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International news and analysis on marine ecosystem-based management

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Integrated Management: What Does It Look Like in Practice?

In Western-style resource management, specific human activities are usually managed by dedicated agencies. Fisheries, for example, are managed by fisheries agencies. Offshore petroleum is regulated by energy or minerals agencies. Shipping is overseen by transportation agencies, and so forth. Each pairing of agency and industry sector operates in its own management silo, seldom interacting with the other ocean uses on planning or management.

A central concept in ecosystem-based management, however, is that management should be *integrated*. This means that the range of human activities that occur within an ecosystem should be considered together in decision-making — because, after all, the activities are often interlinked. In this integrated management, entities (from individual stakeholders to small groups to whole governments) may have to learn to work cooperatively for the good of ecosystems and the services they provide to humans.

Seeking financial support for MEAM

Dear reader,

Funding to support the first three years of MEAM was generously provided by the David and Lucile Packard Foundation. Unfortunately, that funding expires at the end of 2011 and is non-renewable. As a result, MEAM will not continue beyond 2011 unless it attracts new funding sources.

MEAM has nearly 5000 subscribers in more than 120 countries: it is likely the most widely read source on marine EBM and spatial planning. Your institution's support for MEAM is critical at this point. By stepping up to support MEAM, your institution will be recognized as contributing a significant benefit to our global audience.

Members of the MEAM staff and editorial board will be at the International Marine Conservation Congress from 14-18 May in Victoria, Canada (www.conbio.org/imcc2011). If you see us there, please say hello. We look forward to meeting you.

Sincerely,

John Davis, editor@meam.net

The need for integrated management is cited often in EBM guidance but rarely fleshed out in terms of how it is achieved. What does integrated EBM look like in practice? How can government agencies — whose bureaucracies may be resistant to change — work together and share responsibility? In this issue, MEAM examines three examples of integrated management and how the integration has impacted EBM.

How shared assessment protocols can help nations work together: The Wadden Sea

The Wadden Sea is a vast intertidal zone in the south-eastern part of the North Sea, stretching 500 km from The Netherlands through Germany to Denmark. Typified by tidal mud flats and associated islands, the ecosystem is recognized for its rich biodiversity, particularly bird species. It is a Ramsar wetland of international importance and a UNESCO-listed World Heritage site, and is the world's largest tidal barrier island system.

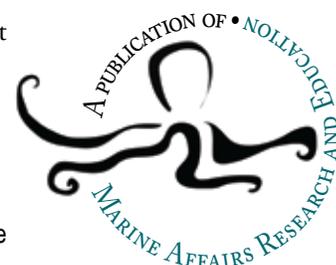
The governments of Denmark, Germany and The Netherlands have worked together since 1978 to protect and conserve this ecosystem and the services it provides. In 1982, a Joint Declaration on the Protection of the Wadden Sea was agreed upon in which the countries declared their intention to coordinate activities and regulations. A renewed Joint Declaration 2010 was adopted last year, together with a trilateral management plan.

Jens Enemark is secretary of the Common Wadden Sea Secretariat (www.waddensea-secretariat.org), which supports and facilitates the trilateral cooperation. "In the course of 30 years of trilateral Wadden Sea cooperation, the common policies have developed from being rather sectoral in the 1980s (protection of single species), to more integrated approaches in the 1990s (species protection, habitat protection, environment quality), to an integrated ecosystem approach in the 2010s," he says. "The key message of the Joint Declaration is that The Netherlands, Germany, and Denmark will continue to manage the Wadden Sea as a single ecological entity for its natural, landscape and cultural heritage values, for the benefit of present and future generations."

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Managing the 14,000-km² area as a single ecological entity is more easily said than done when it includes three countries with different management regimes. The Wadden Sea countries have been working for years to harmonize those national differences, says Enemark,

with a particular focus on developing common methods for integrated ecosystem assessments.

“Having a common assessment methodology — as we do with regard to the status of salt marshes, for example — is a fundamental first step in the process of developing a common management approach,” he says. A common assessment methodology allows the three countries, for the first time, to know the real status of Wadden Sea salt marshes, ecosystem-wide.

“The management of salt marshes has already reached a high level of harmonization across the three states,” says Enemark. The countries have also harmonized their assessment of input nutrients and pollutants across the ecosystem.

“An integrated and comprehensive approach does make a difference,” says Enemark. “When the discussion started a generation ago, the Wadden Sea was under heavy pressure: habitats were being lost due to coastal development, there were declines in biodiversity due to pollution and

disturbance, and various unregulated activities compromised the system. Now pollution has decreased and the populations of many species have rebounded. Although there are still concerns and challenges, including climate change and fisheries impacts, in general it has been a good success story.” *The Wadden Sea Quality Status Report - Synthesis Report 2010*, an assessment of ecosystem developments, issues of concern, and knowledge gaps, is at www.waddensea-secretariat.org.

Seven components of integrated management

Effective integrated management in marine EBM must consist of more than just individual agencies working together, says Jon Day, director of ecosystem conservation and sustainable use for the Great Barrier Reef Marine Park Authority. In *Managing Protected Areas: A Global Guide*, Day outlines that integrated management should include the following components:

- **Inter-governmental integration** — vertical integration across all relevant levels of government, including any jurisdiction responsible for the marine environment or the adjoining coastal environment;
- **Inter-agency integration** — horizontal integration between agencies with differing mandates;
- **Intra-agency integration** — horizontal integration within agencies;
- **Land-water interface integration** — across the land-water boundary, considering such aspects as connectivity and downstream impacts;
- **Inter-sectoral integration** — considering the range of different user and stakeholder groups;
- **Inter-disciplinary integration** — integrating ecological, social, economic, and cultural considerations; and
- **Inter-generational integration** — considering the views and interests of past, current, and future generations.

[Day, J.C. (2006) Marine Protected Areas, in *Managing Protected Areas: A Global Guide*, Lockwood, M., Worboys, G., Kothari, A. (eds). Earthscan, London, pp 603-634.]

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Integration does not have to mean everyone does the same thing: Coral Triangle Initiative

Under the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security, six South Pacific nations have worked together since 2007 to protect their coastal ecosystems and the people who depend on them (www.cti-secretariat.net). The governments of Indonesia, Malaysia, Papua New Guinea, the Philippines, Solomon Islands, and Timor-Leste (formerly East Timor) have committed to develop a plan of action to conserve the region's natural resources, including targeted research on tuna spawning, climate change adaptation, and threatened species status. The 5.7 million-km² Coral Triangle region is home to the highest diversity of marine life on Earth.

Partnering with the six governments are several major NGOs, including The Nature Conservancy, Conservation International, and WWF. The Global Environment Facility and USAID have provided major funding. All together, the initiative is a complex project involving multiple nations and large institutions.

Lida Pet-Soede is leader of the Coral Triangle Programme for WWF, which is providing technical expertise and funding to the Coral Triangle Initiative. “To me, integrated management means that the various parts of a government coordinate their various development agendas,” says Pet-Soede. “Working in the environmental conservation arena, this means that we need to understand how economic development requires certain levels of natural resource use, and that we focus on supporting the most sustainable forms of that. Vice versa, it means that agencies and organizations working in the economic or social development arena need to understand that such would also require certain limitations on the use of natural resources.” Along this line, WWF is working to establish a sustainable live reef fish trade and promote sustainable tuna fisheries, in addition to championing marine protected areas and other conservation strategies.

A challenge, says Pet-Soede, involves encouraging that same mindset of integrated environmental and socioeconomic considerations across governments. “Various agencies still have different perceptions of their priorities,” she says. “Our challenge as NGOs is to find the right way to explain, for example, that a security agenda is well-served by improved fisheries management and enforcement of fishing regulations at sea, and that environmental regulations are not simply a way to reduce the potential economic output of one country versus another.”

She notes that the six Coral Triangle nations have collectively embraced the threat of climate change as an issue on which they must work cooperatively, in unison, to sustain food security. She applauds this, but adds that integrated management does not always have to mean that everyone does the same thing.

Instead it can mean that partners develop a common agenda while allowing for different priorities under that agenda.

She cites the region's fisheries management as an example. "In the Coral Triangle Initiative, some countries expressed interest to collaborate because of their tuna interests, while others said they wanted to focus their collaborative fisheries management on reef fisheries first. This has not been resolved, but it does not need to be. The general discussions within the Coral Triangle Initiative on applying an ecosystem approach to fisheries management (EAFM) are still applicable to the different fisheries. So all six countries embrace the EAFM and are interested in integrating it throughout their fisheries management, even though their focus on particular fisheries may vary."

Pursuing "seamless" integrated management across an MPA: Papahānaumokuākea

The 362,000-km² Papahānaumokuākea Marine National Monument in the Northwestern Hawaiian Islands is governed under a co-management scheme. Three parties serve as co-trustees: the US Fish and Wildlife Service (under the Department of the Interior), the National Oceanic and Atmospheric Administration (under the federal Department of Commerce), and the State of Hawai'i all play roles in managing portions of the vast, remote site. (The roles generally preceded the designation of the monument in 2006. For example, the MPA includes some land and waters that

belong to the State of Hawai'i, as well as national wildlife refuges that were already managed by the Fish and Wildlife Service — www.papahanaumokuakea.gov/management.)

This cooperative arrangement is built into the site's mission, which is to "carry out seamless integrated management to ensure ecological integrity and achieve strong, long-term protection and perpetuation of Northwestern Hawaiian Islands ecosystems, Native Hawaiian culture, and heritage resources for current and future generations." To implement the cooperative arrangement, the MPA's organizational structure consists of:

- A Senior Executive Board composed of a designated senior policy official for each party that is directly responsible for carrying out the agreement and for providing policy direction for the Monument;
- A Monument Management Board (that reports to the Senior Executive Board) composed of representatives from the federal and state agency offices that carry out the day-to-day management and coordination of Monument activities; and
- An Interagency Coordinating Committee representing other state and federal agencies as appropriate to assist in the implementation of Monument management activities.

How the site's mandated "seamless integrated management" looks in practice can be viewed through a single event: the

Insights on guiding agencies toward integration

In his 1998 book *Getting Agencies to Work Together* (a landmark volume on collaborative management among government agencies), Eugene Bardach laid out the changes that bureaucrats often must make to adjust to integrated management, including in the field of managing ecosystems. He wrote:

"The collaborators say they often have to learn a new way of thinking, a new way of doing business, to put results ahead of procedures, capacity building above turf protection, trust ahead of suspicion, joint problem solving ahead of accepted, time-worn methods."

These changes require significant effort, but they can result in better service of the public interest. Bardach, who is now an emeritus professor in public policy at the University of California at Berkeley, suggested the greatest challenge of integrated management is in convincing agency personnel that the changes involved in integrating management are worth it. Below are highlights of the book, excerpted by MEAM to illustrate how to guide agencies toward integration:

On starting integration

Initially, when you have task forces starting, you have everybody staring at one another thinking, "I'm not sure why I'm here." For a task force to mature into an entity that really can deal with environmental problems, it takes a couple of years.... The key

component is cross-education. Other agencies can't help you until they understand your mission and your jurisdiction. That takes quite a while. You have to make lots of presentations and have people interested in learning.

On the bureaucratic ethos vs. the collaborative ethos

Almost nothing about the bureaucratic ethos makes it hospitable to inter-agency collaboration. The collaborative ethos values equality, adaptability, discretion, and results; the bureaucratic ethos venerates hierarchy, stability, obedience, and procedures. Making the transition from an existing way of doing agency business to a new and more collaborative way requires actors to withdraw at least temporarily from the bureaucratic ethos. They must spurn something they may have at least respected if not cherished.

On the importance of interpersonal collaboration

The cutting edge of interagency collaboration is interpersonal collaboration. If interagency collaboration is supposed to create new value, that value will almost certainly be bigger and better if the people involved can work together easily and constructively. One barrier to doing so is the bureaucratic culture. A possible smart practice is to use that culture to cure its own problems. Have interagency teams of experienced bureaucrats exercise their bureaucratic craft skills to design a simpler, less bureaucratic approach to accomplishing the same ends as an existing but too cumbersome system.

[*Getting Agencies to Work Together* (Brookings Institution Press, 1998) is available on amazon.com for US \$20.93.]

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salvage last year of a 33-foot steel-hulled sailboat (*Grendel*) that had grounded in the lagoon of Kure Atoll, in the most northwestern section of the MPA. Papahānaumokuākea staff partnered with the US Navy Pacific Command on the operation, which involved Navy divers refloating the boat and towing it to deeper water, where it was lifted onto a salvage vessel and transported to Hawaiʻi for scrapping. Scott Godwin, who led the operation for Papahānaumokuākea, says that the true integrated management aspect was not the collaboration with the Navy in and of itself, which was outside the normal operations for the Monument. Instead it was the additional conservation activities that were accomplished secondarily to the salvage:

- Under supervision by NOAA representatives, Navy personnel removed 6000 pounds of derelict fishing gear from Kure Atoll;

- Under supervision of State of Hawaiʻi representatives, the Navy removed one acre of alien weeds from Green Island at Kure Atoll; and
- Under supervision by Fish and Wildlife Service representatives, the Navy removed four tons of scrap metal from Midway Atoll on its voyage back to Hawaiʻi.

Godwin points out that although the MPA's trilateral co-management system is robust, it must still reach out to other entities — like the Navy — when particular, sophisticated capabilities are required. “These types of management actions cannot be accomplished without partnership with public sector entities,” he says. “The personnel and assets at the disposal of the US Navy are not present within the agencies tasked with conservation in the marine environment.” **M**

Tundi's Take

Integration: How Can Something So Simple Be So Confounding?

By Tundi Agardy, MEAM Contributing Editor (tundiagardy@earthlink.net)

Integration is the cornerstone of EBM. The lack of it is why sectoral management typically fails to stem ecosystem decline — which, in turn, is why most everyone agrees that integration is necessary. But what, exactly, needs to be integrated in order to achieve EBM?

A key facet of management that requires integration is the **science** upon which management is based. EBM must counter an ever-accelerating trend toward specialization in the sciences; otherwise managers have difficulty “seeing the forest for the trees”, missing the big picture of what is going on. The kinds of scientific information that need to be brought together, and assessed jointly, include:

- Ecological information collected from all biomes that require improved management (this includes the primary ecosystem that is the target of EBM as well as associated ecosystems that are ecologically connected to it);
- Information on environmental impacts caused by all involved sectors;
- Socio-economic data on all affected stakeholder groups; and
- Trends in each of these information sources over time.

The above states the obvious — that all kinds of science need to be brought together. But not so obvious is the need to also integrate **language**: the language of monitoring, of assessment, of management response. Along with the specialization in the natural and social

sciences, there is increasing specialization in jargon used by the various disciplines. Without a common way of explaining concepts, there can be no common understanding — making steps toward the common goal of EBM more difficult.

Another crucial facet of EBM that requires integration is **governance**. Governance affects not only how management will be executed, but also how information will be collected, synthesized, and shared — well in advance of a management response. Thought must be given to the most appropriate framework for marine and coastal governance in any EBM context. Clear lines of authority (not necessarily top-down) that allow cross-sectoral management, as well as management across various scales (communities and institutions through to national and international) should be part of any EBM process.

Finally, governance is meaningless without **mandates**. EBM integration must include requirements that management authorities work together toward the common goal of EBM. Witness the number of times well-meaning initiatives have been launched to integrate scientific information about marine ecosystems, foster cooperation among agencies, and allow ecosystem approaches — only to die on the vine because the integration was voluntary (and typically underfunded). Mandates and the resources needed to carry them out will ensure that steps toward EBM are actually taken. In turn, cross-disciplinary science, common language, and effective integrated governance frameworks will help to make such mandates achievable. **M**

EBM Perspective: How Far Have We Progressed in 30 Years?

By Joseph A. Uravitch

[**Editor's note:** Joe Uravitch served as director of the US National Marine Protected Areas Center from 2000 to 2011. Now retired, he works part-time as a consultant on coastal and marine resource management issues.]

In 1978 I started work at the US National Oceanic and Atmospheric Administration (NOAA). This was during the nation's first "energy crisis", and I worked on a program that pertained to impacts from the siting of coastal energy facilities. That is where I learned that the state of Louisiana's wetlands were eroding into the Gulf of Mexico.

On 1 January 2011, I retired from NOAA in the midst of a "new" energy crisis and a "new" public discovery that among other problems facing the nation, Louisiana's wetlands were eroding into the Gulf.

Given this, what have we accomplished and learned over the past 30 years? For that matter, what have I accomplished and learned? And what does this portend for the future?

Speaking from a US vantage point, the coastal and marine community has made significant progress with institution building, education, and research. With regard to institutions to address our problems in the 1970s, new federal programs such as coastal zone management (CZM), national marine sanctuaries, and national estuarine research reserves were established to provide a more comprehensive suite of tools for action in this environment. Concurrently, new areas of scientific inquiry, formal management disciplines, and the linkages among them began and continue to develop. However, with the exception of the recovery of a few charismatic species and the setting aside of special areas, we have failed to deter continuing species loss and ecosystem degradation, both primary goals.

Coastal zone management

In the 1970s-1980s, the national CZM Program saw cooperative efforts by NOAA and the states and territories — often in consultation with Congressional staff — to develop management programs and an overarching national structure. Together they built the institutions and processes needed to address the use of coastal lands and, to a lesser degree, coastal waters in a comprehensive manner. It was a time of experimentation and innovation as the 35 coastal states and territories served as public administration laboratories. Each experimented with new approaches built upon unique state authorities to address general and specific federal statutory requirements, and shared information and approaches to address common issues.

Unfortunately, that cooperative spirit was lost during the administration of President Ronald Reagan (1981-1989) and a broad-based federal-state professional partnership has not been fully re-established, often hampering the sharing of resources, capabilities, and comprehensive approaches to problem solving. While the final state CZM program is now nearing approval, the magnitude and range of today's problems call for active partnerships across all levels of government, not a go-it-alone approach.

Marine protected areas

The foci of marine protected area programs have evolved over time. For example, in its early years the National Estuarine Research Reserve System (NERRS), then the Estuarine Sanctuary Program, focused on protecting estuarine resources through land acquisition. Today's NERRS is more actively providing environmental education, research, long-term monitoring, and training. The National Marine Sanctuary Program also has evolved, adapting to a broader understanding of stressors and threats. The program's initial focus was on smaller special areas such as Key Largo in Florida and the wreck of the USS Monitor. The late 1980s and early 1990s saw the program driven by significant public pressure to use larger sanctuaries with broad prohibitive regulations to preclude perceived large-scale threats: i.e., oil and gas drilling, and conflicting uses of the sea and seafloor such as sewage outfalls, dredged material disposal, and sand and gravel mining. Sanctuaries today are increasing the use of more specialized and targeted regulatory and non-regulatory approaches, retrofitting existing sites through a public management plan update process. Area-based fisheries management continues to move to a broader, habitat-focused approach, and during the past decade the country's National Parks and National Wildlife Refuges began strengthening the conservation of their non-terrestrial resources.

No doubt we have made progress. But looking back, I have mixed emotions about how much has been accomplished. Certainly we have "saved" some places, reduced the rate of loss and destruction, and established capabilities to address issues. Personally, I wish we had done more. Land can always be redeveloped; but, as time has shown, the restoration of fully functioning coastal, wetland, and marine habitats is not so simple, or even possible. Locations that could support coastal-dependent uses are being converted to other purposes.

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However, no one ever said that management was a short, simple process. I remain cautiously optimistic for the long term. We know more now about how the world works. We have established functioning institutions. The MPA executive order, issued by President Bill Clinton in 2000, has established a mechanism to network action and sites across all levels of government. Further, although one can criticize the process, President George W. Bush used his

authority to protect large areas of the Pacific Ocean. And President Barack Obama has begun the process of coastal and marine spatial planning, providing a mechanism for marine planning including the “wet side” of coastal management. Our difficult fiscal times require partnerships for success. What we need now is the public, political, and professional understanding, desire, and will to address our common problems. ■

Notes & News

Online consultation on MSP and integrated coastal zone management in Europe

The European Commission is gathering stakeholder feedback on the status and future of maritime spatial planning and integrated coastal zone management in Europe, including where EU action on these subjects would be most useful. The information, collected via online questionnaire, will be used as part of an impact assessment by the Commission and may inform the preparation of draft proposals on EU ocean governance.

The questionnaire “Possible ways forward for Maritime Spatial Planning and Integrated Coastal Zone Management in the EU” focuses on the main challenges and needs associated with implementing maritime spatial planning and integrated coastal zone management. The questionnaire is available until 20 May 2011 and is open to all. It is at http://ec.europa.eu/fisheries/partners/consultations/msp/index_en.htm.

EBM Bookshelf: *The Ecosystem Approach to Marine Planning and Management*

Edited by Sue Kidd, Andy Plater, and Chris Frid (Earthscan, 2011).
231 pp. Available for US \$49.95 at www.earthscan.co.uk/?tabid=102473

This book compiles the expertise of natural scientists, social scientists, and resource management practitioners on how to apply an ecosystem approach to oceans planning and management. Adopting a primarily European perspective, the book reviews the development of EU marine and maritime policy over the past 10 years, as well as UN guidance on adopting an ecosystem approach. It identifies challenges to implementation and offers lessons from the application of ecosystem approaches at sea and on land.

“This volume attempts to contribute to the wider body of literature in two ways,” write the editors. “The first is through its transdisciplinary outlook, with each of the chapters reflecting the joint effort of [contributors] from different disciplinary backgrounds. This broad understanding is the key to delivery of the ecosystem approach. The second is through its European perspective.”

The book draws upon a series of seminars in the UK between 2007 and 2009, funded by the country’s Economic and Social Research Council and the Natural Environment Research Council.

Report on MPA governance examines how to combine top-down, bottom-up approaches

A new report from UNEP explores the governance of marine protected areas, analyzing more than 20 case studies from around the world to determine how MPAs may be governed most effectively and equitably. Specifically, the report examines how best to balance three main approaches to MPA decision-making — top-down, bottom-up, and market-based approaches — in different MPA contexts.

A main focus of the study is how the three approaches utilize various types of incentives to steer people to behave in certain ways, namely in favor of biodiversity conservation. These include economic incentives, interpretative incentives (promoting awareness of an MPA and its policies), legal incentives (enforcement of laws), and more — in all, the report lists 40 distinct incentives. “This study suggests that it is the combination and inter-connection of different incentives from different categories that makes governance frameworks more resilient,” write Peter Jones, Wanfei Qiu, and Elizabeth De Santo, the report’s co-authors. The report *Governing Marine Protected Areas: Getting the Balance Right* is at www.mpag.info.

UK publishes guidance for regional marine planning

In March 2011, the UK Government published a marine policy statement that sets general principles to facilitate and support the formulation of regional marine plans covering all UK waters. The marine planning process, conducted under the Marine and Coastal Access Act 2009, is intended to enable effective management of marine activities and more sustainable use of the nation’s marine resources, creating a framework for consistent and evidence-based decision-making.

The marine policy statement provides the general environmental, social, and economic considerations that need to be considered in marine planning. It also provides guidance on the pressures and impacts that decision makers need to take into account when planning for, and permitting development in, the UK marine area. It is available at www.defra.gov.uk/environment/marine/protect/planning.

EBM Perspective: Marine Spatial Planning in the Arctic

By Charles Ehler

The Arctic — all 30 million square kilometers of it — is one of the most pristine, yet vulnerable, ecosystems in the world. Protected by its historic inaccessibility, harsh environment, comparatively small human population, and slow rate of economic development, the Arctic has been relatively less affected by human activity than most other regions on Earth.

This is about to change. Driven by outside economic forces and the effects of climate change, the Arctic, its ecosystems, and its people are all faced with substantial change ranging from the loss of ice-dependent species, more intense human uses of the Arctic, and the loss of natural services provided by Arctic ecosystems. As the Arctic warms, its ice melts and its ecosystems change. As technology improves, and as the demand for natural resources increases, opportunities open up for industry: shorter shipping routes, virgin fishing grounds, new areas of oil and gas exploration and development, and new places for commercial tourism. As well as business opportunities, these changes represent new risks to the Arctic's unique natural environment and to the people who now live and work in the Arctic. *Once these new human activities begin in the Arctic, it will be difficult for policy makers and managers to put limits on them.*

Marine spatial planning (MSP) would be a new approach in most areas of the Arctic. However, in Norway, an ecosystem-based, integrated marine management plan, including spatial and temporal management measures, has been developed already for the Barents Sea and the sea areas off the Lofoten Islands. The plan covers all waters from one nautical mile off the coast to the seaward limit of the Norwegian EEZ, as well as the fishery protection zone around the Svalbard archipelago — a total marine area covering 1.4 million km². Norway is one of the few countries that have successfully integrated all major economic activities (oil and gas development, fisheries, and marine transport) together with nature conservation in its marine spatial planning activities. The plan for the Barents Sea was initiated in 2002 and completed in 2006; the initial plan is now being revised. An integrated marine management plan for the Norwegian Sea (1.2 million km²) has also been developed recently.

Canada's Department of Fisheries and Oceans completed in 2009 an integrated management plan for the Canadian portion of the Beaufort Sea (1.75 million km²) as part of an ecosystem-based management program for five large ocean management areas (LOMAs) in Canada. The integrated management plan does not address MSP, but recom-

mends MSP be conducted for the Beaufort Sea LOMA. Greenland, Russia, and the United States have no marine spatial plans for their sectors of the Arctic.

Potential approaches to Arctic MSP

The Aspen Institute report *The Shared Future* identifies five potential approaches to MSP in the Arctic:

- (1) "Business as usual" — an incremental decision making approach;
- (2) A "bilateral approach" between national governments;
- (3) A "hot spot" approach;
- (4) An Arctic-wide "systems approach" among national governments; and
- (5) An Arctic-wide "systems approach" beyond national governments and led by indigenous peoples of the Arctic.

Under the fourth approach, planning for integrated EBM should be encouraged across all Arctic countries as the full report of the Aspen Institute suggests — and a focus on MSP could be a first step in that direction. This approach would tackle the entire Arctic region, probably under the aegis of the intergovernmental Arctic Council. While the Arctic Council is not an operational body that can impose obligations on its participants, it could undertake MSP for the entire Arctic region with the understanding that implementation of any plan would be the responsibility of individual Arctic coastal nations. Ideally, all interested and affected constituencies, including indigenous peoples, Arctic communities, governments, and the business sector, should participate in the MSP process. However, governments are often slow or unwilling to implement large, ecosystem-based, strategic planning initiatives, especially across borders. In Canada, for example, integrated marine plans that were completed several years ago still await approval by the national government.

In the fifth approach, indigenous peoples from the Arctic could take the initiative to develop an Arctic-wide approach to MSP through a network of their organizations including the Aleut International Association, the Arctic Athabaskan Council, the Gwich'in Council International, the Inuit Circumpolar Council, the Russian Association of Indigenous Peoples of the North

Editor's note:

Charles Ehler, president of Ocean Visions (Paris, France), served as marine spatial planning consultant to the Aspen Institute's Commission on Arctic Climate Change and was co-author of UNESCO's guide to marine spatial planning, published in 2009 (www.unesco-ioc-marinesp.be/publications).

In January 2011, the Aspen Institute released *The Shared Future*, the report of its dialogue and commission on Arctic climate change (www.aspeninstitute.org/sites/default/files/content/docs/pubs/Aspen_Climate_Change_Report_2011.pdf). The report identifies strategies and approaches to conserve the ecological resources of the Arctic Ocean and to ensure sustainable livelihoods for communities that depend on these resources. It offers several recommendations to strengthen management of the Arctic marine environment to sustain the resilience of the region's multiple interdependent ecosystems. The report includes a technical section, "Marine Spatial Planning in the Arctic: A first step toward ecosystem-based management," that is the basis of this essay.

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(RAIPON), and the Saami Council. While capacity building to begin MSP might be needed, technical advice could be sought from the Coastal First Nations Planning Office in Vancouver, British Columbia (Canada), and the Beaufort Sea Planning Office in Inuvik, Northwest Territories (also Canada), both of which have experience with MSP at a large scale. Initially the Arctic Council Indigenous Peoples Secretariat in Copenhagen, Denmark, could provide coordination of an initiative.

Alternatively, the initiative could be self-organizing, relying on the interests and initiative of a few indigenous organizations. Leadership of a MSP initiative by indigenous peoples could provide the basis for other stakeholders — the business and NGO communities, for example — to collaborate actively in the planning process. Eventually the Arctic Council and national governments would join and participate, particularly in the implementation of spatial and temporal management measures. ■

Editor's note: The goal of The EBM Toolbox is to promote awareness of tools for facilitating EBM processes. It is brought to you by the EBM Tools Network, a voluntary alliance of tool users, developers, and training providers.

The EBM Toolbox by Sarah Carr

New EBM Tools Database Released

The EBM Tools Network is very pleased to announce the release of a new online database at www.ebmtoolsdatabase.org. This new database is designed to help practitioners find resources for their EBM projects and share information about their own work with the broader EBM community. The database contains interlinked information on:

- **Tools** — including spatial planning tools, climate change adaptation tools, watershed models, marine ecosystem models, and many more;
- **Projects** — case studies of projects that have used tools;
- **Resources** — publications, toolkits, databases, and other resources related to EBM;
- **Organizations** — companies and other institutions providing assistance with EBM tools and projects; and
- **Practitioners** — professionals offering tools, resources, or other services to promote EBM.

Users are encouraged to contribute their own resources to the database by clicking on the “Add Information” link. Using and adding information to the database is free of charge. Help contribute to this important resource today by going to www.ebmtoolsdatabase.org. The database was developed by PlaceMatters and supported by the David and Lucile Packard Foundation.

(Sarah Carr is coordinator for the EBM Tools Network. Learn more about EBM tools and sign up for Network updates at www.ebmtools.org.)

Science Spotlight: What are stable isotopes, and how can they inform marine EBM?

On 10 May, Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) is hosting a symposium on how knowledge about food webs can be best integrated into marine EBM. Specifically the symposium is focusing on the movement of stable isotopes through food webs (www.csiro.au/org/Stable-Isotope-Symposium.html).

What are “stable isotopes”? For insights MEAM asked Beth Fulton, who leads the ecosystem modeling group in marine and atmospheric research at CSIRO.

Please describe what a stable isotope is.

Beth Fulton: An isotope is a natural variant of a chemical element that has more or fewer neutrons than normal, and so has a slightly different atomic mass. When we say an isotope is stable, this means it does not lose or gain neutrons — its atomic mass remains constant over time. The stable isotope carbon-13, for example, is taken up in different amounts by different primary producers, but its signal persists as it moves through a food web. That is, the signal of where that production ultimately originated is largely conserved even as it moves through many predator-prey interactions. As a result, the isotope can be used as a tracer for pathways of food through food webs.

Another useful isotope is nitrogen-15, which is enriched with each step up the trophic chain. As a result, it can be a good indicator of trophic level.

How does the use of stable isotopes differ from other food web research, such as stomach content analyses?

Fulton: Because stable isotopes are stored in tissue and are not subject to bias about what you can see in the gut (and differential digestion rates of hard vs. soft parts of prey), they can be a source of more representative trophic relationships. In other words, they are better at telling you who really eats what — including if the source is unexpected, like material from land entering the sea.

There are other chemical tracers now (fatty acids and DNA of material from stomachs) that are complementing the information provided by stable isotopes. But the isotopes remain a key potential information source, especially as it is often easier to grab a quick tissue biopsy rather than keep a whole fish's stomach contents for taxonomic sorting.

Are there examples in practice of stable isotopes informing coastal or marine EBM?

Fulton: To my knowledge, no single decision to date has been made solely on the back of stable isotope data. Instead it has a supporting role to help elucidate food web structure, which is then used to understand connections in the system and guide levels of exploitation and protection for key groups. There is an example where a mudflat crab species that had been assumed to be mainly a flesh eater turned out to get a good proportion (>30%) of its diet from mangrove leaf litter and small things that lived on mangroves; crabs macerate their prey so finely that we would never have known this, or at least not easily, without the isotopes. ■

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