FAO) Current Legal and Institutional Issues Relating to the Conservation and Management of High Seas Deep Sea Fisheries; see also Molenaar, above ft. 49.

120 In a slightly summarized form, FSA Article 5 calls for States to: a) adopt measures to ensure the long-term sustainability of the fish stocks; b) use the best scientific information available; c) apply the precautionary approach in accordance with Article 6; d) asses the impacts of fishing; e) adopt measures for species belonging to the same ecosystem or associated with or dependant upon the target fish stocks; f) minimize pollution, waste, discards, catch by lost or abandoned gear and impacts on associated or dependent species; g) protect biodiversity in the marine environment; h) take measures to prevent or eliminate overfishing and excess fishing capacity; j) collect and share data; k) promote and conduct scientific research and develop appropriate technologies; and l) implement and enforce conservation and management measures through effective monitoring, control and surveillance. Article 6 on application of the precautionary approach further calls for States to apply the precautionary approach in order "to protect the living resources and preserve the marine environment" (Art. 6.1). States are also to "be more cautious when information is uncertain, unreliable or inadequate. The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures." (Art. 6.2).

121 Molenaar, above ft. 49.

122 Grant, S. 2005. "The Challenges of marine protected area development in Antarctica", PARKS Magazine issue on High Seas MPAs. vol. 15, no.3 (Gjerde, K.M. and Kelleher, G., (eds.)).

- scientific areas to assist with distinguishing between the effects of harvesting and natural ecosystem changes, and to provide opportunities for understanding of the Antarctic marine ecosystem in areas not subject to human interference; and
- areas potentially vulnerable to impacts by human activities, to mitigate those impacts and/or ensure sustainability of the rational use of marine living resources.

CCAMLR also noted the potential need for interim protection to be afforded to areas identified as candidate sites, but where more information is required before a conclusion on protection can be reached.[123] Work on bioregionalization has begun with a workshop in September 2006. CCAMLR also has rules in place to control the development of new and exploratory fisheries, and hence areas are closed to fishing until CCAMLR determines that the fishery is sustainable and that appropriate rules are in place to prevent adverse ecosystem impacts or long-term damage.

In the Northeast Atlantic, NEAFC in late 2004 closed five areas on an interim three-year basis to bottom fishing in response to a proposal from Norway. At the same time, NEAFC deferred decisions on two other proposals, one from Norway and the other a request from the regional seas organization—OSPAR, for protection of deep-sea corals in the Rockall Bank and Hatton Bank. No action was taken on these two proposals in 2005. The Secretary General's report notes that the reason given by NEAFC was that "current information is insufficient to support scientifically based closures."[124] At the time it was also debated whether NEAFC had the legal authority to close areas to fishing for biodiversity conservation purposes, as opposed to purposes directly related to stock management.[125] NEAFC has since initiated a reform process and expanded its mandate to include ecosystem-based management. In November 2006, it agreed to close Hatton Bank and three areas of Rockall Bank from 2007 to 2009, based on earlier solicited ICES advice. One of the areas recommended by ICES "South Rockall" (area: 3214.5 sq km) was not accepted. OSPAR has expressed an interest in incorporating these temporarily protected areas into their regional network of MPAs. This provides a useful opportunity to enhance regional cooperation and coordination, one of the key recommendations of the NEAFC performance review panel.[126] Cooperation between regional organizations on matters of High Seas biodiversity conservation may be most successful if it occurs early and often.

In the Northwest Atlantic Ocean, NAFO agreed in September 2006 to move towards an ecosystem approach and to expand NAFO's mandate to minimize harmful impacts and preserve marine biodiversity. NAFO members also agreed to protect four seamount areas from high seas bottom trawling for a three year period.[127] These areas will be fully closed in 2007, and as of January 1, 2008, 20 percent of the fishable area of each seamount may be opened to a small scale and restricted exploratory fishery. In the event hard corals are encountered in these four areas, the fishery will be subject to closure. These measures will be reviewed in 2010 at which time they may be ended, extended, or possibly made permanent.[128]

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123 Id.

124 The dilemma posed by requiring more information to protect an area than to fish in it is described by John Gordon, chair of the ICES deep-sea fisheries assessment study group between 1995-2000, as follows: "It is perhaps not much of a consolation, but at least in the Rockall Trough we know a lot about the ecosystem that is being destroyed. From the small amount of available knowledge, the Hatton Bank is a different ecosystem and we will never know what we are in the process of destroying." http://www.ices.dk/reports/ACE/2002/SGCOR02.pdf#search=%22John%20Gordon%20JNCC%20ICES%20%20fish%22; REPORT OF THE STUDY GROUP ON MAPPING THE OCCURRENCE OF COLD WATER CORALS By correspondence May 2002 ICES CM 2002/ACE:05 Ref: E, WGECO

125 Norwegian proposal submitted to NEAFC, 2004.

126 Performance Review Panel, 2006. Report of the North East Atlantic Fisheries Commission, para, 3.6.3.3. available at: http://www.neafc.org/news/docs/performance-review.pdf.

127 "NAFO reform in Full Swing" 2006 Annual Meeting Press Release 22 September 2006, available at: http://www.nafo.int/about/frames/about.html

128 Id.

SEAFO in the Southeast Atlantic adopted a conservation measure in October 2006 suspending all deep-sea fishing activities in 10 areas as of 1 January 2007 for three years.[129] Small scale exploratory fishing may resume in 2008 in 20 percent of the defined areas, and where vessels encounter hard corals, an immediate temporary closure is to be declared. Vessels in these areas are to carry scientific observers. SEAFO has not adopted other measures related to the protection of sensitive deep-sea habitats (other than corals inside the 10 partially closed areas).

In the Mediterranean, the GFCM has closed on a precautionary basis the deeper waters of the Mediterranean below 1 000 m, and in 2006 closed three areas to bottom trawling in shallower waters. According to recent scientific studies on deep-sea corals in the Mediterranean, coral diversity and abundance are higher in the unprotected shallower waters: the deepest known coral occurrence is 1 200 m.[130]

With regard to areas lacking competent RFMOs, in the Southern Indian Ocean an agreement to promote sustainable management was opened for signature in July 2006, seven years after negotiations commenced. The agreement is based largely on provisions of the Fish Stocks Agreement. A new agreement for the South Pacific is in the early stages of negotiation: a preliminary meeting was held in February 2006. With respect to an area in the North Pacific, Russia, Japan, Korea and the United States met in August 2006 to discuss a possible arrangement to regulate deep-sea fishing in the region where the first deep-sea bottom fisheries emerged in the late 1960s.

With a few exceptions (e.g. CCAMLR and the GFCM 1000 m depth closure in the Mediterranean), it would appear that the current closures are small in scale compared to the potential area where deep-sea fisheries may occur and only temporary in duration. As evidenced from the experience in CCAMLR, where there are both political will and a specific conservation mandate, RFMOs can move rapidly to establish rules to protect vulnerable areas and to lay the groundwork for the establishment of comprehensive systems of MPAs. However, there is much to be done to make up for the slow pace of progress in the past.

8. HIGH SEAS MPAs: DEEP-SEA FISHERIES AND COMPLIANCE

Issues regarding compliance with and enforcement of High Seas MPAs for deep-sea fisheries will need to be addressed in the larger context of high seas fisheries management and governance. IUU fishing is a major problem that can undermine any fisheries measure. Nevertheless, there are a variety of mechanisms that can improve compliance and enforceability today of RFMO-designated MPAs for deep-sea fisheries. Practices employed by Australia for its remote Heard Island and McDonald Islands fisheries (which also incorporate rules adopted by CCAMLR) indicate currently available technologies and practices:[131]

1) Vessel Monitoring Systems for all vessels, centralised by CCAMLR since 2004. Gear codes can now be attached to VMS monitoring devices.
2) Fishing operators must report when they enter and exit the fishery, and have the duty to complete a daily logbook, whose data are transmitted to Australian authorities.
3) Cameras to assist observers will be introduced by 2008.

129 Conservation Measure 06/06 on the on the Management of Vulnerable Deep Water Habitats and Ecosystems in the SEAFO Convention Area. Available at: http://www.seafo.org/.
130 Taviami, M, Freiwald, A. and Zobrowius, H. 2005. "Deep coral growth in the Mediterranean Sea: an overview" In: Cold-water Corals and Ecosystems (eds. A. Freiwald and J.M. Roberts). Springer-Verlag, Berlin Heidelberg, pp. 137-156.
131 Gotheil, above ft. 10.

4) An International Telecommunications Union radio/call sign (IRCS) is mandatory on all vessels for the identification of legal vessels, and each buoy has to be marked with the IRCS number.
5) Independent officers are in charge of notifying and monitoring the unloading and export of all catches, in accordance with CCAMLR's Catch Documentation Scheme, and inspectors are appointed under CCAMLR.
6) Specific requirements for the packaging and labelling of catches help to determine the amount of catch to be deducted from the TAC and provide additional surveillance to ensure that fishing has been conducted by a legally authorised vessel.
7) Most infringements to the rules, such as overcatch, the use of smaller mesh sizes than authorised, etc. are punished by a reduction of fishing quotas defined in "penalty units".
8) Presence of an armed patrol vessel to intercept illegal vessels: At HIMI, the presence of the *Oceanic Victory* helped to reduce illegal catches of toothfish from about 7 000 t in 1997 to between 0 and 265 t during the 2004-05 season.
9) The HIMI Marine Reserve further benefits from a "Territory Watch Programme" wherein authorized fishers are encouraged to report suspicious activities in the HIMI area.
10) A dedicated database is used to trace and investigate suspected violations to HIMI regulations. Any type of boat or aircraft will be tracked.
11) Regular patrols by civilian and Australian Defence Force vessels to detect and deter any illegal activity, principally linked to IUU fishing.
12) The Australian Government also relies on the French Government, with whom it signed an agreement in 2003 to cooperate for the conduct of surveillance activities around HIMI, including in the Reserve, and Îles Kerguelen.

Comparable measures could be adopted to enhance compliance with and enforcement of High Seas MPAs as part of a wider enforcement regime for deep sea fisheries. However, mutually agreed at-sea enforcement mechanisms, such as those available under the Fish Stocks Agreement, would also be necessary to authorize the boarding of ships by non-flag states on the high seas. At the same time, as discussed at the Fish Stocks Agreement Review Conference in May 2006 and described in the Final Report of the High Seas Task Force,[132] efforts to enhance compliance must comprehensively address the fishing industry, flag states, states of nationality and corporate registration, port states, RFMOs, and market states.

To enhance compliance, positive incentives may be directed at the most affected stakeholders—the deep-sea fishing industry. Some have suggested that a system of fishing rights or privileges for deep-sea fisheries in specific areas may be useful. Others have noted, however, that there is no legal right or authority to allocate exclusive rights to common property resources, such as those that exist on the high seas.[133] Instead, if agreed to by states and if equitable issues are addressed, revocable contracts granting conditional access to specific areas might be agreed upon via an RFMO, with strict and carefully monitored conditions for sustainability and protection of marine biodiversity. Other forms of incentives noted by Young (2006) include tax benefits and streamlined license renewal for those able to document compliance; certification systems that enable users to access particular markets or obtain a premium price; and voluntary codes of conduct with clearly explained benefits for those who comply.[134]

132 High Seas Task Force, 2006. Closing the net: Stopping illegal fishing on the high seas. Governments of Australia, Canada, Chile, Namibia, New Zealand, and the United Kingdom, WWF, IUCN and the Earth Institute at Columbia University. Available at: http://www.high-seas.org/.
133 Osherenko, G. 2006. "New Discourses on Ocean Rights: Understanding Property Rights, the Public Trust, and Ocean Governance", Paper 1537, ExpressO Preprint Series.
134 Young, above ft. 2.

Flag states have an important role to play in ensuring responsible and sustainable use of resources as well as in enforcing regulations with respect to MPAs in areas beyond national jurisdiction. As noted at the FAO Workshop on MPAs, flag states could contribute by a range of methods, including through effort management of their national fleet, independent on-board observers, gear regulations and technological requirements to ensure compliance with MPAs and other spatial controls. Flag states (as well as port states and RFMOs) could require that VMS equipment be used and that data be made available to the relevant RFMO as well as flag and port state enforcement agencies on a real time basis as a condition to fish on the high seas. Broad based cooperation could ensure that sufficiently stringent measures and penalties (high enough to serve as a credible deterrent) are imposed. For example, global cooperation would be necessary to prevent "ports of convenience" from emerging where IUU fishers/transhippers can go to process illegal catches. Penalties for vessels caught fishing in contravention of the conditions of their permits could result in denial/revocation of fishing permits and landing privileges.[135]

States may also assert controls over their nationals and corporations, and could establish regulations requiring transparency of overseas vessel ownership, applicable to beneficial owners, and by making it illegal for their nationals and corporations to re-flag vessels to avoid compliance with conservation measures. Many have recommended that legislation similar to that found in the United States' Lacey Act be adopted to make it an offence for a national to be involved in activities contravening regional and internationally agreed conservation measures.[136]

Port states, market states and RFMO member states may take mutually supportive action to address the acknowledged problems of flag state compliance.[137] Port states can enact strict vessel inspection and catch documentation requirements, and harmonize them on a regional and ideally global basis. These could require vessels to document that the catch was harvested only in approved areas and/or outside of designated MPAs and provide certificates to that effect. Market states could agree to purchase or allow the transhipment of catch only if it is properly documented and certified as caught in compliance with conservation measures, including geo-spatial restrictions like MPAs.

RFMOs can also impose conditions on access to fisheries resources. In addition to catch documentation schemes, they can use their allocation authority to limit or deny access to fishing vessels of non-complying members and may implement schemes for boarding and inspection of vessels of member states on the high seas.[138]

Where no RFMOs currently exist, interim arrangements such as catch documentation and certification schemes could be established, possibly on a global scale, for application by flag, port and market states. The Convention on International Trade in Endangered Species provides a useful precedent for global monitoring of trade in species of concern. Requirements to document 'introduction from the sea' might be used to require identification of where the commercial product is harvested, and permits issued for exports or imports only if the cargo owner is able to document that the catch was not obtained in a restricted area or is obtained in compliance with any geo-specific requirements. As noted by Young (2006), the CITES provision on "introduced from the sea" can only be implemented by knowing (or accepting vessel operator's statements about) where the species was harvested.[139]

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135 Rayfuse, R. 2005. "To Our Children's Children's Children From Promoting to Achieving Compliance in High Seas Fisheries" in The International Journal of Marine and Coastal Law special Issue on High Seas Fisheries Governance, Moving from Words to Action (Gjerde, KM (ed.)). vol. 20, nos. 3-4, pp. 509-532.

136 Schmidt, C-C. 2005. "Economic Drivers of Illegal, Unreported and Unregulated (IUU) Fishing", in The International Journal of Marine and Coastal Law, Special Issue on High Seas Fisheries Governance, Moving from Words to Action (Gjerde, KM (ed.)) vol. 20, nos. 3-4, 479-508; Ortiz, P. "An Overview of the U.S. Lacey Act Amendments of 1981 and a proposal for a Model Port State Fisheries Enforcement Act", report prepared for the High Seas Task Force. Available at: http://www.high-seas.org/.

137 Young, above ft. 2 at 19.

138 Rayfuse, above ft. 134

139 Young, above ft. 2.

9. HIGH SEAS MPAs AND DEEP-SEA FISHERIES: GOVERNANCE AND LEGAL ISSUES AT THE GLOBAL LEVEL

Current legal and institutional issues relating to the conservation and management of high seas deep sea fisheries are covered in depth in the complementary paper by Erik Japp Molenaar and will not be addressed here.[140] This section instead focuses on some of the major issues related to governance and law at the global level that will be important to address in the context of High Seas MPAs for deep-sea fisheries and for biodiversity conservation in general.

9.1 Adequacy of the regime in UNCLOS and the CBD for protection of marine biodiversity including through MPAs in areas beyond national jurisdiction

Many commentators and states have highlighted the need to build on the present high seas legal regime to enable the effective establishment, management and enforcement of MPAs. They also stress the need to develop mechanisms for transparent, science-based and participatory decision-making.The principles of ecosystem-based management and precaution and the duty to protect marine biodiversity are incorporated into fisheries management via the Fish Stocks Agreement. However, these principles and duties are not as yet applied on a consistent basis to fishing or to other activities that may impact marine biodiversity beyond national jurisdiction. Other activities or issues of concern include underwater noise, cable and pipeline laying, marine scientific research, proposals for CO_2 disposal or sequestration, bioprospecting, deep seabed minerals mining and deep seabed oil and gas exploration and exploitation. Also, while the Fish Stocks Agreement provides authority for States to enforce fisheries conservation and management measures (including MPAs) on other RFMO members or States Parties, there is no comparable authority to enforce MPAs established outside the remit of an RFMO or the Agreement. Moreover, even an MPA established by one RFMO would not necessarily be binding on non-members or non-parties to the Agreement.

We have seen that a growing number of RFMOs have or will soon have the legal authority to adopt measures for biodiversity conservation purposes, including MPAs (closed areas) with respect to fisheries activities. However some feel that absent a specific legal mandate for RFMOs to act, or a mechanism to ensure their transparency and accountability, little progress will occur. This underscores the need to have a consistent and coherent approach to establishment of MPAs that is not captive to any single special interest but rather takes into consideration the broader interests of civil society and future generations.

As a first step, basic criteria and guidelines for achieving the WSSD goal of representative networks could be developed and applied through a variety of relevant international bodies (e.g. FAO, IMO, ISA, and IOC) to assist nations in reaching part ways towards that goal by 2012. However, many believe that an overarching agreement on high seas biodiversity—an implementing agreement to UNCLOS just as the Fish Stocks Agreement is an implementing agreement to UNCLOS -- would better enable integrated area-based management and enforcement. At the same time, inclusive processes and participatory mechanisms could be developed. Also necessary will be mechanisms to address adverse influences on high seas biodiversity stemming from activities outside of MPAs, for example, through specific environmental impact assessment requirements and performance review processes. Such a development could be in the interests of all, as raising the standard of biodiversity conservation throughout the high seas could decrease the need for site-specific interventions.

[140] Molenaar, above ft. 118.

9.2 Adequacy of regime for deep-sea fisheries

As noted in Section 6 above, the Fish Stocks Agreement sets forth generally accepted standards for deep-sea fisheries management. Nevertheless, absent a new agreement or expansion of the Fish Stocks Agreement to incorporate discrete deep-sea fisheries on the high seas, it remains unclear whether states must also apply the Fish Stock Agreement's provisions relating to RFMO governance, dispute resolution, or enforcement. In 2005, COFI urged Members to fully apply the FAO Code of Conduct and four related International Plans of Action (IPOAs) to deep-sea fishing and to ensure that their vessels operated in a manner consistent with the ecosystem approach to fishing, and to fully report on their fishing activities,[141] but again, there are no binding standards upon which to assess state or RFMO performance or to base possible enforcement actions.

Additional concerns are that large areas of the globe are not covered by an existing organization with competence to regulate discrete high seas fisheries and consequently, there is no body with competence to establish High Seas MPAs for this purpose. Current gaps in RFMO coverage include the Pacific Ocean, Southwest Atlantic, Indian Ocean and the Caribbean. While action is being taken in the Southern Indian Ocean, the South Pacific and Northwest Pacific, it may be some while before these agreements come into effect.

9.3 Different standards applied to mineral seabed resources and living seabed resources

The incongruence in international law regarding impacts from potential mineral mining compared to deep-sea trawling on the seabed beyond national jurisdiction is worth noting. Under UNCLOS and the implementing agreement for Part XI, the International Seabed Authority (ISA) has responsibility to develop regulations to control pollution, conserve natural resources of the "Area" (i.e. the seabed beyond national jurisdiction) and prevent damage to flora and fauna of the marine environment from minerals activities before any seabed mining activities may occur. For example, before any exploitation of polymetallic nodules may occur, the contractor must propose areas to be set aside and used exclusively as "preservation reference zones" in which no mining shall occur, so that representative and stable biota of the seabed remain in order to assess any changes in the flora and fauna of the marine environment due to mining.[142] Furthermore, contractors are required to gather environmental baseline data, to establish environmental baselines against which to assess the likely effects of their activities on the marine environment, and to establish a programme to monitor and report on such effects.[143] Similar provisions are under consideration in the draft regulations for sulphide and cobalt-crust deposits found at hydrothermal vents and seamounts.[144] Outside of the CCAMLR provisions for new and exploratory fisheries, similar requirements do not exist with respect to deep-sea fisheries, although such fisheries may have comparably large-scale and potentially irreversible impacts. As at the national level, environmental impact assessment requirements may assist in levelling the playing field between economic sectors, and enable regulators to impose comparable standards.

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141 FAO, 2005. Report of the 26th session of the Committee on Fisheries (Rome, Italy, 7-11 March 2005) para. 83-94.

142. Regulation 31.7, Regulations for Prospecting and Exploration for Polymetallic Nodules in the Area, 19 July 2000. See Document ISBA/6/A/18 for official text. This regulation also requires the contractor to set aside an "impact reference zone," representative of the environmental characteristics of the Area, to be used for assessing the effect of that contractor's activities in the Area on the marine environment. Available at www.isa.org

143 Regulation 31.4, Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area, note 24. In 2001, the Authority's Legal and Technical Commission adopted recommendations for the guidance of the contractors for the assessment of the possible environmental impacts arising from exploration for polymetallic nodules in the Area, Document ISBA/7/LTC/1/Rev.1, 13 February 2002..

144 Regulation 33, ISBA/10/C/WP.1, 24 May 2004.Available at www.isa.org.

9.4 The adequacy of high seas enforcement powers

Problems of non-compliance and illegal activities are serious impediments to sustainable fisheries, particularly due to inconsistent flag and port state performance. The problems with flags and ports of non-compliance, and the lack of effective at-sea enforcement provisions under UNCLOS for areas beyond national jurisdiction do not occur only in high seas fisheries management, but also with respect to illegal discharges from merchant ships, illegal dumping, and trafficking in drugs or migrants. Solutions to remedy these problems may need to be dealt with as a whole at the global level as well as at the sector-specific level. As described in Section 7 above, potential approaches for improving the enforceability of high seas MPAs designated by RFMOs include strengthening both flag and port state enforcement, catch documentation and tracing schemes, further use of agreed at-sea boarding and inspection schemes (as envisaged by the Fish Stocks Agreement), systematic use of modern information and communications technologies to identify and track illegal activities, and harsh penalties. Comparable mechanisms would need to be developed to enable effective enforcement of MPAs established through other (non-RFMO) agreements. A globally harmonized yet stringent regime for port state inspections and enforcement would decrease some of the need for enhanced at-sea enforcement powers, though visual surveillance, monitoring and tracking would remain essential.

10. HIGH SEAS MPAs AND DEEP-SEA FISHERIES: GOVERNANCE AND LEGAL ISSUES AT REGIONAL LEVEL

At the regional level, several governance and legal issues also stand out as of immediate importance in determining the effectiveness of MPAs as a tool for managing deep-sea fisheries and protecting deep-sea biodiversity.

10.1 Adequacy of RFMO coverage, competence and consistency

RFMOs are the obvious fora for establishing High Seas MPAs relating to deep-sea fisheries management and conservation. However, as noted in Section 5, gaps in area coverage and legal mandate mean that only five RFMOs currently have competence to regulate deep-sea fisheries on the high seas. Within these five, many have noted very uneven performance: CCAMLR has a very complex and precautionary regime applicable to deep-sea fisheries, while some of the others have enacted measures only after many of their deep-sea fisheries have virtually collapsed.[145] The GFCM, NAFO, NEAFC and SEAFO have focused on protecting a few vulnerable areas from the impacts of bottom fishing, but have not yet adopted a large-scale systematic approach for their geographic area.

RFMO track records in implementing ecosystem-based and precautionary management measures and the lack of science-based decision making processes were discussed at the Fish Stocks Review Conference in May 2006. The Conference stressed the need for RFMOs to incorporate more fully the precautionary approach and the ecosystem approach and encouraged the use of MPAs as a tool. As a way to assess progress, the Conference also recommended that RFMOs should undertake performance reviews.

New requirements for states and RFMOs with respect to deep sea bottom fisheries are set forth in the 2006 UNGA Resolution on Sustainable Fishing (A/61/105, see Section 3 above). RFMOs should adopt measures detailed in paragraph 83 (A-D) of the resolution no later than December 31, 2008. In areas where a new RFMO or arrangement for deep-sea fisheries is under negotiation, states should accelerate their negotiations and adopt, no later than December 31, 2007, interim measures consistent with paragraph 83 of the resolution. At the same time, flag states should either adopt and implement measures in

145 UN Sec. Gen. Impacts of Fishing Report, above ft. 35. See also Molenaar, above at ft. 49.

accordance with paragraph 83 or cease to authorize their flag vessels to conduct bottom fisheries in areas where there is no competent RFMO. Such measures should be made publicly available through the FAO. State and RFMO implementation of such measures will be assessed by the UNGA in 2009. These steps should help to improve the adequacy and consistency of deep-sea fisheries management and protection of vulnerable deep sea ecosystems, if combined with credible RFMO performance review and improvements.

10.2 Adequacy of scientific knowledge and expertise within RFMOs

In some RFMOs the scientific advisory bodies may need to be supplemented with additional expertise regarding elements of implementing the ecosystem approach or identifying vulnerable marine areas. The need for additional expertise is rapidly apparent in light of the call by the UNGA in the 2006 Sustainable Fisheries Resolution for RFMOs and States to, inter alia:

1. assess, on the basis of the best available scientific information, whether individual bottom fishing activities would have significant adverse impacts on vulnerable marine ecosystems;
1. identify vulnerable marine ecosystems and determine whether bottom fishing activities would cause significant adverse impacts to such ecosystems and the long-term sustainability of deep-sea fish stocks;
2. improve scientific research and data collection and sharing;
3. identify areas where vulnerable marine ecosystems are known to occur or are likely to occur (UNGA 61/L.38, para 83(A-C)).

The lack of this type of expertise was highlighted in the June 2006 report of NAFO's Scientific Council, which stated that their current expertise is principally focused on stock assessment of fin-fish, squid and shrimp, environment influence, and extends to seals through a joint NAFO/ICES Working Group.[146] As a result, at its June 2006 meeting the Scientific Council was unable to make recommendations with respect to criteria for determining areas of marine ecological and biological significance, in particular areas associated with seamounts, hydrothermal vents, and cold-water corals or provide information on their distribution.[147] They suggested that additional expertise could be obtained either through the contracting parties or through cooperation with other organizations such as ICES. The Scientific Council also noted that it lacked the competence required to implement certain aspects of the ecosystem approach to fisheries. At least on an interim basis, ICES and its working groups on deep-sea fisheries and deep-sea ecology may be in a useful position to supplement or advise the scientific bodies to RFMOs or arrangements in need of additional expertise. ICES may however also need to enhance its capacity and expertise on these matters.

10.3 Adequacy of geographic coverage of regional organizations responsible for comprehensive environmental management

Some regionally-based agreements that establish comprehensive environmental protection regimes also enable regional organizations to designate MPAs. Examples described above include Antarctica, the Mediterranean and Northeast Atlantic. These allow for designation of different types of MPAs to manage current and potentially threatening activities. However, they cannot directly regulate fishing and shipping activities. As these organizations may have the broadest expertise to identify significant and vulnerable areas that would benefit from protection, effective coordination and cooperation with the relevant RFMOs is essential. In the past, this cooperation has been patchy, as the RFMOs may have lacked an interest in or

146 NAFO, 2006. REPORT OF SCIENTIFIC COUNCIL MEETING 1-15 JUNE 2006, available at: http://archive.nafo.int/open/sc/2006/screpjun06.pdf.
147 Id.

a mandate for ecosystem-based management and/or biodiversity conservation.[148] These problems are now widely acknowledged, and a variety of mechanisms are being developed to enhance cooperation. For example, CCAMLR and the Environment Committee of the ATCM both send observers to each others meetings, and provide full reports on activities of relevance to the others mandate. They are now collaborating on the MPA initiative for the Southern Ocean. Similar exchanges and formal agreements between regional seas bodies and RFMOs, as well as with relevant global bodies, may enhance cooperation.

However, many High Seas regions presently lack regional marine agreements or organizations that can manage activities (other than fishing and shipping) that may negatively affect high seas biodiversity or identify and establish MPAs. The patchwork of geographic and political coverage can operate as a restriction on action.[149] Some have suggested that a global mechanism could help fill that gap until regional organizations are established. In the interim, regional grouping of states and user states could develop agreements amongst themselves to identify and protect vulnerable and representative marine ecosystems, based on globally agreed MPA criteria and guidelines.

11. NEXT STEPS FOR HIGH SEAS MPAs

Assuming RFMOs undertake the necessary reforms, and interim measures and arrangements are adopted in areas lacking competent RFMOs, MPAs can become an effective tool for deep-sea fisheries and biodiversity conservation and management on the High Seas. However, given the large gaps in information, the vulnerability of deep-sea fisheries to rapid depletion and the potential for long term and potentially irreversible damage to deep-sea ecosystems, a large-scale approach that reflects a high level of precaution and prevention will be necessary. As called for by the FAO Code of Conduct and the Fish Stocks Agreement, the absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures to protect the living marine resources or preserve the marine environment. The 2006 UNGA Resolution on Sustainable Fisheries sets forth steps for all states and RFMOs to take in the absence of information, and details mechanisms to help develop the basic information required. But that too will take time. This time-lag highlights the continuing need for mechanisms such as a suspension of high seas bottom trawling, a dramatic reduction in effort and area, and/or a reversal in the burden of proof so as to make best use of the data already available within the fishing industry.

In developing plans for MPAs with respect to deep-sea fisheries on the High Seas, the following elements are worth further consideration:

- Protection of deep-sea coral and seamount diversity will need to be targeted in the upper 1 500 meters, where most of the coral diversity and targeted deep-sea fish stocks are located, and where the greatest fishing pressure takes place.
- Sponge beds and other communities that may be found on soft bottom habitats are also vulnerable to the impacts of deep-sea bottom fishing and will need to be considered for protection. These species also enhance local biodiversity but are very sensitive to increased turbidity and very slow to recover.
- At the scientific level, efforts to obtain data and understanding will need to be rapidly escalated and precede expansion of deep-sea fisheries in effort or into new areas. Rules to strictly control new and emerging fisheries and to prevent long term damage, such as those adopted by CCAMLR, may provide a useful model.

148 Royal Commission on Environmental Pollution, 2004. Turning the Tide – Addressing the Impact of Fisheries on the Marine Environment, 25th Report, December 2004 at 253. Available at www.rcep.org/uk/fishreport.htm.
149 Young, above ft. 2.

- Further work is necessary to identify and map deep-sea ecotypes and bioregions, to model the distribution of deep-sea species, and to understand the factors that influence the biodiversity of seamounts and other deep-sea habitats.
- Research on the ecology and biogeography of deep-sea benthic species and ecosystems remains critical. Its absence continues to confound approaches to develop a methodology for identifying vulnerable ecosystems or representative, special or unique areas as candidates for MPAs.
- Where areas have been proposed for protection, but the RFMO considers that there is a need for additional information or data, RFMOs might consider adopting an approach similar to that applied by CCAMLR by providing interim protection to an area so that further information can be gathered or further studies pursued.
- Vastly improved management and reporting on deep-sea fisheries, including at finer temporal and spatial scales than at present, is essential. Information on fishing areas, fishing effort, fishing strategies and targeted and bycatch species will need to be collected and assessed to identify what and where has been fished, what can be fished and where and what can be protected.
- To enable a fair assessment of socio-economic interests and biodiversity considerations, an agreed open, transparent and participatory process will need to be in place in all regions and/or at the global level for identifying MPAs and establishing protective measures. The development of consistent criteria, principles and guidelines by a spectrum of intergovernmental organizations, governments, scientists, conservation organizations and fishing industry representatives may assist RFMOs in developing such a process at least with respect to MPAs addressing high seas fishing activities.
- To secure a comprehensive system of High Seas MPAs, enhanced coordination mechanisms will need to be established between RFMOs and regional seas organizations and among specialized regimes with the capacity to regulate uses on the High Seas. Memoranda of understanding, participation in meetings, exchange of information between Secretariats and at the national level could assist in enhancing coordination.
- To implement effectively an ecosystem-approach to the High Seas and coordinate individual MPA designations within a larger ecosystem and biogeographic framework, mechanisms will also be needed to ensure conservation and sustainable use throughout the High Seas. The European Union has proposed an implementing agreement to UNCLOS for this purpose, though some suggest that this can be done through better use of existing mechanisms. There is an urgent need for broader discussion of this issue.

Efforts will also need to be directed towards applying the lessons learned at the FAO workshop on MPAs for fisheries management described in Section 1 above. These include: i) the need for political will as well as supportive legal and jurisdictional frameworks throughout the High Seas; ii) the advisability of harmonizing legislation between sectors and mandating institutional coordination, consultation and cooperation among agencies with relevant interests; iii) the possible use of zonation schemes, where there is sufficient capacity for enforcement of detailed, spatially explicit regulations; and iv) the need for involvement of stakeholders both within and beyond MPA boundaries, recognizing that on the High Seas, additional mechanisms may be necessary to enhance compliance and secure enforcement.

In the long run, the effectiveness of MPAs on the High Seas will hinge on the continued commitment and political will of nations to address broader issues related to high seas fisheries management and oceans governance on a global basis. Problems of poor implementation, compliance, decision-making, and enforcement within RFMOs and IUU fishing everywhere will need to be resolved at the same time as significant efforts are invested into improving scientific knowledge, deep-sea fisheries management and biodiversity conservation.

ANNEX 1: LIST OF ACRONYMS

CBD	Convention on Biological Diversity
CCAMLR	Convention for the Conservation of Antarctic Marine Living Resources
COFI	Committee of Fisheries of the FAO
COP	Conference of the Parties
EEZ	Exclusive Economic Zone
FAO	UN Food and Agriculture Organisation
GFCM	General Fisheries Commission for the Mediterranean
HERMES	Hotspot Ecosystem Research on Margins of European Seas
ICES	International Council for the Exploration of the Sea
IMO	International Maritime Organisation
IOC	Intergovernmental Oceanographic Commission
IPOA	International Plan of Action
ISA	International Seabed Authority
IUCN	The World Conservation Union
IUU	Illegal, Unreported and Unregulated fishing
MPA	Marine Protected Area
NAFO	Northwest Atlantic Fisheries Organisation
NEAFC	North-East Atlantic Fisheries Commission
OSPAR	Commission for the protection of the marine environment of the North-East Atlantic
PSSA	Particularly Sensitive Sea Areas
RFMO	Regional Fisheries Management Organisation
SEAFO	South East Atlantic Fisheries Organization
SIODFA	Southern Indian Ocean Deepwater Fishers Association
UNCLOS	United Nations Convention on the Law of the Sea
UNGA	United Nations General Assembly
WSSD	World Summit on Sustainable Development

ANNEX II: SECTION X, 2006 UN GENERAL ASSEMBLY "SUSTAINABLE FISHERIES" RESOLUTION (A/61/L.38)

X
Responsible fisheries in the marine ecosystem

76. *Encourages* States to apply by 2010 the ecosystem approach, notes the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem and decision VII/11 and other relevant decisions of the Conference of the Parties to the Convention on Biological Diversity, notes the work of the Food and Agriculture Organization of the United Nations related to guidelines for the implementation of the ecosystem approach to fisheries management, and also notes the importance to this approach of relevant provisions of the Agreement and the Code;

77. *Encourages* States, individually or through regional fisheries management organizations and arrangements and other relevant international organizations, to work to ensure that fisheries and other ecosystem data collection is performed in a coordinated and integrated manner, facilitating incorporation into global observation initiatives, where appropriate;

78. *Also encourages* States to increase scientific research in accordance with international law on the marine ecosystem;

79. *Calls upon* States, the Food and Agriculture Organization of the United Nations and other specialized agencies of the United Nations, subregional and regional fisheries management organizations and arrangements, where appropriate, and other appropriate intergovernmental bodies, to cooperate in achieving sustainable aquaculture, including through information exchange, developing equivalent standards on such issues as aquatic animal health and human health and safety concerns, assessing the potential positive and negative impacts of aquaculture, including socio-economics, on the marine and coastal environment, including biodiversity, and adopting relevant methods and techniques to minimize and mitigate adverse effects;

80. *Calls upon* States to take action immediately, individually and through regional fisheries management organizations and arrangements, and consistent with the precautionary approach and ecosystem approaches, to sustainably manage fish stocks and protect vulnerable marine ecosystems, including seamounts, hydrothermal vents and cold water corals, from destructive fishing practices, recognizing the immense importance and value of deep sea ecosystems and the biodiversity they contain;

81. *Reaffirms* the importance it attaches to paragraphs 66 to 69 of its resolution 59/25 concerning the impacts of fishing on vulnerable marine ecosystems;

82. *Welcomes* the important progress made by States and regional fisheries management organizations or arrangements with the competence to regulate bottom fisheries to give effect to paragraphs 66 to 69 of its resolution 59/25, to address the impacts of fishing on vulnerable marine ecosystems, including through initiating negotiations to establish new regional fisheries management organizations or arrangements, but on the basis of the review called for in paragraph 71 of its resolution 59/25 recognizes that additional actions are urgently needed;

83. *Calls upon* regional fisheries management organizations or arrangements with the competence to regulate bottom fisheries to adopt and implement measures, in accordance with the precautionary approach, ecosystem approaches and international law, for their respective regulatory areas as a matter of priority, but not later than December 31, 2008:

A. To assess, on the basis of the best available scientific information, whether individual bottom fishing activities would have significant adverse impacts on vulnerable marine ecosystems, and to ensure that if it is assessed that these activities would have significant adverse impacts, they are managed to prevent such impacts, or not authorized to proceed.

B. To identify vulnerable marine ecosystems and determine whether bottom fishing activities would cause significant adverse impacts to such ecosystems and the long-term sustainability of deep sea fish stocks, *inter alia* by improving scientific research and data collection and sharing, and through new and exploratory fisheries;

C. In respect of areas where vulnerable marine ecosystems, including seamounts, hydrothermal vents and cold water corals, are known to occur or are likely to occur based on the best available scientific information, to close such areas to bottom fishing and ensure that such activities do not proceed unless it has established conservation and management measures to prevent significant adverse impacts on vulnerable marine ecosystems; and

D. To require members of the regional fisheries management organizations or arrangements to require vessels flying their flag to cease bottom fishing activities in areas where, in the course of fishing operations, vulnerable marine ecosystems are encountered, and to report the encounter so that appropriate measures can be adopted in respect of the relevant site;

84. *Calls upon* regional fisheries management organizations or arrangements with the competence to regulate bottom fisheries to make the measures adopted pursuant to paragraph 83 publicly available;

85. *Calls upon* those States participating in negotiations to establish a regional fisheries management organization or arrangement competent to regulate bottom fisheries to expedite such negotiations and, by no later than December 31, 2007, to adopt and implement interim measures consistent with paragraph 83 and make these measures publicly available;

86. *Calls upon* flag States to either adopt and implement measures in accordance with paragraph 83, *mutatis mutandis*, or cease to authorize fishing vessels flying their flag to conduct bottom fisheries in areas beyond national jurisdiction where there is no regional fisheries management organization or arrangement with the competence to regulate such fisheries or interim measures in accordance with paragraph 85, until measures are taken in accordance with paragraph 83 or 85;

87. *Further calls upon* States to make publicly available through the FAO a list of those vessels flying their flag authorized to conduct bottom fisheries in areas beyond national jurisdiction, and the measures they have adopted pursuant to paragraph 86;

88. *Emphasizes* the critical role played by the FAO in providing expert technical advice, in assisting with international fisheries policy development and management standards, and in collection and dissemination of information on fisheries-related issues, including the protection of vulnerable marine ecosystems from the impacts of fishing;

89. *Commends* the FAO for its work on the management of deep sea fisheries in the high seas, including the expert consultation held on 21 to 23 November 2006 in Bangkok, Thailand, and further invites the FAO to establish at its next Committee on Fisheries meeting a timeframe of relevant work with respect to the management of the deep sea fisheries in the high seas, including enhancing data collection and dissemination, promoting information exchange and increased knowledge on deep sea fishing activities, such as through convening a meeting of States engaged in such fisheries, developing standards

and criteria for use by States and regional fisheries management organizations or arrangements in identifying vulnerable marine ecosystems and the impacts of fishing on such ecosystems, and establishing standards for the management of deep sea fisheries, such as through the development of an international plan of action;

90. *Invites* the FAO to consider creating a global database of information on vulnerable marine ecosystems in areas beyond national jurisdiction to assist States in assessing any impacts of bottom fisheries on vulnerable marine ecosystems and invites States and regional fisheries management organizations or arrangements to submit information to any such database on all vulnerable marine ecosystems identified in accordance with paragraph 83;

91. *Request* the Secretary-General, in cooperation with the Food and Agriculture Organization of the United Nations, to include in his report to the 64th session concerning fisheries a section on the actions taken by States and regional fisheries management organizations or arrangements in response to paragraphs 83 to 90, and *decides* to conduct a further review of such actions during the 64th session of the United Nations General Assembly in 2009, with a view to further recommendations, where necessary;

92. *Encourages* accelerated progress to establish criteria on the objectives and management of marine protected areas for fisheries purposes and in this regard welcomes the proposed work of FAO to develop technical guidelines in accordance with the Convention on the design, implementation and testing of marine protected areas for such purposes, and urges coordination and cooperation among all relevant international organizations and bodies**;**

93. *Notes* that the Second Intergovernmental Review Meeting of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) held 16 - 20 October 2006 in Beijing, and urges all States to implement the GPA and to accelerate activity to safeguard the marine ecosystem, including fish stocks, against pollution and physical degradation;

94. *Reaffirms* the importance it attaches to paragraphs 77 to 81 of its resolution 60/31 concerning the issue of lost, abandoned, or discarded fishing gear and related marine debris and the adverse impacts such debris and derelict fishing gear has on, *inter alia*, fish stocks, habitats and other marine species, and urges accelerated progress by States and regional fisheries management organizations and arrangements in implementing these paragraphs of the resolution;

95. *Further* e*ncourages* the FAO Committee on Fisheries to consider the issue of derelict fishing gear and related marine debris at its next meeting in 2007, and in particular the implementation of relevant provisions of the FAO Code of Conduct for Responsible Fisheries;

ANNEX III: EXCERPTS FROM 2006 UN GENERAL ASSEMBLY OCEANS AND LAW OF THE SEA RESOLUTION (A/61/L.30)

89 *Reaffirms* its role relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction; notes the work of States, relevant complementary intergovernmental organizations and bodies on these issues, including the Convention on Biological Diversity and the Food and Agriculture Organization of the United Nations, and invites them to contribute to its consideration of these issues within the areas of their respective competence;

91 *Takes note* of the report of the Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction,[4] and requests the Secretary-General to reconvene, in accordance with paragraph 73 of resolution 59/24, and with full conference services, a meeting of the Working Group in 2008, to consider:

(a) The environmental impacts of anthropogenic activities on marine biological diversity beyond areas of national jurisdiction;

(b) Coordination and cooperation among States as well as relevant intergovernmental organizations and bodies for the conservation and management of marine biological diversity beyond areas of national jurisdiction;

(c) The role of area-based management tools;

(d) Genetic resources beyond areas of national jurisdiction; and

(e) Whether there is a governance or regulatory gap, and if so, how it should be addressed;

98 *Notes* the work of States, relevant intergovernmental organizations and bodies, including the Convention on Biological Diversity, in the assessment of scientific information on, and compilation of ecological criteria for the identification of, marine areas that require protection, in light of the objective of the World Summit on Sustainable Development to develop and facilitate the use of diverse approaches and tools such as the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012;

99 *Notes* the report of the Scientific Experts' Workshop on Criteria for Identifying Ecologically or Biologically Significant Areas beyond National Jurisdiction, held in Ottawa, from 6 to 8 December 2005,[150] and encourages experts to participate in follow-up workshops;

101 *Calls upon* States and international organizations to urgently take action to address, in accordance with international law, destructive practices that have adverse impacts on marine biodiversity and ecosystems, including seamounts, hydrothermal vents and cold water corals;

108 *Calls upon* States, individually, or in collaboration with each other or with relevant international organizations and bodies, to improve understanding and knowledge of the oceans and the deep sea, including, in particular, the extent and vulnerability of deep sea biodiversity and ecosystems, by increasing their marine scientific research activities in accordance with the Convention;

150 A/AC.259/16.