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Protecting Marine Biodiversity in Polar Areas Beyond National Jurisdiction

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Relatively little is known about polar marine biodiversity, which faces increasing threats from extractive and non-extractive activities and from the effects of climate change. The international legal regime for the protection of polar marine biodiversity in areas beyond national jurisdiction is currently inadequate, particularly in the Arctic. An important and useful outcome of this International Polar Year would be an international agreement for conservation and sustainable long-term management of marine biodiversity in the central Arctic Ocean areas beyond national jurisdiction. This agreement should incorporate the best elements of the Antarctic Treaty System together with modern conservation and management principles, and it should recognize the legitimate interests of the international community as a whole in the conservation and management of polar marine biodiversity.

INTRODUCTION

The marine environment is complex, dynamic and vast, and knowledge of its components, including marine biodiversity, is still rudimentary. Indeed, scientists estimate that millions of species exist in the oceans, many of which have not yet been documented or assessed. The paucity of knowledge of marine biodiversity is particularly acute in areas beyond national jurisdiction (ABNJ), including the high seas and the deep seabed, which have long been both literally and metaphorically 'out of sight and out mind'. Nowhere has this been truer than in the Earth's polar regions, where geographical and physical characteristics of remoteness, inaccessibility and extreme environmental conditions have limited the acquisition of knowledge of marine biodiversity. The International Polar Year (IPY), launched in March 2007, has provided an unprecedented opportunity to increase knowledge and understanding of marine biodiversity in the polar regions. However, as is clear from experience in other ocean areas, knowledge and understanding alone is not sufficient to ensure the conservation and sustainable use of the oceans and their biodiversity for current and future generations. Effective governance mechanisms are needed to address adequately the various challenges that arise.

At the global level, discussions in international fora have raised questions as to the ability of the current international legal regime to adequately protect the marine environment, including marine biodiversity and vulnerable marine ecosystems, from existing, new and emerging activities in and uses of oceans in ABNJ. United Nations General Assembly (UNGA) resolutions have repeatedly encouraged States and relevant international organizations to improve the scientific understanding and assessment of marine ecosystems and to consider ways to integrate and improve the management of risks to marine biodiversity within the framework of the United Nations Convention on the Law of the Sea (UNCLOS).[1] These issues have been raised through the annual Informal Consultative Process and, in 2004, the UNGA established an 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.[2] Protection of marine biodiversity was also addressed during the 2006 Review Conference of the UN Fish Stocks Agreement (FSA)[3] and discussions on marine protected areas (MPAs), particularly in ABNJ, have taken place at the Conference of the Parties to the Convention on Biological Diversity (CBD).[4]

This article examines the adequacy of existing legal regimes to protect marine biodiversity in polar areas beyond national jurisdiction. It is often suggested that a fundamental difference between the two polar legal regimes, posited as a sovereignty paradigm in the Arctic and a lack of sovereignty paradigm in the Antarctic, renders bi-polar comparison of regulatory approaches

[1] United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982) (UNCLOS).

[2] The first meeting of the Working Group was held in February 2006. See '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' (UN Doc. A/61/65, 21 March 2006).

[3] 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 (New York, 4 August 1995).

[4] Convention on Biological Diversity (Rio de Janeiro, 5 June 1972).

nugatory. However, the suspension of sovereignty claims in the Antarctic[5] currently renders the entire Antarctic area, including the Southern Ocean south of the Antarctic Convergence, one beyond national jurisdiction, albeit one governed by a special regime established by the various agreements and bodies comprising the Antarctic Treaty System. A bi-polar comparison of the legal regimes applicable to polar ABNJ is therefore both possible and, in the context of the IPY, appropriate. While three high seas areas exist in the Arctic,[6] this article focuses particularly on the central Arctic Ocean, which is almost totally unregulated. It also examines the Southern Ocean.

The next section below provides a brief description of polar marine biodiversity. Section 3 briefly discusses the threats to marine biodiversity in polar regions. Section 4 examines the applicable legal regimes and highlights the crucial differences in governance between Arctic and Antarctic marine ABNJ. From this discussion, section 5 proceeds to a proposal on how to address the governance gap currently applicable to Arctic ABNJ. It is concluded that a useful outcome of this IPY would be the negotiation of an international agreement establishing a regional oceans management organization mandated to conserve and protect the marine environment, including marine biodiversity, in the Arctic.

POLAR MARINE BIODIVERSITY

Polar oceans are among the most productive marine ecosystems on Earth, supporting high biomasses (as opposed to high rates of species diversity) of marine living resources.[7] Species are found in the sea ice, in the water column and on the sea floor.

In the Arctic, charismatic mega-fauna such as whales, walrus and seals are well documented. However, according to the Census of Arctic Marine Life, current knowledge of Arctic marine biodiversity, particularly in ABNJ, is still rudimentary compared to most other regions, due to the logistical challenges imposed by its multi-year ice and inhospitable climate. Nevertheless, current knowledge indicates that the Arctic Ocean holds a multitude of unique life forms highly adapted in their life history, ecology and physiology to the extreme and seasonal conditions of their environment. Bacteria, protozoa and metazoa have been identified in the sea ice, although little is known of community abundance or diversity. Amphipods, too, have been identified as thriving at the underside of the sea ice. Plant and animal benthic communities include crustaceans, amphipods, polychaetes, bivalve molluscs, brittle stars, sea urchins, worms, sponges and cnidarians. Indeed, roughly 5000 species of marine invertebrates are known to inhabit the Arctic, with over 90% of those living at the sea floor. About 350 to 400 of those species are deep-water species living in the central Arctic Ocean.[8] Moreover, the existence of hydrothermal vents in the Arctic, together with their unique ecosystems of extremophiles and specially adapted species, has now been confirmed by the discovery of vent systems on the Gakkel Ridge north of Greenland[9] and the Mohns Ridge between Spitsbergen and Iceland.[10] Large low temperature fields that support a vast community of life including large sea lilies sitting on top of mineral/bacterial chimney-like structures have also been found.[11] In the water column relatively little is known about non-copepod species and abundance, particularly deep-water species where the greatest potential for the discovery of new species is expected. In addition, although numerous fish and shrimp species are known to exist, little is known of their abundance, diversity or range, particularly in the central Arctic Ocean, where the physical impossibility of conducting fish collecting operations in ice-covered waters has thus far resulted in a void in basic knowledge.[12]

In the Antarctic, too, larger organisms such as whales, penguins, seals, seabirds, fish, squid and krill are well documented. However, little is known of other aspects of Antarctic marine biodiversity. According to the Census of Antarctic Marine Life:

> Current knowledge of Antarctica's marine biodiversity is patchy. For the most part, almost nothing is known about the mesopelagic, bathy/abysso-pelagic and benthic fauna of the slopes and deep-sea abyssal plains. Practically nothing is known about the tiny organisms (bacteria, archaea, eukaryl protists, viruses, nanoplankton) in the sea wherever they

[5] Pursuant to Article IV of the Antarctic Treaty (Washington, 1 December 1959).

[6] There are three areas of 'high seas' in the Arctic: the central Arctic Ocean, the Barents Sea 'Loophole' and the Norwegian Sea 'Banana Hole'.

[7] V. Smetacek and S. Nicol, 'Polar Oceans in a Changing World', 437:7057 *Nature* (2005), 362.

[8] See R. Gradinger, R. Hopcroft and B. Bluhm, 'Arctic Census of Marine Life (ArcCoML) Program Proposal' (15 April 2004), at 5, available at <http://www.arcodiv.org/files/Arctic_CoML_for%20web.pdf>.

[9] J. Roach, 'Hydrothermal Vents Found in Arctic Ocean', *National Geographic News* (23 January 2003), available at <http://news.nationalgeographic.com/news/2003/01/0123_030123_hotspring.html>. See also L. Lippsett, 'Summer Under Arctic Ice: A conversation with WHOI geophysicist Rob Reves-Sohn' (WHOI, 19 July 2007), available at <http://www.whoi.edu/oceanus/viewArticle.do?id=29731&sectionid=1001>.

[10] Anon., 'Researchers Find Hydrothermal Vent Fields in Far North', *ScienceDaily* (20 August 2005), available at <http://www.sciencedaily.com/releases/2005/08/050819123850.htm>.

[11] Ibid.

[12] See R. Gradinger, R. Hopcroft and B. Bluhm, n. 8 above.

occur and in whatever habitats, or about the faunas associated with hydrothermal vents, cold seeps, and seamounts.[13]

Scientific expeditions conducted between 2002 and 2005 discovered over 580 new species of isopod crustaceans in the deep Weddell Sea adjacent to the Antarctic Peninsula,[14] with a follow-up cruise in 2006 revealing at least 15 potentially new species of amphipod (shrimp-like) crustaceans and four new species of cnidarians (organisms related to coral, jellyfish and sea anemones).[15] The Census of Marine Life OBIS (Ocean Biogeographic Information System) database and its Antarctic component SCAR–MarBin (the Scientific Committee on Antarctic Research – Marine Biodiversity Information Network) currently list 5957 marine life forms for the Antarctic with an estimated 5000 to 11,000 species yet to be discovered.[16]

THREATS TO POLAR MARINE BIODIVERSITY

Threats to polar marine biodiversity mirror threats to marine biodiversity globally. These threats arise from both extractive and non-extractive activities. Extractive activities such as fishing, whaling and bioprospecting carry with them the threat of over-exploitation of both targeted and non-targeted species, as well as the potential for habitat destruction from the use of destructive fishing practices such as bottom trawling or other harvesting or extraction techniques. Due to its traditional perennial ice cover, no commercial fishing or bioprospecting currently takes place in the central Arctic Ocean. However, in the Antarctic, illegal, unreported and unregulated (IUU) fishing, particularly for Patagonian toothfish, continues to pose a significant threat to marine biodiversity, undermining not only the viability of the target species, but also of by-catch of non-target fish, sea birds and other species. Recent proposals for massive extraction of krill, primarily to produce feed for fish farms and oil for pharmaceutical and food additives, have raised concerns that the activity may threaten the very foundations of the region's ecosystem, which is fundamentally dependant on krill as a food source.[17] Bioprospecting, too, is already being conducted in Antarctic waters.[18]

Non-extractive activities such as shipping, tourism, marine scientific research, the laying of cables and pipelines or construction of artificial islands or other installations and ocean dumping all give rise to other possible harms including vessel source pollution, introduction of alien species, noise pollution and habitat destruction. None of these threats are new, however, they are increasing. In the Arctic, other extractive activities such as offshore oil and gas exploration and seabed mining may pose threats to polar marine biodiversity, while in the Antarctic pollution from land-based sources such as research stations has already become an issue.

Perhaps the greatest threat to polar marine biodiversity, however, is that posed by climate change. Numerous ice-dependent species, including polar bears, walrus, seals and Adelie penguins are either threatened with extinction or increasingly vulnerable due to reductions in their ice habitat.[19] Warming ocean temperatures, decreasing salinity due to sea ice melt and increasing ocean acidification due to excess CO_2 absorption are also affecting other species. Krill, the foundation of the Antarctic food chain, are reported to be disappearing from their traditional spawning grounds[20] and evidence is emerging of geographical shifts in populations of other Antarctic species, including the Patagonian toothfish, while non-Antarctic species such as southern bluefin tuna are migrating southwards. In the Arctic, too, cold-adapted fish stocks are being squeezed

[13] M. Stoddart and C. Summerhayes, 'Census of Antarctic Marine Life (CAML) Project Description' (CAML, undated), available at <http://www.coml.org/descrip/caml.htm>. See also CAML Scientific Steering Committee, 'The Census of Antarctic Marine Life Science Statement' (CAML, 30 May 2005), available at <http://www.caml.aq/education-outreach/documents/20061114_CAMLSciStatement_000.pdf.

[14] A. Brandt *et al*., 'First Insights into the Biodiversity and Biogeography of the Southern Ocean Deep Sea', 447:7142 *Nature* (2007), 307.

[15] Anon., 'Antarctic Marine Explorers Reveal First Hints of Biological Change After Collapse of Polar Ice Shelves', *M/V Polarstern* News Release (25 February 2007), available at <http://www.caml.aq/news/documents/FINALCAML-PolarSternnewsrelease2.pdf>.

[16] Ibid.

[17] Australian Antarctic Division Press Release, 'There's oil in them there krills' (22 October 2007), available at <http://www.aag.gov.au/default.asp?casid=17>.

[18] D. Lohan and S. Johnston, *Bioprospecting in Antarctica* (United Nations University – Institute of Advanced Studies, 2005), at 7–13; B.P. Herber, 'Bioprospecting in Antarctica: The Search for a Policy Regime', 42:221 *Polar Record* (2006), 139–146; S. Arico and C. Salpin, *Bioprospecting of Genetic Resources in the Deep Seabed; Scientific, Legal and Policy Aspects* (United Nations University – Institute of Advanced Studies, 2005). See also the article by David Leary in this issue of *RECIEL*.

[19] On the Arctic, see *Impacts of a Warming Arctic: The Arctic Climate Impact Assessment* (Arctic Council, 2004), available at <http://amap.no/acia/>. On the Antarctic see, for example, WWF International, *Antarctic Penguins and Climate Change* (WWF, December 2007), available at <http://assets.panda.org/downloads/folleto_penguins.pdf>; and D.G. Ainley, *The Adelie Penguin: Bellwhether of Climate Change* (Columbia University Press, 2002). See also Intergovernmental Panel on Climate Change, *Fourth Assessment Report – Climate Change 2007: Synthesis Report* (UNFCCC, 2007), Topic 3, at 12, available at <http://www.ipcc.ch/ipccreports/ar4-syr.htm>.

[20] R. Schubert *et al*., *The Future Oceans – Warming Up, Rising High, Turing Sour* (WGBU German Advisory Council on Climate Change, 2006).

northward while southern species such as haddock, cod and salmon are migrating into Arctic waters.[21]

The disappearance of polar sea ice will also affect the communities of organisms living in and under the ice. On the one hand, the importance of these communities is demonstrated by recent discoveries in the Antarctic that icebergs, which have been increasing in number over the past decade due to the break up of ice shelves caused by atmospheric warming, are veritable 'hot spots' for ocean life, supporting thriving colonies of sea birds, phytoplankton, krill and fish.[22] Significant reductions in sea ice extent, such as that already evidenced in the Arctic,[23] can therefore be expected to have detrimental effects on polar pelagic ecosystems. On the other hand, the disappearance of sea ice can be expected to lead to shifts and possible increases in both the diversity and abundance of benthic communities.[24]

Aside from the direct effects of climate change, increasing human activities in newly ice-free areas, such as shipping and oil and gas extraction, and activities aimed at mitigating the adverse effects of climate change, may also pose threats to polar marine biodiversity. Ocean fertilization, for example, is currently being touted by some as a simple, quick and environmentally friendly fix to the world's CO_2 emissions problems. Ocean fertilization involves stimulating phytoplankton or algae blooms in the ocean, either by the addition of nutrients such as iron, nitrogen or phosphorous, or by pumping nutrient rich deep water into the shallows. In theory, the phytoplankton absorbs atmospheric CO_2, converting it to organic carbon, which then sinks to the ocean floor, sequestering the CO_2. In reality, neither the efficacy nor the verifiability of the sequestration has yet been shown after repeated experiments,[25] and a range of adverse side effects on the marine environment, including its biodiversity, have been observed and/or predicted. These include changes to the natural speciation of phytoplankton and the marine food web, chemical alterations of the oceans leading to eutrophication, and alteration of primary production patterns resulting in unforeseen, cumulative and long-term consequences.[26] Increased releases of dimethyl sulfide and halogenated organic compounds which contribute to ozone destruction have also been observed, as have increased releases of nitrous oxide and methane, both greenhouse gases with a much higher warming potential that CO_2.[27] Nevertheless, proposals are currently being formulated for large-scale and even basin-wide continuous fertilization of the Southern Ocean.[28]

Potential ecosystem impacts of climate change and proposed climate change mitigation strategies on polar marine ecosystems are currently little understood and 'disentangling the effects of human exploitation of upper trophic levels from basin-wide, decade-scale climate cycles to identify long-term, global trends' has been described as 'a daunting challenge'.[29] Thus, the greatest climate change-related threat to polar marine biodiversity is possibly increased human access and its concomitant propensity for increased exploitation of marine resources. Data gathered during this IPY will help to establish baselines from which the effects of global warming on marine species and ecosystems can be measured in future. It will also provide baselines for the establishment of regimes to manage anthropogenic exploitation of, and effects on, the marine environment and its resources. The question is whether existing polar legal regimes provide an adequate basis for that regulation.

LEGAL REGIMES FOR THE PROTECTION OF MARINE BIODIVERSITY IN POLAR AREAS BEYOND NATIONAL JURISDICTION

PROTECTION OF MARINE BIODIVERSITY IN ARCTIC ABNJ

No pan-Arctic binding legal instrument exists governing the conservation and sustainable use of marine

[21] L. Hamilton, B. Brown and E. Rassmussen, 'West Greenland's Cod to Shrimp Transition: Local Dimensions of Climate Change', 56:3 *Arctic* (September 2003), 271; A. Perry *et al*., 'Climate Change and Distribution Shifts in Marine Fishes', 308:5730 *Science* (24 June 2005), 1912; and M. Inman, 'Fish Moved by Warming Waters', 308:5724 *Science* (13 May 2005), 937.

[22] K.L. Smith Jr. *et al*., 'Free-Drifting Icebergs: Hotspots of Chemical and Biological Enrichment in the Weddell Sea', 317:5837 *Science* (2007), 478.

[23] See, e.g., 'Arctic Sea Ice Minimum Shatters All-Time Record Law, Report Scientists' *ScienceDaily* (21 September 2007), available at <http://www.sciencedaily.com/releases/2007/09/070920160226.htm>.

[24] See n. 8 above.

[25] M.J. Lutz, *et al*., 'Seasonal rhythms of net primary production and particulate organic carbon flux describe biological pump efficiency in the global ocean', 112 *Journal of Geophysical Research* (2007), C10011.

[26] S.W. Chisholm, P.R. Falkowski and J.J. Cullen, 'Dis-crediting Ocean Fertilisation', 294:5541 *Science* (2001), 309.

[27] M.G. Lawrence, 'Side Effects of Oceanic Iron Fertilisation', 297:5589 *Science* (2002), 1993; X. Jin and N. Gruber, 'Offsetting the radiative benefit of ocean iron fertilisation by enhancing N2O emissions', 30:24 *Geophysical Research Letters* (2003), 2249; N. Meskhidze and A. Nemes, 'Phytoplankton and cloudiness in the Southern Ocean', 314:5804 *Science* (2006), 1419.

[28] R. Rayfuse, M.G. Lawrence and K.M. Gjerde, 'Ocean Fertilisation and Climate Change: The Need to Regulate Emerging High Seas Uses' *International Journal of Marine and Coastal Law* (2008, forthcoming).

[29] See V. Smetacek and S. Nicol, n. 7 above.

biodiversity. While the Arctic Council has a number of programmes relating to protection of the Arctic marine environment, it has no regulatory authority.[30] Similarly the mandate of the North Atlantic Marine Mammal Commission[31] is recommendatory only. Rather, within the Arctic, human activities in ABNJ are governed by the over-arching legal framework of the UNCLOS, including its high seas and deep seabed regimes and a variety of global treaties and competent international organizations regulating specific activities in ABNJ such as fishing, shipping and dumping. These include the two implementing agreements to the UNCLOS, the Implementation Agreement on Part XI[32] and the FSA, as well as the range of treaties adopted under the auspices of the International Maritime Organization (IMO), the most relevant of which for present purposes are the International Convention for the Prevention of Pollution from Ships (MARPOL Convention)[33] and the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London (Dumping) Convention)[34] and the Protocol thereto.[35] Other relevant treaties include the International Convention on the Regulation of Whaling[36] and the CBD.[37]

However, major shortcomings exist in this global framework, including both spatial and substantive gaps and potential overlaps in the various governance and regulatory regimes.[38] The decentralized and sectoral nature of the legal framework gives rise to a range of inconsistent or insufficient mandates in existing agreements and institutions and there is an overall lack of coordination and cooperation both within and across the various sectors. Effective compliance and enforcement mechanisms are generally missing, there is insufficient regulation of the increasing impacts from shipping and military activities, as well as certain other activities, such as marine scientific research, bioprospecting, laying of cables and pipelines, construction of various types of installations and marine archaeology. Additionally a whole range of new and emerging activities such as climate change mitigation techniques and aquaculture are not specifically regulated at all in ABNJ. Modern conservation principles and management tools such as requirements for environmental impact assessment; prevention, minimization or remediation of adverse impacts and ongoing monitoring; and the use of area-based measures including the establishment of MPAs, have not been consistently incorporated into existing agreements or applied in practice to the full range of ocean-based human activities in ABNJ. Moreover, there is no specific regime for the conservation and sustainable use of certain components of marine biodiversity in ABNJ, such as most discrete high seas fish stocks, and there is no regime for assessment of the cumulative impacts over time and across all the different sectors. In addition, there is significant lack of clarity on the applicable regime relating to marine genetic resources in ABNJ, with some arguing for their regulation in accordance with the high seas regime of 'freedoms', and others insisting on their regulation as part of the common heritage of mankind.[39] Finally, there is no regime for coordinating activities occurring between the high seas water column and the extended continental shelf of coastal States. This latter point is of considerable importance in the Arctic where coastal States' claims to the outer or extended continental shelf potentially underlie all but a tiny portion of the high seas water column of the central Arctic Ocean.[40]

In the North-East Atlantic sector of the Arctic, which lies between 42° west and 51° east, and which encompasses the high seas enclaves in the Barents Sea and the Norwegian Sea and the high seas portion of the central Arctic Ocean stretching to the North Pole, the situation is somewhat ameliorated by the existence of regional regimes relating to fisheries and protection of the marine environment. The Convention on the Future of Multilateral Cooperation in North-East

[30] For a recent overview of the work of the Arctic Council, see T. Koivurova and D.L. VanderZwaag, 'The Arctic Council at 10 Years: Retrospect and Prospects', 40:1 *University of British Columbia Law Review* (2007), 121–194.

[31] Established pursuant to the Agreement on Cooperation in Research, Conservation and Management of Marine Mammals in the North Atlantic (Nuuk, 9 April 1992).

[32] Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (New York, 28 July 1994).

[33] International Convention for the Prevention of Pollution from Ships (London, 2 November 1972), as modified by the 1978 Protocol (London, 1 June 1978) and as regularly amended.

[34] Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London, 29 December 1972).

[35] Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London, 7 November 1996).

[36] International Convention for the Regulation of Whaling (Washington, 2 December 1946).

[37] For a comprehensive study of global regimes applicable in the Arctic see L. Nowlan, *Arctic Legal Regime for Environmental Protection* (IUCN, 2001).

[38] For an analysis of gaps and overlaps in the context of high seas fisheries see E.J. Molenaar, 'Managing Biodiversity in Areas Beyond National Jurisdiction', 22:1 *International Journal of Marine and Coastal Law* (2007), 89–124, at 95.

[39] See, e.g., T. Scovazzi, 'Bioprospecting on the Deep Seabed: A Legal Gap Requiring to be Filled', in Francioni and Scovazzi (eds), *Biotechnology and International Law* (Oxford University Press, 2006), 81; D. Tladi, 'Genetic Resources, Benefit Sharing and the Law of the Sea: The Need for Clarity', 13 *Journal of International Maritime Law* (2007), 183; and D.K. Leary, *International Law and the Genetic Resources of the Deep Sea* (Martinus Nijhoff, 2007).

[40] R. Rayfuse, 'Melting Moments; The Future of Polar Oceans Governance in a Warming World', 16:2 *RECIEL* (2007), 196, at 207. For an analysis of the law relating to protection of marine biodiversity on the outer continental shelf, see J. Mossop, 'Protecting Marine Biodiversity on the Continental Shelf Beyond 200 Miles', 38:3 *Ocean Development and International Law* (2007), 283.

Atlantic Fisheries (NEAFC)[41] applies to all fishery resources including sedentary species, molluscs and crustaceans, except marine mammals, highly migratory species and anadromous stocks. The Convention for the Conservation of Salmon in the North Atlantic (NASCO)[42] applies to all anadromous stocks that migrate beyond areas of national jurisdiction of the coastal States of the North Atlantic throughout their migratory range. Fisheries in the enclosed Barents Sea 'Loop Hole' are regulated pursuant to a tripartite agreement between Iceland, Russia and Norway.[43] With respect to the broader marine environment, the Convention on the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and its five annexes and three appendices on pollution from land-based sources (Annex I), pollution by dumping or incineration (Annex II), pollution from offshore sources (Annex III), assessment of the quality of the marine environment (Annex IV) and protection and conservation of ecosystems and biological diversity of the maritime area (Annex V),[44] regulate all existing maritime activities, apart from fishing, whaling and shipping, to the extent that these activities are not covered by competent global organizations such as the IMO or the International Seabed Authority,[45] and can function as the default authority for new and emerging maritime activities.

Nevertheless, while arguably better than the situation in the rest of the high seas portion of the Arctic Ocean, where no regulatory regime exists, the situation in the North-East Atlantic sector is not ideal. Despite apparently complementary mandates and increasing institutional coherence between the various agreements, significant shortcomings remain. For example, the OSPAR Commission is charged with responsibility for implementing the CBD at the regional level; pursuing an ecosystem approach with an even broader purpose than that of the CBD; and with pursuing the establishment of a coherent network of MPAs. To date, however, the Commission has succeeded in none of this. In 2003, the Commission resolved to establish a network of MPAs by 2010.[46] While Member States have designated a number of areas as MPAs, none of them are located in ABNJ, and it remains unclear how the Commission will identify and designate such areas in any event.[47] In the interim, NEAFC has closed some areas of the North-East Atlantic to fishing to protect cold water corals.[48] However, no area has yet been designated in the Arctic Ocean. Given the current absence of fishing operations in the high latitudes this is perhaps not surprising. However, it is precisely this current lack of activity that provides a useful window of opportunity for the international community to act in a precautionary manner to ensure protection of vulnerable Arctic marine ecosystems.

In addition, OSPAR has thus far failed to provide any indication of an intention to exercise its implicit regulatory competence over a number of activities that can impact on marine biodiversity in ABNJ, including the construction of artificial islands, reefs, installations and structures, the placement of cables and pipelines, sea-based deep sea tourism, marine scientific research and bioprospecting. On the contrary, it has expressed a preference for these activities to be regulated through other competent global and regional organizations.[49] However, no such regulation exists at the moment. With increasing marine scientific research and other activities occurring in the high seas of the central Arctic Ocean, this failure to regulate leaves extremely vulnerable ecosystems and marine biodiversity as unprotected in the North-East Atlantic sector as in the rest of the Arctic Ocean ABNJ. The question inevitably arises as to whether the legal regime in the Antarctic provides a more effective model for the protection of marine biodiversity in polar ABNJ.

PROTECTION OF MARINE BIODIVERSITY IN THE ANTARCTIC

Like the Arctic, the Antarctic is subject to the full range of global agreements relating to protection of

[41] The Convention on the Future of Multilateral Cooperation in North-East Atlantic Fisheries (London, 18 November 1980) (NEAFC Convention) was amended in 2004 and 2006 and the amended text is being applied provisionally by States parties pending ratification. The 1980 Convention did not define the fisheries to which it extended, so there was some doubt as to whether it covered sedentary, molluscs and crustaceans. That doubt has now been removed. The text of the 'new' Convention is available at <http://www.neafc.org/about/docs/new_convention.pdf>.

[42] Convention for the Conservation of Salmon in the North Atlantic (Reykjavik, 22 January 1982).

[43] Agreement between the Government of Iceland, the Government of Norway and the Government of the Russian Federation Concerning Certain Aspects of Co-operation in the Area of Fisheries (St Petersburg, 15 May 1999).

[44] Convention on the Protection of the Marine Environment of the North-East Atlantic (Paris, 22 September 1992) (OSPAR Convention). The first four annexes were adopted together with the Convention. Annex V was adopted in 1998 along with Appendix 3, which sets out criteria for identifying human activities for the purpose of Annex V.

[45] Established pursuant to Article 156 of the UNCLOS, the International Seabed Authority is the international organization through which States parties to the UNCLOS organize and control activities, relating particularly to mineral resources, on the seabed, ocean floor and subsoil thereof in areas beyond national jurisdiction.

[46] OSPAR Commission Recommendation 2003/3 on a Network of Marine Protected Areas (27 June 2003).

[47] 2006 (Second) Report on the Status of the OSPAR Network of Marine Protected Areas (OSPAR Document 07/6/6, 29 June 2007). See Summary Record of the Meeting of the OSPAR Commission, 25–29 June 2007 (OSPAR 07/24/1-E, 29 June 2007).

[48] *Report of the Twenty-Fifth Annual Meeting of NEAFC*, 13–17 November 2006 (NEAFC, 2006), Agenda item 8, at 95 and Annex M.

[49] Briefing on OSPAR's Work on the Protection of the Marine Environment of the High Seas, Summary Record of the Meeting of the OSPAR Commission, 26–30 June 2006 (OSPAR 06/23/1-E, 30 June 2006), Annex 6.

the environment, at least to the extent that these agreements apply to States parties operating in Antarctic areas. However, unlike the Arctic, the Antarctic is governed by its own regional regime, the Antarctic Treaty System (ATS), which to some extent ameliorates the shortcomings of the global regime, noted above, in its application to the Antarctic. Central to the ATS is the Antarctic Treaty (AT),[50] which suspends sovereign claims and preserves Antarctica for scientific and peaceful purposes only. The Treaty applies to all areas south of 60° South, which includes vast tracts of the Southern Ocean. The Treaty is supplemented by its Environmental Protocol (EP),[51] which prohibits non-scientific mineral resource activity in favour of the comprehensive protection of the Antarctic environment and dependent and associated ecosystems. Activities in the Antarctic Treaty area are subject to environmental impact assessment requirements and are to be planned and carried out in such a manner as to avoid adverse effects on the environment, including its flora and fauna. Annexes to the Protocol deal more specifically with the requirements of environmental impact assessment (Annex I), conservation of Antarctic flora and fauna (Annex II), waste disposal and management (Annex III), prevention of marine pollution (Annex IV), area protection and management (Annex V) and liability arising from environmental emergencies (Annex VI).

With respect to marine biodiversity, the most important element of the ATS is the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR).[52] This Convention applies to all Antarctic marine living resources, in other words, all marine biodiversity, south of the Antarctic Convergence, an area extending beyond that covered by the Antarctic Treaty. The Commission established by the Convention (and sharing the acronym CCAMLR) is charged with ensuring the conservation, defined as including the rational use, of all Antarctic marine living resources, on a precautionary and ecosystem basis in order to maintain the ecological relationships between harvested, depleted and related populations.[53] The Convention itself is often described as being precautionary in origin, having been adopted primarily with a view to ensuring the conservation of krill stocks in advance of the development of any significant commercial krill fishery. There is clearly potential for overlap in the functions of the Antarctic Treaty Consultative Meetings (ATCMs) established under the AT and the EP and CCAMLR, particularly under Annex V to the EP, which provides for the establishment of Antarctic Specially Protected Areas (ASPAs) and Antarctic Specially Managed Areas (ASMAs). However, in matters relating to marine areas and marine living resources, CCAMLR is the operative forum with jurisdiction over regulation of conservation and exploitation of marine biodiversity and over designation of ASPAs and ASMAs.[54]

Much has been written on the successes and failures of CCAMLR in regulating Antarctic fisheries and in implementing its mandated ecosystem approach.[55] In general, CCAMLR is seen as a relatively successful regional fisheries management organization, although, as with fisheries globally, CCAMLR's management of Antarctic fisheries resources has been compromised by poorly regulated or unregulated fishing by both Members and non-Member States. Illegal, unreported and unregulated fishing has had adverse effects on both fish stocks and on other components of marine biodiversity as a result of by-catch of non-target species, including sea birds such as petrels and the iconic albatross. In response, CCAMLR has adopted an extensive range of conservation measures aimed at eliminating IUU fishing and accidental by-catch of non-target species and has embarked on a process to ensure that vulnerable marine ecosystems are protected from significant harm from bottom trawling.[56] At its most recent meeting, in November 2007, CCAMLR also adopted precautionary management arrangements for krill, which should help to ease concerns over the recent massive expansion of krill fisheries.[57] CCAMLR has also begun a process of 'bioregionalization', which involves identifying Antarctic waters at the biological zoning level as well as at the level of ecosystem processes in order to prepare for the identification and creation of a network of marine protected areas. CCAMLR has not, however, dealt with the vexed issue of regulation of bioprospecting for marine genetic resources, although it is competent to do so.

It is clear that CCAMLR has done a great deal to resolve issues relating to the protection of Antarctic

[50] Antarctic Treaty (Washington, 1 December 1959).
[51] Protocol on Environmental Protection to the Antarctic Treaty (Madrid, 4 October 1991).
[52] Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) (Canberra, 20 May 1980).
[53] Ibid., Article II.
[54] No marine area can be designated by the ATCM as an ASPA or ASMA without the prior approval of CCAMLR. See ibid., Annex V, Article 6(2).
[55] See, e.g., D. Miller, E. Sabourenkov and D. Ramm, 'Managing Antarctic Marine Living Resources: The CCAMLR Approach', 19:3 *International Journal of Marine and Coastal Law* (2004), 317; and E.J. Molenaar, 'CCAMLR and Southern Ocean Fisheries', 16:3 *International Journal of Marine and Coastal Law* (2001), 465.
[56] See Conservation Measure CM22-05 (2006) on interim restrictions on the use of bottom trawling gear in high seas areas of the Convention area for the fishing seasons 2006/07 and 2007/08 (XXVth Meeting of the Commission, 23 October – 3 November 2006), available at <http://www.ccamlr.org/pu/e/e_pubs/cm/06-07/22-05.pdf>. See also the *Report of the XXVth Meeting of the Commission* (CCAMLR, 2006), section 12, available at <http://www.ccamlr.org/pu/e/e_pubs/cr/06/i12.pdf>.
[57] The *Report of the XXVIth Meeting of the Commission* will be available at <http://www.ccamlr.org> in due course. This information is based on personal communications.

marine biodiversity, although lasting solutions to a range of existing and emerging issues have yet to be found. Nevertheless, CCAMLR and the rest of the ATS do provide a governance and regulatory framework within which protection of Antarctic marine biodiversity can be addressed, something almost wholly lacking in the Arctic. Moreover, they attempt to do so in an integrated and comprehensive manner designed to ensure maximum achievement of the objectives and principles of the EP and the other agreements and to avoid inconsistency or inter-agreement interference. Thus, while perhaps not certain, any conflict between CCAMLR and the ATCM over the adequacy of measures for conservation and protection of marine biodiversity would most likely be resolved in favour of CCAMLR or, at any rate, in favour of the approach most likely to ensure achievement of the objective of conservation and protection of marine biodiversity.

Like all international treaty regimes, the ATS and its component agreements can be undermined by parties and non-parties alike. Where implementation and enforcement of obligations is left to States parties, there is a risk of non-implementation or non-compliance and the development of an 'implementation gap' between parties who take their obligations seriously and those who do not. There is also the ever-present risk of activities by non-parties undermining the efforts of the parties. Growing commercial pressures for access to Antarctic marine biodiversity including fisheries and marine genetic resources further exacerbate these problems, while the growing number of cross-cutting environmental issues and strategic environmental needs relating to protection of the marine environment and its biodiversity from marine pollution and extractive activities challenge the ability of the ATS to govern the Antarctic region effectively. The interrelationship of the ATS with other global treaty regimes including the UNCLOS and the CBD is also yet to be fully explored. Nevertheless, while there may be implementation, and even regulatory, gaps in the Antarctic framework, there is no governance gap as there is in the Arctic in ABNJ. The question is, therefore, whether the Antarctic precedent can be of any use in the Arctic.

IMPROVING THE LEGAL REGIME FOR PROTECTION OF MARINE BIODIVERSITY IN POLAR REGIONS

It is often suggested that the ATS is not an obvious model for the Arctic. In large part this is true. In particular, as noted above, the five coastal States bordering the Arctic Ocean (Canada, Denmark, Norway, Russia and the USA) are currently pursuing, or at least investigating, their claims to great swathes of the Arctic seabed as part of their outer or extended continental shelf, pursuant to Article 76 of UNCLOS.[58] Ultimately, only a small portion of the Arctic seabed will be beyond national jurisdiction. Protection of continental shelf biodiversity will therefore be a matter for the coastal States who exercise sovereign rights for the purpose of exploring and exploiting the natural resources of the continental shelf, including all mineral and non-living resources of the seabed and subsoil, as well as all living sedentary species.[59] However, the water column of the central Arctic Ocean above the outer continental shelf remains high seas beyond national jurisdiction and, with the exception of the area covered, albeit inadequately, by OSPAR/NEAFC, no comprehensive legal regime exists for regulation of maritime activities or protection of marine biodiversity in Arctic ABNJ.

The idea of a comprehensive Arctic Treaty has been canvassed elsewhere.[60] In general, there seems to be little appetite for such an agreement. Nevertheless, in furtherance of their self-interest, the five Arctic Ocean States might instead establish a special regime for the Arctic Ocean ABNJ under the UNCLOS, relying, in particular, on the enclosed or semi-enclosed seas provisions of Articles 122 and 123.[61] Precedent certainly exists for the Arctic States to promote themselves as 'custodians' of the Arctic for the international community. This is essentially what Canada, Denmark, Norway, Russia and the USA have done in the Agreement on the Conservation of Polar Bears,[62] where they recognize their 'special responsibilities' and 'special interests' in relation to the protection of polar bears and agree to take action to conserve and manage polar bears through a range of measures, including a prohibition on their hunting, killing and capture except in certain specified circumstances.

However, not only would such an agreement divide the Arctic States by excluding Finland, Iceland and Sweden, it would effectively allow the Arctic Ocean States to appropriate unto themselves control over the entire Arctic Ocean, thereby interfering with the legitimate rights and interests of non-Arctic Ocean States in access to, conservation of and long-term sustainable utilization of the high seas of the Arctic Ocean and

[58] As a non-party to the UNCLOS, the USA is not entitled to claim an outer continental shelf. It is, nevertheless, actively engaged in research to establish the extent of any future claim it may make. See, e.g., J.V. Gerdner, L.A. Mayar and A. Armstrong, 'US Law of the Sea Mapping', 9:2 *Hydro International* (2005), available at <http://www.hydro-international.com/issues/articles/id453-US_Law_of_the_Sea_Mapping.html>.

[59] See UNCLOS, n. 1 above, Article 77.

[60] See, for example, the contribution of T. Koivurova in this issue.

[61] See R. Rayfuse, n. 40 above, at 215.

[62] Agreement on the Conservation of Polar Bears (Oslo, 15 November 1973).

its resources, including its marine biodiversity. Given the new challenges in the Arctic posed by, or arising as a result of, climate change, there is arguably a legitimate need for non-Arctic States to engage in Arctic matters, particularly where they relate to Arctic ABNJ. Experience from other ABNJ demonstrates that as the ice melts and access to the area increases, effective management, conservation and sustainable use of marine biodiversity will become more difficult, as will regulation of shipping and other activities in the dangerous, remote waters. In addition, continuing lack of clarity as to the interaction of the high seas regime with the regime for the outer continental shelf will eventually lead to disputes between coastal and non-coastal States.

The most effective manner of protecting the rights and interests of all States in this area is to adopt an international treaty regime, open to all States, governing that part of the Arctic Ocean that lies beyond national jurisdiction. Such a regime could incorporate the best of the ATS into one agreement adopting a cross-sectoral, ecosystem-based, precautionary approach to management and embodying modern conservation and management principles, including the need for environmental impact assessments of all activities to be carried out in the area. In short, what is envisaged is an Arctic Ocean regional oceans management organization (ROMO), having plenary jurisdiction over fisheries, scientific research, navigation, bioprospecting and all other high seas activities and uses, and acting as moderator between the interests of the coastal States and those of the international community. The objective of the organization would be to adopt cooperative measures for adaptive management of Arctic Ocean ecosystems and biological resources in the face of what is now accepted to be rapid, unnatural climate change and to promote adaptation of these marine ecosystems to climate change. The establishment of such an organization would present a unique opportunity for the international community to both engage in and benefit from marine scientific research and monitoring on climate change processes of global as well as regional interest, and to ensure precautionary, ecosystem-based management of an extremely vulnerable and, as yet, little investigated, poorly understood and non-exploited marine ecosystem. Pending establishment of such an organization, the international community could consider adopting a voluntary moratorium on all activities in, on and under the central Arctic Ocean, other than internationally peer-reviewed marine scientific research carried out pursuant to strict environmental impact assessment and monitoring guidelines, including activities carried out by the five Arctic Ocean coastal States.

Although undoubtedly considered by some at worst fanciful or, at best, possibly merely premature, history shows that precautionary-minded international agreements are easier to reach before vested interests have become entrenched. In some respects it may already be too late. OSPAR and NEAFC already cover a portion of the central Arctic Ocean. However, the OSPAR regime is essentially limited to coastal States in the region,[63] while new membership in NEAFC requires the approval of three-quarters of the contracting parties.[64] This effectively excludes the rest of the international community, including, in the case of OSPAR, some coastal Arctic States, from participation in the regime. In an ideal world, the central Arctic Ocean would be subject to only one regime. In reality, however, it is unlikely that OSPAR and NEAFC would be prepared to reduce their geographical scope. A new Arctic Ocean ROMO would therefore have to work closely with OSPAR and NEAFC to develop a sophisticated and workable *modus operandi* for ensuring not only the efficacy but also the consistency and compatibility of measures across the entire central Arctic Ocean.

However, as is clear from the experience in the Antarctic, the adoption of a governance regime alone – no matter how progressive – cannot ensure the conservation and long-term sustainability of marine biodiversity in the face of inadequate participation, implementation and compliance. In adopting a new regime for the Arctic, new solutions will need to be devised aimed at overcoming the design and implementation shortcomings of the ATS and its constituent agreements, including their reliance on flag State or national enforcement jurisdiction and their limited application to States parties only. Thus while the ATS may, indeed, be a model for the high seas of the central Arctic Ocean, a ROMO responding to the climate change-induced challenges to the Arctic should go beyond the ATS model to a truly integrated, holistic, cross-sectoral agreement enforceable by and on behalf of the international community.

In the Antarctic, improvement of the legal regime requires the strengthening of regulatory efforts to manage Antarctic marine ecosystems under circumstances of uncertainty. These circumstances include IUU fishing as well as climate change-related uncertainties. CCAMLR has recently agreed to undertake a performance review,[65] to be conducted by a panel

[63] See OSPAR Convention, n. 44 above, Article 25.

[64] See the new NEAFC Convention, n. 41 above, Article 20.

[65] The review was agreed to by the Commission at its meeting in October – November 2007. The review implements a call for performance reviews of regional fisheries management organizations made by the Review Conference of the UN Fish Stocks Agreement. See 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, held in New York from 22–26 May 2006 (UN Doc. A/CONF.210/2006/15, 5 July 2006).

including external and internal experts and a non-governmental organization representative. The report will be considered at the next meeting of the commission in 2008 and is expected to provide a template to both improve CCAMLR's best practice performance and provide guidance for filling gaps where its practice is not up to best practice standards.

However, beyond reviewing its past performance, the time is approaching when CCAMLR will need to genuinely implement its ecosystem management approach for all marine biodiversity, not just for fisheries management purposes. Much work will need to be done by CCAMLR to adequately factor other effects of climate change, such as ocean acidification and warming, into its management strategies. In addition, as ecological boundaries, including the location of the Antarctic Convergence, change and species migrate south, CCAMLR will need to develop close working relationships with other regional fisheries organizations whose geographical boundaries border the CCAMLR area, such as the Commission on the Conservation of Southern Bluefin Tuna, to ensure appropriate protection of all Antarctic marine biodiversity. Even the anomalous situation of Antarctic whaling may fall to CCAMLR to deal with. It will be recalled that whaling was excepted from the CCAMLR Convention[66] on the basis that it was regulated by an earlier treaty, the International Convention for the Regulation of Whaling. However, the ongoing stand-off in the International Whaling Commission (IWC) between pro- and anti-whaling States has led to calls for the termination of the IWC and the negotiation of a new agreement.[67] In theory, CCAMLR is the appropriate body to manage whaling activities in the Antarctic. In reality, whaling States in CCAMLR will be likely to block any consensus on agreement to regulate the activity. The implications of a breakdown in CCAMLR over the issue cannot be ignored.

CCAMLR will also need to address its relationship with the International Seabed Authority and the governance regime for the international deep seabed (the 'Area') to definitively determine which organization will take jurisdiction over marine biodiversity on and under the deep seabed. With differing memberships and objectives, tensions between the two organizations can be expected. In addition, as coastal Antarctic claimant States present their submissions for extended continental shelves off the continent, CCAMLR will have to deal with the issue of jurisdiction over marine biodiversity on the extended continental shelf. While CCAMLR is, *prima facie*, the appropriate body to regulate exploitation of marine biodiversity on both the extended continental shelf and the deep seabed of the Antarctic, claimant coastal States may work to block its attempts to do so.

Finally, a significant challenge for CCAMLR is one of ensuring improvement in the development and implementation of the ATS regime to protect marine biodiversity from both over-exploitation and the effects of increasing human activities such as shipping and tourism. As vividly demonstrated by the sinking of the tourist vessel the *M/V Explorer* in November 2007, these activities bring with them, in addition to the risk to human life, the risk of marine pollution and introduction of invasive alien species and their attendant detrimental effects on marine biodiversity. CCAMLR should lead the way within the ATS and in other international fora in adopting and/or pressing for the adoption of regulations governing all human activities in the Southern Oceans which have or may have adverse effects on the conservation and long-term sustainability of marine biodiversity.

CONCLUSION

The polar oceans in ABNJ are unique and extremely vulnerable ecosystems about which relatively little is known. Protecting polar marine biodiversity is not just a matter of regulating its exploitation. Rather, it encompasses all aspects of protection of the marine environment from the deleterious effects of all human activities, including pollution, destructive fishing or exploitation practices, marine scientific research and the introduction of invasive alien species. In the Antarctic, a legal framework for this protection, albeit an imperfect and imperfectly implemented one, already exists. While this should not be cause for complacency, the Antarctic situation stands in stark contrast with the situation in the central Arctic Ocean.

From an international law standpoint, the most important outcome of the International Geophysical Year of 1958–1959 was the adoption of the Antarctic Treaty. The international community should similarly utilize the current IPY not only to learn more about the marine biodiversity that exists at both poles, but also to pledge to its better conservation and management. This can be accomplished at both ends of the globe with a commitment to multilateral approaches incorporating the best and latest knowledge and standards for conservation and sustainable management of

[66] CCAMLR Convention, n. 52 above, Article VI states that: 'Nothing in this Convention shall derogate from the rights and obligations of Contracting Parties under the International Convention for the Regulation of Whaling and the Convention on the Conservation of Antarctic Seals'.

[67] For a discussion of the issues see D. Currie, 'Whales, Sustainability and International Environmental Governance', 16:1 *RECIEL* (2007), 45.

marine biodiversity. For the Antarctic, it is a matter of strengthening what is already there. For the Arctic, an outcome of this IPY should be the adoption of an international agreement, which recognizes the legitimate interests of non-Arctic States in the conservation and management of marine biodiversity in the central Arctic Ocean ABNJ.

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