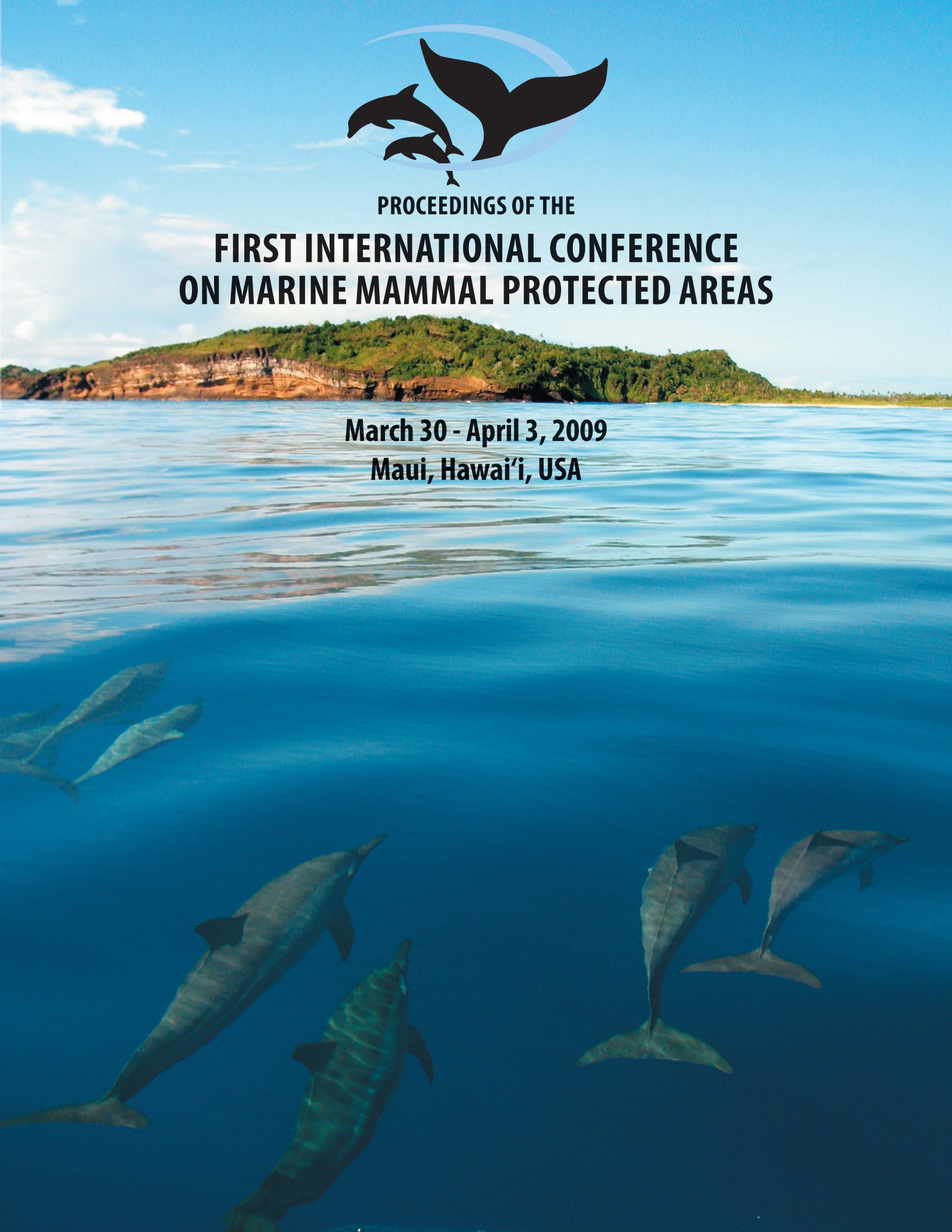

PROCEEDINGS OF THE

FIRST INTERNATIONAL CONFERENCE ON MARINE MAMMAL PROTECTED AREAS

March 30 - April 3, 2009

Maui, Hawai'i, USA

EDITOR

Randall R. Reeves

CO-HOSTS

National Marine Fisheries Service
Office of International Affairs

National Marine Sanctuaries
Hawaiian Islands Humpback Whale

SUPPORTERS

Premiere Level:

Australian Government
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Benefactor Level:

- The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)
- International Whaling Commission
- Marine Mammal Commission
- National Park Service
- NOAA Marine Debris Program
- NOAA National Marine Fisheries Service, Marine Mammal Health and Stranding Response Program
- NOAA National Marine Fisheries Service, Pacific Islands Regional Office
- NOAA National Marine Fisheries Service, Office of Protected Resources
- NOAA Marine Protected Areas Center
- Pacific Whale Foundation
- Pelagos Unit in Monaco
- Whale and Dolphin Conservation Society (WDCS)

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The Conference Co-Hosts and the Steering Committee would like to give their deep appreciation to the conference committees, the conveners of the panel, workshop, and training sessions, and the sponsors. Thank you also to everyone that traveled from near and far to attend the First International Conference on Marine Mammal Protected Areas.

Cover photo: Spinner dolphins approaching American Samoa, Ed Lyman, HIHWNMS, NOAA
Other photos: NOAA

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Conference Welcome

The first International Conference on Marine Mammal Protected Areas (ICMMPA) opened with a statement of welcome by Charmaine Tavares, mayor of Maui County, who cited the humpback whale as the "mascot of Maui" and noted the great pride taken by local people in the nearby Hawaiian Islands Humpback Whale National Marine Sanctuary. She acknowledged the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) Office of International Affairs, and Hawaiian Islands Humpback Whale National Marine Sanctuary for co-hosting the conference.

The mayor's remarks were followed by three plenary talks, as follows:

Donna Petrachenko of the Australian government's Department of the Environment, Water, Heritage and the Arts, and currently serving as the Australia Commissioner to the International Whaling Commission (IWC), provided a brief global overview of the history and evolution of marine protected areas, emphasizing that the preferred current model is one of networks that seek to protect species and biotic communities and to manage multiple, ongoing pressures from human activities in an integrated way.

A detailed, highly personal memoir on the history of whale sanctuaries and the International Whaling Commission was provided by Sidney Holt, a key figure in the IWC Scientific Committee for many decades and among the most influential thinkers in the modern conservation movement. This paper was introduced by Giuseppe Notarbartolo di Sciara, as Sidney Holt was unable to attend the conference.

Finally, Jack Dunnigan, Assistant Administrator of NOAA's National Ocean Service, reviewed the role of NOAA and its partners in developing the National Marine Sanctuaries system in the United States and, in particular, attempted to place the Hawaiian Islands Humpback Whale National Marine Sanctuary in context.

The full texts of all three of these keynote presentations are available at www.icmmpa.org.

Table of Contents

A traditional Hawaiian blessing and hula opened the conference.

Participants of the First International Conference on Marine Mammal Protected Areas.

Executive Summary and Main Conclusions

From March 30—April 3, 2009, more than 200 marine mammal protected area (MMPA) researchers and managers and representatives of government departments and conservation groups from 40 countries met in Maui, Hawai'i, to explore how they might build networks of people, institutions, and protected areas to advance the conservation of marine mammals and their habitat.

The overall conference theme of "networks: making connections" was explored in three conference threads focusing on (1) design, (2) management, and (3) networking for the future of MMPAs and MMPA networks. These thematic strands were realized through a combination of talks and panels in three plenary symposiums, followed by workshops, training sessions, posters, and films.

The first symposium thread on design of MMPAs and MMPA networks established that there is a growing number of MMPAs but that their effective coverage of important or critical habitat of the many wide-ranging species of marine mammals remains slight. A few networks are in the early stages of development, including a sister-sanctuary relationship between the United States and the Dominican Republic for humpback whale feeding and breeding areas, but the network possibilities remain largely unrealized. There are substantial benefits in terms of exchange of knowledge and resources, as well as providing better protection for marine mammals. Engagement is also needed with the larger marine protected area (MPA) community at national, regional, and international levels.

In terms of management, many MPAs have been slow to set up effective management plans with monitoring regimes. To be effective, management must be continuous and science-based, incorporate ecosystem-based management and monitoring, take account of socioeconomic concerns and larger environmental issues, particularly those related to fisheries, and include public participation with educational programs. To meet such challenges, political will is essential. Many management approaches have been tried, including time-area closures, permitting/licensing mechanisms, targeted research, and various educational tools. These approaches need to be evaluated and shared. Strategies for ensuring funding and achieving success on a low budget are equally important. Considerable time and effort was devoted to the problem of how to measure management effectiveness. Adaptive management is considered an important tool, but MMPAs should still be established with the best possible management from the beginning.

The third strand looked to the future and included, among other things, new approaches for pelagic and high-seas MMPAs based on monitoring dynamic and ephemeral ocean systems as well as discussion of ocean zoning outside MMPA networks, which becomes more important with accelerating exploitation of pelagic waters and the high seas. Region-scale spatial management, using comprehensive ocean zoning, could help address threats throughout the extensive ranges of marine mammals. Protecting marine mammals as umbrella species can result in conservation measures that protect whole communities and ecosystems, and as such can be seen as an investment in maintaining

marine biodiversity and ocean health, but this can only work if threats are adequately understood and if management is truly tailored to the threats. In the brave new world of ocean zoning, the focus should remain on threats, and not revert to cookie-cutter approaches to MPAs in the hope that they will solve every conservation problem. This consideration of marine mammal protection leading to broader ecological benefits provided an added value to the ICMMPA.

The high seas were mentioned in various presentations on MPA design, management, legal aspects, and incorporation into networks. Representing about half of the world ocean, the high seas provide habitat for many marine mammal species, though this area, due to its distance from land, is much less studied than coastal and nearshore areas. Currently, the IUCN World Commission on Protected Areas High Seas MPA Task Force, the Regional Activity Centre for Specially Protected Areas (RAC/SPA) in the Mediterranean, and other regional scientific and conservation bodies are starting to use scientific criteria from the biogeographic classification system of the Convention on Biological Diversity (CBD) to identify ecologically or biologically significant areas in need of protection, with the idea of creating functioning MPA networks on the high seas. Greatly accelerated research on marine mammal critical habitat is essential for this process. Consideration is being given to making the "High Seas" the theme for the next ICMMPA conference planned for France in 2012.

MPA designers, planners, and managers must continue to engage stakeholders, indigenous people, and the public through partnership, consultation, education, and outreach to build constituencies of support for MPA networks. There is great potential for incorporating cultural practices (indigenous, historical, and modern) into planning and managing MPAs. It is important that costs and benefits be distributed fairly among stakeholders.

The emphasis of the conference was on the urgent need to build marine mammal protected area (MMPA) networks. Various elements can lead to the formation of MMPA networks, including:

- Legal obligations created from regional or global agreements (e.g., the Barcelona and Cartagena conventions, the CBD).
- Marine mammals migrating across various jurisdictions (e.g., the Latin American cetacean network).
- Requirements under national policies (e.g., New Zealand).
- The need for standardized monitoring throughout the range of a species or population (e.g., US national marine sanctuaries).
- The desire to gather data to support a common decision (e.g., establishment of sanctuaries by the International Whaling Commission).
- Critical habitat protection (e.g., 33 sites identified in Mexico).
- Creating sister-MPAs to share expertise and lessons learned, and
- Fulfilling the desire to connect people and institutions.

In addition to the three symposiums, six workshops focused on criteria for and mapping of critical habitat, getting stakeholders to talk to each other, exploring the role of culture in MMPA management, and creating regulations that work.

A workshop and several talks were also devoted to monk seal conservation. The conference was fortunate to have a number of the world's monk seal experts in attendance, with problems and good conservation outcomes from the Mediterranean, Madeira and Hawai'i to present and discuss.

Training sessions covered marine mammal stranding, entanglement, and health assessments, monitoring MMPAs (check-up and review), management planning, naturalist training, and the role of education in the community and on the water.

The location of the conference in the middle of the Pacific Ocean was timely and appropriate. In January 2009, the United States had designated three new large MPAs in its Pacific territories, and over the previous few years, the number and size of MPAs had increased dramatically. To date, 7 of the 8 largest MPAs in the world, and 11 of the top 15, are in the Pacific. Also, the Pacific has four IUCN Category I protected areas, meaning they are among the most highly protected MPAs in the world. The Hawaiian Islands Humpback Whale National Marine Sanctuary, a co-host and the conference venue, was a pioneer MPA in the region. Partly through its efforts, and those of the collaborative international Structure of Populations, Levels of Abundance and Status of Humpbacks (SPLASH) program and the South Pacific Whale Research Consortium (SPWRC), contributed to the impetus for the conference and for the idea of solidifying and improving nascent networks in the Pacific.

Key recommendations and conclusions that emerged from the conference were as follows:

- An urgent worldwide effort must be made to identify and define important marine mammal habitats and "hot-spots." This information must be mapped with other species and eco-geographic data to assist in the design and creation of MPA networks in national waters and on the high seas, working through national governments as well as various regional and international fora. Critical habitat is not defined simply as an area of high animal density. Less densely occupied areas may be more critical to survival, depending on behavior and population/stock structure, and whether threats in these areas have an impact on the population. Therefore, not only critical habitat, but also threats and human activities, must be mapped.
- Global databases covering environmental features, ocean processes, and species may help identify critical habitat and contribute to the design of MPAs and MPA networks, but such databases need to be "ground-truthed" against more local data and/or through expert bodies using, for example, a Delphic process (an expert-driven process to arrive at draft MPA boundaries and design).
- Threats to species and habitat may occur outside of an MPA, so it is important to look "outside the box." It may be possible for MMPA networks to act as

catalysts, partners, or support systems for impact research and mitigation strategies at regional, national, and international levels.

- Bycatch is a major threat to marine mammals worldwide. If fishery regulations do not address the bycatch problem adequately, MMPAs with no-fishing zones offer an alternative to regular fishery management.
- For management, advisory councils can be used as part of a strategy for engaging stakeholders. Expert advisory groups can help ensure that appropriate scientific expertise is applied to the design of research projects and monitoring programs.
- More attention must be devoted to management plans: developing and updating them to make them more effective and sharing "best practices" between MMPAs in an MMPA network to guide future work, as well as developing and sharing methods of evaluation.
- Guidance needs to be developed for integrating conventional marine management tools with MMPAs/MMPA networks to achieve conservation. Which tools are best applied, alone or in combination, under what circumstances?
- In terms of establishing MMPAs and levels of protection and zoning, marine mammal scientists should not be forced to become advocates. Rather, they should be encouraged to describe and quantify trade-offs and present choices so that decision makers can evaluate options.
- As part of networking, a strong effort should be made to transfer skills and resources to researchers and management staff in less developed countries, thus increasing their capacity to obtain the data necessary to develop and manage MMPAs. A website with extensive resources and mentoring contacts should be set up as part of this, and teams of experts in the various aspects of MMPAs and network building could visit sites in order to teach and help measure effectiveness.
- The Conference supported the research goals and, in particular, the cooperative approach of the Southern Ocean Research Program (SORP).
- MMPAs should become centers for research innovation and creativity in terms of solving marine mammal conservation problems, and the knowledge thus generated should be shared as widely as possible. (Good examples are the development of acoustic monitoring at Stellwagen Bank and the suite of techniques used to study as well as to help free gear-entangled humpback whales.)
- Noise considerations should be incorporated into management plans of MMPAs through, for example, the use of buffer zones. International or national (EEZ) cetacean sanctuaries, or areas without formal protection, could add noise-related spatio-temporal restrictions to their array of protection measures. Diversion of shipping lanes or limits on ship speed also may reduce the exposure of cetaceans to noise. Long-term visual and passive acoustic monitoring of cetaceans, and monitoring of noise levels, are particularly important in MPAs.
- A major challenge in MPA design is to accommodate diverse oceanic habitats (static, persistent, or ephemeral) that are critical for marine mammals and their food webs. This requires spatially explicit marine zoning and conservation. Upper trophic-level oceanic predators make their living in a vast, dynamic, and heterogeneous environment even though at any one time they may be concentrated within relatively small-scale foraging areas of only tens or hundreds

of square kilometers. They respond to changes in water mass, productivity, and prey availability. In principle, MPAs could, and should, be designed to protect "predictable" concentrations of predators. Size alone will not necessarily accomplish this. Rather, it may require scale-explicit management and the incorporation of dynamic metrics.

- Marine *mammal* protected areas (MMPAs), like marine protected areas (MPAs), come in many shapes, sizes, and guises. Some are broad in area but narrow in scope (e.g., IWC "whaling sanctuaries" and national EEZ whale sanctuaries that exist mainly to prohibit whaling). Some are large, broad in the range of species protected, and intensively managed (e.g., the Great Barrier Reef Marine Park in Australia). Others are small and narrow in the range of both species protected and threats addressed (e.g., the Gully and Robson Bight, both in Canada). Still others are tailored to protect a single species from a single threat but are managed on a strictly voluntary basis (e.g., Roseway Basin Area to be Avoided, eastern Canada). Given this great variability, a classification system with clearly defined terms for different types of MMPAs is needed, possibly along the lines of the systems developed by IUCN for classifying protected areas. Criteria that might be considered include size, funding for research and management, dedicated permanent staff, whether management addresses single or multiple species and threats, whether management measures are voluntary or mandatory, and whether ecosystem concerns are explicitly considered. The classification scheme should be simple and clear, with names for different types of MMPAs that are readily understandable for professionals and the general public alike.
- In order to design MPAs and MPA networks with ecologically meaningful boundaries, it is desirable to consider multiple species with various characteristics in common, particularly with respect to distribution, movements, and threats. Behavior and social systems should also be taken into account in attempting to identify "critical habitat" for the species of greatest interest and concern. Results of spatial (and other) modeling should be integrated into survey design as much as possible.
- Corridors have been largely neglected in the design of MMPAs for marine mammals and MPA networks. Instead, the focus has tended to be on boxes drawn around "hotspots" of animal occurrence, often taking into account the feasibility of designation in terms of political, economic, and social considerations. However, corridors used by marine mammals as they migrate or move between "hotspots" can be critically important to long-term population viability. Corridors may be amenable to management as dynamic protected areas or protected through other temporally and spatially explicit management measures.
- It is important that social, cultural, political, and economic factors be taken into account when designing MMPAs, but the primary role must remain to conserve species and ecosystems.

The conference concluded with the announcement of a new potentially trilateral sister-sanctuary relationship, with discussions underway between the conference co-host Hawaiian Islands Humpback Whale National Marine Sanctuary, the Glacier Bay National Park in Alaska, and the Commander Islands State Biosphere Reserve in Russia, all of

which are visited by some of the same individual humpback whales migrating between their tropical breeding area and cold-water feeding grounds.

The ICMMPA will maintain a continuing presence on the www.icmmpa.org website and the steering committee will coordinate with the newly formed French *Agence des Aires Marines Protégées* regarding plans for the next ICMMPA, tentatively planned for late 2011, or 2012.

Note from the Steering Committee

The following collection of reports on the various components of the conference program constitutes the Proceedings. As will be readily apparent to readers, the reporting was uneven in terms of format, degree of detail, and length. Some of the reports submitted to the conveners included summaries or abstracts of presentations; others did not. Some had conclusions and recommendations that had been adopted by participants before the panel or the workshop adjourned; others had little more than a statement of the objectives and questions addressed. This variability reflects the diverse spirit of the conference, where networking (i.e., communication among delegates) was itself much of the purpose, i.e., a specific written product was not always intended as an outcome of a given event in the program. The variability also reflects how the conference was organized. The steering committee – itself a diverse group of individuals with differing backgrounds, perspectives, and expectations – did not set out with the goal of establishing standard guidelines for reporting. Rather, the goal was to enlist a wide range of experienced practitioners to address relevant topics, give them considerable latitude in organizing and conducting the symposiums (talks and panels), workshops, and training sessions, and trust that they and the other participants would make good use of the allotted time. No reports were requested from the training sessions, so these Proceedings consist of reports on the symposiums and workshops. The overall conclusions and recommendations, prepared by the conveners, are presented as part of the Executive Summary.

Note that a number of presentations, posters, daily reports, and other materials from the conference will remain available for viewing and download from the permanent conference website, www.iccmpa.org. This site will also report on developments regarding the second International Conference on Marine Mammal Protected Areas, tentatively set for 2011 or 2012.

The steering committee would particularly like to thank Randall R. Reeves for his help in editing these proceedings.

Members of the conference steering committee.

Symposium 1: Designing MPAs and MPA Networks

Moderator: Erich Hoyt

Key Themes:

- Now is the time for marine mammal-oriented MPAs to become involved in and part of the broader MPA movement.
- Communication is an overarching need.
- MMPAs need to take advantage of the latest MPA design, management, and decision science.
- The Southern Hemisphere is leading the way in many respects.
- Areas lying between MPAs and outside MPA boundaries may also require special protection measures.
- MPAs are not always the answer to a conservation problem or challenge.
- Many legal mechanisms are available that can be used to compel "non-party" states to comply with high-seas MPA policies and regulations.

Summaries of Presentations:

Marine mammal protected areas (MMPAs): the global picture. Nascent networks moving toward an interconnected future
Erich Hoyt

In recent years, the Pacific has led the world in conservation through the use of MPAs. From the cetacean perspective, Mexico's protection of Scammon's Lagoon in Baja California in 1971 was a major milestone, as was the creation of the Hawaiian Islands Humpback Whale National Marine Sanctuary in 1992. Recently, several U.S. marine national monuments have been established in the northwestern Hawaiian Islands, Northern Marianas Islands, Line Islands, and American Samoa. These MPAs are particularly valuable because they are large (35,000 km^2–362,000 km^2) and confer the highest level of protection recognized by IUCN (Category I). By comparison, about a third of the also very large Great Barrier Reef Marine Park (345,400 km^2) is zoned as highly protected, which is still substantial. The Pacific has 11 of the world's 15 largest MPAs and it also has 15 of the world's 25 national EEZ-wide cetacean sanctuaries. Unlike MPAs, the EEZ sanctuaries have no management plans or stipulations other than "no hunting," but they could become much more.

The word "network" has been little used in the naming of these MPAs and sanctuaries so far, but the initiatives are suggestive of nascent networks. Viewed globally, many of the more than 500 marine mammal protected areas (MMPAs) are too small; they give insufficient protection to mobile marine species, especially the wide-ranging whales, dolphins, and porpoises. Networks, if carefully designed and planned, could begin to remedy this situation. Recently proposed MMPA networks include: (1) a large Ross Sea MPA and potential network for Antarctic waters, (2) the Bangladesh Cetacean Diversity Project, (3) the South American River Dolphin Protected Area Network, and (4) 17

MPAs in the Mediterranean and Black seas under ACCOBAMS, the CMS cetacean agreement.

What is an MPA network? IUCN defines it as a system of individual MPAs operating cooperatively and synergistically, at various spatial scales, and with a range of protection levels, in order to achieve ecological aims more effectively and comprehensively than individual sites could when functioning in isolation. An MPA system should also confer social and economic benefits, although the latter might only be fully realized over long time scales as ecosystems recover. With an MPA network, the whole is greater than the sum of its parts.

The advantages of MMPA networks are that they can: (1) help compensate for the small sizes of most MMPAs, (2) protect linkages between various types of habitat and in doing so, support species, populations, and ecosystems, (3) bring together people and communities around a common interest in marine mammals and marine mammal habitat, (4) draw upon common legal frameworks to create shared or similar provisions for management, enforcement, research, and monitoring, (5) help accommodate or adapt to the damaging effects of climate change, and (6) facilitate an ecosystem-based management approach, especially if this is employed in conjunction with ocean zoning.

The essential principles for designing and implementing MPA networks, as set down by the IUCN World Commission on Protected Areas, and all applicable to marine mammals, are: (1) include the full range of biodiversity present in the biogeographic region, (2) ensure that ecologically significant areas are incorporated, (3) maintain long-term protection, (4) ensure ecological linkages, and (5) ensuring maximum contributions of individual MPAs to the network.

To create effective MMPAs and MMPA networks, we need to learn more about species, more about threats, and more about habitat. We need to characterize preferred habitat and identify where such habitat occurs using habitat preference models. We need to build human networks to collaborate on research projects covering whole oceans, such as the recent SPLASH project on humpback whales in the North Pacific. We need to have larger, more flexible, better-managed MPAs – 40% of all MMPAs are less than 100 km^2 in size and many have no management plan. We need to think critically. For example, are MPAs always the answer? Ultimately, we may need to consider a much larger-scale approach and pay more attention to areas outside MPA borders and the spaces between parts of the MPA network. For this, the new tools of marine spatial planning and ocean zoning could prove invaluable.

Internationally agreed targets (e.g., under the Convention on Biological Diversity) have provided the impetus to create many more MPA networks in national waters and on the high seas by 2012. Marine mammal scientists have been charged with defining and describing critical habitat so that it can be included in MPA network proposals. We urgently need to fill the gaps in knowledge and to produce proposals that reflect the best science and incorporate a precautionary approach. Otherwise, new MPAs and MPA networks will be created without marine mammals in mind, and marine mammal habitat may be left largely out of the picture. Marine mammals have the potential to put MPA

networks in the public eye, on the politician's agenda, and on the map in a high-profile way. But it is up to us to make that happen.

What's taking us so long?
Brad Barr

Creating networks of MMPAs should be relatively straightforward, but surprisingly few exist despite their obvious benefits. The animals to be protected are large and charismatic, and considerable research has been carried out to identify their migratory routes and critical habitat. We know where the MPAs are that include marine mammals as key protected resources, and it does not take much effort or additional information to be able to "connect the dots" between these sites. We know what the significant threats to these animals are and how those threats might be more effectively addressed if the research and management at sites known to be important to the populations were integrated in some way. There is a growing literature on how to network MPAs, and although not all the answers are available, we know enough to get started. Also, we keep saying that we are prepared, and know how, to learn from our successes and failures. So, there is no good excuse for not making more progress toward the goal of MMPA networking.

The purpose of this conference was to bring together a community of marine mammal scientists and MPA managers and to get us talking to one another, sharing experiences and ideas, and forging relationships needed to establish fully functioning networks. We have many of the technological tools and a rapidly growing knowledge base that can help us achieve that goal. Here are some suggestions to get us started:

- Start simple. Use the ICMMPA as a means of getting to know others who might make good network partners, and learn how others are addressing management challenges similar to yours.
- Be patient, but not too patient. Try to work with others who share responsibility for managing shared resources and see what you can do better through collaboration. There is no need to rush into a formal agreement until both sides understand and accept the terms, implications, and expectations involved.
- Spend some time learning the basics. There are many good references and an extensive array of functioning MPAs, and it is important to build on what others have already learned.
- Look for opportunities to establish and strengthen network collaborations. Does your management plan have a section dealing with networking actions you intend to take? If not, it should.
- Seek advice from colleagues. Part of the reason for the ICMMPA is to begin to build a "community of practice" for MMPA managers. Often, the answer to a confounding management challenge is only a phone call or e-mail away.
- Invite colleagues to come and visit your MPA. Feedback provided by colleagues in either informal visits or formal reviews of your management program can be very useful. The "community of practice" should eventually develop a program to provide expert review panels that can be drawn from when seeking external reviews.

- Look for economies of scale. Seek out opportunities for collaborative research, outreach, or management. Before starting a new initiative, call colleagues and see if they are interested in joining on a collaborative basis.

Networks can start with a single phone call, a brief conversation, or an encounter at a meeting or workshop. Like most good things though, they are unlikely to develop fully unless they are deliberately, thoughtfully conceived and nurtured. Considering how ripe and compelling the concept of MMPA networks is, if the next time this group comes together we are unable to highlight several solid examples that started here in Maui, we should all wonder why we bothered to meet at all.

Facilitating public engagement in national and international MMPA network design and implementation: involving stakeholders at the start of the MPA creation, management, and threat mitigation process

Ricardo Sagarminaga van Buiten

Situated at the entrance of the Mediterranean Sea and the intersection of three biogeographic areas, the Alborán Sea is a migration corridor for cetaceans. Also, the region's unique ocean conditions, combined with its geomorphology, make it an aggregation site for a great variety of prey species that support at least ten species of cetaceans. The Alborán Sea is a site of exceptional marine biodiversity and also an area used intensively by humans. In addition to the value represented by its natural attributes, the Alborán Sea is both nationally (Spain) and internationally important for socio-economic and strategic reasons. More than 30% of the world's maritime traffic crosses these waters. Offshore oil and gas development, windfarms, and tourism are rapidly emerging as significant forms of human use in addition to fishing, which is already a deeply rooted part of local culture. The Alborán Sea is in every sense a "hotspot" for cetaceans (and marine birds and turtles) and for the array of conflicts that arise where human activities and marine life overlap.

Alnitak and its partners have been monitoring cetaceans, seabirds, marine turtles, and human activities in the Alborán Sea for the past 20 years. It has also been involved in a series of projects to design MPAs and develop management and conservation plans, for example: P. Mediterráneo (1999-2002, designing MPAs), LIFE02NAT/610 (2002-2006, designing management plans), priority actions for risk mitigation (2006-2008), and LIFE INDEMARES MITIGA Lab (2009-2014). The 2002-2006 LIFE Nature project, called "Conservation of Cetaceans and Turtles in Murcia and Andalusia," centered on (a) the development of conservation and management plans, (b) the development of innovative, cost-effective tools for monitoring marine pelagic species, and (c) the active involvement of stakeholders. Alnitak's projects have used three classic fishing vessels as meeting places and classrooms and to host traveling exhibits.

As a result of those efforts, one Special Area for Conservation (SAC) has been established off Murcia (Medio Marino de Murcio) and additional MPAs have been proposed, including SACs in the Strait of Gibraltar, off southern Almería, and around the Island of Alborán; an Oceanic Area in the far eastern Alborán Sea; and a Specially Protected Area of Mediterranean Importance essentially encompassing the entire northern Alborán Sea and Gulf of Vera.

Management planning is regarded as a 7-step process, as follows:

- Establish conservation objectives;
- Define attributes to conserve;
- Establish specific objectives with respect to the attributes;
- Identify threats in relation to the specific objectives;
- Establish targets and indicators;
- Prioritize – bring stakeholders into the discussions at this point;
- Find consensus.

It is difficult to overstate the importance of stakeholder participation. Cooperation with whale watching tourism can foster goodwill and contribute to data collection. Fishermen are often both the most important and most difficult group of stakeholders to bring into the process in a meaningful way. In the Alborán Sea, the fishing sector consists primarily of a large fleet of small boats. The sector is not well organized or well represented, and it is difficult to win the trust of the fishermen. With its particularities, the fishing sector is almost impossible to control. Several things can help facilitate engagement. One is to invite fishermen from other, successful MPAs to function as ambassadors and speak with local fishermen. Another is for researchers working with the MPA to use the same types of vessels as those used by the fishermen; this can gain them local respect. Similarly, researchers working in shipyards can make a strong positive impression on fishermen. Participation by fishermen in experimental fishing projects and in efforts to develop measures to mitigate bycatch and depredation is beneficial for a variety of reasons. Frequent meetings, both formal and informal but especially the latter (often one on one), are essential. Examples of positive momentum stemming from stakeholder engagement in the management process are (a) waste management on fishing boats and (b) implementation of bycatch mitigation measures.

Four meetings have been held with the Spanish merchant navy and a formal presentation has been made to the International Maritime Organization. As a result, an initiative has been taken to relocate 25% of the world's maritime traffic some 20 nm south of Sur de Almería, one of Europe's most valuable, and vulnerable, natural sites of marine biodiversity. Another initiative has been to advise NATO of regional high-risk areas for deployment of mid-frequency sonar.

Design risks and practical performance assessment in MMPAs
Trevor Ward, Rom Stewart, and Lissa Barr

To begin, consider Alice's Dilemma – if you don't know where you want to go, it's reasonably easy to get there. In designing MPAs and assessing their performance, it is essential to know where one wants to go and how to get there. Based on the Australian experience, six main scientific design principles should apply, as follows:

- Establish and maintain the primacy of biodiversity;
- Recognize the management constraints;
- Define multiple objectives (multiple uses);
- Identify threats and address them explicitly;
- Enable effective monitoring and reporting;
- Involve stakeholders and local communities.

Two of those principles deserve special consideration. The first (biodiversity primacy) requires consideration of the planning framework, biodiversity metrics, maintenance of biodiversity, levels of representation, and extent of high protection. The fifth (monitoring and reporting) should involve incorporation of an adaptive management cycle such as that outlined by Fulton and Smith (http://www.cmar.csiro.au/research/mse/images).

Systematic conservation planning and implementation can be thought of as a 10-step process, as follows:

- Identify and involve the stakeholders;
- Identify the management goals and objectives;
- Identify and compile data and knowledge;
- Specify the system properties (describe state of system: natural, resource, cultural);
- Determine management options and constraints;
- Specify the uncertainties (what don't we know about the system or the decision problem?);Establish conservation principles and targets;
- Identify MPAs and complementary management solutions;
- Implement conservation and management actions;
- Review and assess solutions, then adapt.

Western Australia's marine parks and reserves provide examples of how monitoring and reporting can be carried out through annual audits of inputs, outputs, and outcomes, weighed against key performance indicators (park values, management objectives). The aim is to ensure that MPAs are subjected to a regular performance assessment process that addresses design risk for marine mammals, focuses on practically achievable monitoring and reporting systems based on resilience principles, and is both transparent and accountable. Reporting takes the form of report cards with both qualitative and quantitative scores. In Jurien Bay Marine Park, water and sediment quality, seagrass meadows, finfish stocks, and sea lion pup production are monitored. In the marine reserves in Shark Bay, water and sediment quality, seagrass, stromatolites, fish, Monkey Mia dolphins, dugongs, and loggerhead turtles are all monitored. These are just two

examples of what is happening in Western Australia in relation to marine mammals and MPAs.

Performance assessment systems based on the principles of decision science (typically using values, objectives, strategies, reporting) need to be carefully focused on the key design risks, or they may lead to false conclusions about the success of MPA design and management. This becomes especially challenging when the MPA does not encompass the entire range of the focal population (the usual situation), creating need for complementary off-MPA management to achieve real conservation outcomes within the MPA.

There are two main conclusions. First, major scientific risks must be addressed at the design stage, and this is particularly important for spatially extensive MMPA networks. The predominant risks are:

- Inadequate specification of biodiversity objectives.
- Incomplete decision science – objectives and outcomes need to be smart and explicit.
- Inadequate risk framework, i.e., when evaluation of human uses and threats falls short of what is needed.
- Failure to integrate practical management experience, resulting in ineffective zoning and compliance.

Second, optimization tools can help resolve complexity and address specific tradeoffs within the MPA design problem (e.g., Alice's dilemma – where to go and how to get there).

Legal instruments for the formal establishment of MPAs and MPA networks: finding the appropriate designation, governance mechanism, and accompanying regulations for MPAs and MPA networks in national waters and on the high seas
Irini Papanicolopulu

For an MPA to be legally binding with enforceable conservation measures, it has to be established through a legal instrument, either a national law or an international treaty. There is a general need for scientists and managers to have a language in common with each other as well as with those trained in law. Maritime nations have a number of general obligations under international law. Some of these stem from treaties, such as the United Nations Convention on the Law of the Sea (UNCLOS), which was adopted in 1982, entered into force in 1994, and currently has 157 State parties, or the Convention on Biological Diversity (CBD), which was adopted in 1992, entered into force in 1993, and currently has 191 State parties. Others emanate from customary rules and are applicable to all States.
Article 192 of UNCLOS obliges State parties to "protect and preserve the marine environment." Article 194 obliges them to take measures "necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life." Article 8 of the CBD specifically calls on contracting parties to "establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity." IUCN guidelines define an MPA as "any area of intertidal or subtidal terrain, together with its overlying

water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment."

Among the maritime zones recognized in international law are internal waters, territorial waters (within 12 nm), contiguous zone (24 nm), continental shelf (≥ 200 nm), exclusive economic zone (EEZ, 200 nm), high seas, and the International Seabed Area. Most national MPAs are within territorial waters, some are within the EEZ, and very few extend onto the high seas. International MPAs can be formed under a variety of global conventions, e.g., MARPOL 73/78, International Convention for the Regulation of Whaling, Ramsar Convention, World Heritage Convention, and Convention on Migratory Species, or regional agreements, e.g., Bern Convention, Barcelona Convention and Specially Protected Areas Protocol, and OSPAR. Examples of regional MPAs exist in the eastern Africa region, the southeastern Pacific Ocean, and the Wider Caribbean Region.

Article 197 of UNCLOS obliges States to cooperate on a global or regional basis "for the protection and preservation of the marine environment, taking into account characteristic regional features." Article 87 establishes that the high seas are open to all, but that such freedom is subject to the rules of this and other conventions. High-seas MPAs can be established either under national legislation or international treaties. Importantly, CBD Decision VIII/24 (2006) urges parties and other governments to pay particular attention to the integration of MPAs "into the wider seascape" and to increase collaborative activities "to protect ecosystems in marine areas beyond the limits of national jurisdiction." Further, CBD Decision IX/20 (2008) urges them to identify ecologically or biologically significant or vulnerable marine areas in need of protection and encourages the establishment of "representative networks" of MPAs.

The management rules of high-seas MPAs established by a single country can require only that State's citizens (including companies) and ships to comply, whereas MPAs established under international treaties oblige the citizens and ships of all State parties to comply. State parties can, moreover, exercise pressure (economically and politically) to obtain compliance by non-parties. For example, the Antarctic Treaty charges contracting parties "to exert appropriate efforts … to the end that no one engages in any activity in Antarctica contrary to the principles or purposes" of the treaty. In general, States not only *can*, but in fact *must*, protect threatened species and marine ecosystems in the high seas. There is no doubt about the legality of high-seas MPAs; the difficulties of establishing them are due mainly to political considerations.

Symposium 2: Managing MMPAs

Moderators: Steve Gittings and David Mattila

Key Themes:

All MPAs need a management plan.

The goals of a given MPA should be integrated into the broader management framework or context, while the MPA itself has a management plan that includes specific measures to protect particular species and manage relevant fisheries and other human activities. Science must be at the heart of MPA planning and function, but it is important to (a) be pragmatic in making use of all available sources of data and information and (b) ensure that the associated uncertainty is explicitly recognized and, if possible, quantified. Working with stakeholders, especially fisheries, is key to MPA effectiveness.

Persistence and creativity in finding ways to make things work can be decisive factors in the establishment of effective MPAs, as exemplified by case studies of the vaquita in Mexico and monk seals in Greece. The vaquita example also illustrates the challenges of having to revisit or change management measures once they have been successfully negotiated with stakeholders; it is greatly preferable to "get things right" the first time, using historical evidence and perspectives.

Without political will to support management, an MPA has little chance of achieving its purpose. In the case of the vaquita, a recovery team composed of recognized international experts helped convince Mexican officials of the need for action. In the case of the multilateral Pelagos Sanctuary, creating political will in the signatory states remains a challenge.

Advisory councils (such as those used in the U.S. National Marine Sanctuaries system and as required for MPAs in Greece) may be costly and bring a certain amount of managerial discomfort, but they are valuable for ensuring that MPAs are well managed, appropriately focused, and functionally linked to stakeholders. Advisory Councils can also serve as bridges that enable dialogue between MPA managers and representatives of other ocean sectors, such as ferry operations and aquaculture. NOAA holds annual meetings of all Advisory Council chairs in order to establish social networks and leverage tools. A global meeting of such individuals is something to consider.

In some situations, conflicts between MPAs and commercial user-groups might be resolved by stressing that MPAs contribute to environmental health, which, in turn, can facilitate tourism, support clean and productive fisheries, and bring other economic benefits. It is important to avoid pitting development and ecology against each other and to show how MPAs can improve local economies and contribute to national economic development.

Summaries of Presentations:

Managing MPAs in a changing world: how can well-managed MPAs contribute to helping solve the emerging problems of our time
Dan Basta

MPA management needs to be a mixture of classical approaches and modified, adaptive approaches that are better suited to a rapidly changing world. The following features need to be considered:

- *A continuous management process*: Not just management of the MPA but the planning process itself needs to be continuous.
- *Public participation*: However difficult, involvement of the public is vital to the success of an MPA. The public needs to be included not only at the formation of the MPA, but also in its day-to-day running (for example, through involvement of an advisory council). MPA management needs to invest in the public, e.g., through educational programs that include basic design and management principles.
- *Science as the basis*: Science needs to be the basis of an MPA's design and development. Education is important for ensuring that the science is shared with the public, and that everyone involved with the MPA, including boat drivers, etc., are educators.
- *Ecosystem-based management*: This is not a new idea, but it is important to recognize that people within the ecosystem are being managed, not the ecosystem
- *Needs of the area*: To get people more involved and supportive of the larger environmental goals of the MPA, it needs to address their interests, which can include maritime heritage. Given the intense competition for people's attention, ways need to be found to connect people with the MPA and give it value in their eyes.
- *Socio-economics*: Managing for metrics based solely on indices such as profitability and customer satisfaction may lead MPA managers to miss the mark on larger issues that are central to their mission. Although those metrics need to be addressed (to avoid the loss of funding and other forms of support), it is important to keep the larger issues in sight as well.
- *Use MPAs to address larger environmental issues*: MPAs can and should be used as tools in the global battle to change human behavior and resolve environmental issues. Keeping this in mind will affect how MPA managers interact with the public.
- *The importance of marine mammals*: There is a special connection between marine mammals and humans that does not necessarily exist between fish and humans. Managers of MMPAs should not only work toward the protection of marine mammals, but also use that special connection to advance the conservation of other natural species and environmental features for which such a connection is lacking or less direct.

The following suggestions are meant to help address the management challenges in MPAs:

- Establish advisory councils.
- Ensure that management plans include high-profile events and activities (likely to attract film and other media interest) in order to create energy and harness public enthusiasm.
- Avoid focusing only on the animals and include an emphasis on the relationships between humans and marine mammals. If possible, let people get close to the animals so that they (the animals) can "speak for themselves".
- Tell stories as metaphors for the relationships between marine mammals and humans.
- Maximize connectivity and use new tools of influence, such as Google Oceans.
- Establish partnerships to cultivate relationships, especially with the zoo and aquarium network.
- Be creative in how management plans are developed and in what they contain (i.e., try to "think outside of the box"). Use advisory councils and other outreach tools to build support, including from major corporate donors.

Given the challenges that we all face, time is of the essence. The stories of how marine mammals stand to be affected by climate change needs to be told, and articulation of the links with other topical issues (e.g., networking, economy, culture) can give momentum to an MPA's educational efforts.

How MPAs have been managed for marine mammals: what can we learn from a case study of the vaquita?

Lorenzo Rojas-Bracho, Armando Jaramillo-Legorreta, and Tim Gerrodette

Bycatch in fisheries is the main risk factor for small cetaceans. It has been estimated that hundreds of thousands are killed annually in fishing gear worldwide. The bycatch threat is commonly cited as a principal rationale for establishing protected areas for cetaceans. However, the baiji has gone extinct and the vaquita has become critically endangered in spite of protected area designations intended to protect them from bycatch. Several other species and populations of small cetaceans are threatened by bycatch in different areas of the world: e.g., finless porpoises (China, Southeast Asia, Indian Ocean), Irrawaddy dolphins (Southeast Asia, South Asia), franciscanas (Argentina, Uruguay, Brazil), Hector's dolphins (New Zealand), Commerson's dolphins (Argentina), harbor porpoises (Baltic Sea, Black Sea), botos (Amazon basin), and susus (South Asia). All too often, MPAs exist only on paper, and the list of threatened populations seems to be increasing in several places.

The vaquita provides a case study that may be instructive for scientists and managers who are thinking about how, and how not, to use MPAs to manage marine mammal bycatch. Only about 150 vaquitas are thought to remain, which may mean that considerably fewer than ten new individuals are recruited into the population each year. The vaquita is unquestionably on the brink of extinction. Two MPAs have been designated to protect it. The Biosphere Reserve of the Upper Gulf of California was established in 1993 with a nuclear zone where fishing was prohibited in order to protect

vaquitas. However, in 2005, after it had been demonstrated scientifically that most of the habitat occupied by vaquitas was outside the nuclear zone of the reserve, a new MPA was created to restrict fishing inside the polygon containing most of the sightings. This is called the Wildlife Refuge Area for Vaquita. Given the species' extremely limited distribution, it is reasonable to ask why it was necessary to create two different MPAs for the vaquita's protection.

Some of the explanation lies in the inadequacy of data. During the 1970s and 1980s, data on bycatch locations were sparse and ambiguous, and survey coverage was inadequate to provide a definitive characterization of the vaquita's distribution. This led to the erroneous belief that protective measures in the nuclear zone of the biosphere reserve would reduce vaquita bycatch significantly. Once all available records had been compiled and examined for the period 1972-1992, it was revealed that there were no confirmed sightings of vaquitas inside the nuclear zone; also, some sightings had been entirely outside the reserve's boundaries (i.e., even outside the buffer zone). The situation, then, in the late 1990s and early 2000s was that we had a nuclear zone where gillnetting was not allowed but vaquitas *were not* present, and a buffer zone where gillnetting was allowed and vaquitas *were* present. The biosphere reserve therefore offered no prospect of eliminating the vaquita bycatch even though the best scientific advice was that such elimination was needed.

After what can only be described as a long, divisive, and painful campaign, a refuge now exists that encompasses about 80% of the sighting locations of vaquitas seen during a large-scale cruise in 1997. A massive, multi-million dollar program is underway to eliminate gillnets from this refuge (using buy-outs, switch-outs, rent-outs, and fisherman compensation schemes), achieve enforcement and transparency, develop new fishing methods that will not cause vaquita bycatch, and assist fishermen in finding alternative livelihoods.

Possible lessons learned from the vaquita experience:

- In the face of resistance to MPA designation, it can help to marshal scientific advice from an independent body (in this case it was the International Committee for the Recovery of the Vaquita).
- All available data should be compiled and considered to determine a course of action, but only if appropriate attention is paid to the uncertainty associated with such data (a Bayesian approach is well suited to this as it allows comprehensive integration of information with uncertainty).
- A historical perspective is fundamental, and all relevant records (e.g., administrative reports, field notes, interviews) should be consulted in developing it.
- Once they have been negotiated with stakeholders, it becomes very difficult to change zonation decisions, boundaries, and other controversial aspects of an MPA.
- Nevertheless, it is important to be creative and remain open to fresh approaches (e.g., multiple nuclear zones).
- The importance of maintaining detailed records of human activities (e.g., fishing effort, number of vessels and nets, permit statistics [number, by type], fishing

areas) cannot be overstated; these have been central in trying to devise effective vaquita bycatch reduction strategies.
- Unless and until fisheries are brought under credible, enforceable management, it will be very difficult to succeed with such things as buy-outs, rent-outs, or compensation schemes.

The Pelagos Sanctuary hanging in the balance: will it be a beacon for Mediterranean protection or a failed park?
Giuseppe Notarbartolo di Sciara

The Pelagos Sanctuary, declared in 2002 by France, Italy, and Monaco to protect marine mammals in the northwestern Mediterranean Sea, was initially acclaimed as the world's first high-seas MPA. Encompassing the Ligurian Sea permanent front, it was designed to protect the critical habitat of eight cetacean species regularly found in the region. Fifteen percent of the surface area of the sanctuary is in internal waters of France, Italy, and Monaco; 32% is in territorial waters of those states; and 53% lies in what are considered the Mediterranean high seas. The sanctuary achieved listing as a Specially Protected Area of Mediterranean Importance (SPAMI) in 2001 under the auspices of the Barcelona Convention, thus benefiting from a regional protection framework. Nevertheless, in spite of its potential for stimulating the growth of place-based conservation in Mediterranean waters and its significance as the first element in an anticipated representative network of regional high-seas MPAs, in the seven years since its establishment the Pelagos Sanctuary has failed to fulfill its promise of significantly improving the conservation status of the region's cetacean populations.

A successful outcome for this sanctuary would require, among other things, the creation of highly protected conservation zones, channeling the area's intense maritime traffic along established corridors, and systematically addressing fishery impacts on cetaceans. There was, and still is, reason to expect Pelagos to provide leadership in the creation of a regional network of protected areas for marine mammals. Specifically, it could, for example, participate actively in the current effort by the regional seas organization, UNEP's Mediterranean Action Plan, to establish a network of high-seas MPAs, in cooperation with the European Commission, applying SPAMI criteria combined with those recently elaborated under the Convention on Biological Diversity.
The sanctuary's failures are not a reflection of lack of competence or dedication on the part of individuals involved. Rather, they reflect the management structure (the Agreement's Secretariat), which is powerless, vague about roles and responsibilities, and unable to function as a surrogate management body. In order to retain its crucial status as a SPAMI, the Pelagos Sanctuary must comply with the requirement of having "a management body, endowed with sufficient powers as well as means and human resources to prevent and/or control activities likely to be contrary to the aims of the protected area" (SPA Protocol, Annex I, D.6). To date, the three signatories of the Pelagos Agreement have resisted the pressure for them to fulfill that requirement.

Deletion of the Pelagos Sanctuary from the SPAMI list would be a serious setback and could, in fact, lead to its demise. Even if it retains its regional status, however, the fact that Pelagos is deprived of the basic tools needed for it to function prevents it from achieving its founding goals. This situation seems counter to the reason for the

sanctuary's very existence and leads one to question why it was created in the first place. Therefore, it is urgent that (a) the political will to make Pelagos a functioning MPA be rekindled, (b) a legal basis (e.g., a protocol to the agreement) for the creation of a proper management body be laid down, and (c) serious management action be taken to demonstrate that the parties mean it to be more than a mere paper-park.

Conservation of the critically endangered Mediterranean monk seal in Greece: achievements, drawbacks, and potential of an MPA network
Spyros Kotomatas

The Mediterranean monk seal, with a total global population of no more than about 600 individuals, is one of the most critically endangered marine mammals. The species has disappeared from most of its original range and today is found in small, isolated populations in the Cabo Blanco Peninsula in Northwest Africa, parts of Madeira, and the eastern Mediterranean Sea. Greece presently hosts the largest population of the species, estimated at between 250-300 individuals occurring in several scattered breeding groups throughout its 15,000 km of coastline and 3,000 islands. The long list of threats in Greece include the deliberate killing of seals (mainly by fishermen), entanglement in fishing gear, increasing and unregulated tourism development in coastal areas, boat traffic, pollution, and prey depletion. These are in addition to "natural" threats from disease, catastrophic events (storms etc.), and climate change.

In Greece, a comprehensive national conservation strategy (led by MOm) has been applied over the last two decades. This strategy has a number of key elements apart from MPA designations, *per se*. These include lobbying efforts aimed at improving national and European policies, habitat protection, basic research on the species' biology and ecology, rescue and rehabilitation of injured, orphaned, or sick animals, addressing the seal-fisheries conflict, and public awareness and education campaigns. The focus has been on limiting human disturbance and persecution, as well as preventing further fragmentation, deterioration, and loss of suitable habitat.

Designation studies for 11 potential protected-area sites were completed in the 1980s and 1990s, and in 1992 the National Marine Park of Alonnisos Northern Sporades was established (having first been proposed in 1985). This was followed by designation of the Karpathos MPA in 2009 (proposed in 2000). Among the ongoing challenges are that: (1) data on the status of monk seals and their habitat are limited, (2) national authorities lack experience in MPA design, planning, and management, (3) numerous government agencies are involved in the designation process, (4) designation studies take, on average, 4-7 years to complete, (5) initially at least, the attitude of locals tends to be negative, and (6) an effective participatory process is usually lacking. Greece implemented legislation for protected area (PA) management in 2000, and management bodies were created in 2003 for 27 PAs, of which three were MPAs, two of them specifically for monk seals. A proposal by NGOs for the structure of such management bodies was accepted, and as a result they participate on the boards, but with minority status. Among the challenges have been that MPA managers lack experience and training, there are no management plans or means of evaluating effectiveness, local and national politics exert strong influence on management board membership and financing, funds tend to be directed

toward infrastructure rather than "hands-on" management, and governmental (including EC) funding has been very limited.

The National Marine Park of Alonnisos Northern Sporades provides a sobering example of how difficult it can be to create and maintain an effective MPA for monk seals in Greece. A "pilot" guard system set up in 1993 involved private guards supplied by MOm, port police, and officers from the Ministry of Environment. Illegal activities diminished, and local fishermen gradually came to respect the rules. With this success, similar systems were designed for two more areas. However, enforcement depended on a long, complex judicial process that was out of proportion to the low fines. There was local opposition initially due to fear of a decline in tourism. Moreoer, the program was expensive, and stable government support was lacking. Upon the establishment of a management body for the Marine Park of Alonnisos in 2003, the existing guard system stopped functioning. Even though guarding resumed in 2007, the management body has continued to encounter problems, including strong opposition from the local community.

Monk seals in Greece tend to occur in areas with small, isolated, relatively undeveloped island communities, where local people view nature conservation as an obstacle to tourism development. In fact, it appears difficult to reconcile monk seal protection with increased tourism; the seals are generally inaccessible to the public, and this makes it difficult to promote seal watching as "ecotourism." Public education and awareness is especially challenging under these circumstances. MOm has managed to establish and operate information centers and to conduct environmental education programs at key monk seal sites; it uses rehabilitation centers for outreach as well. Despite the challenges, there is a strong and growing community of individuals in Greece who are determined to see monk seals recover, and who are eager to maintain close links and share ideas with monk seal researchers and conservationists in both neighboring and distant countries.

Monk seals in Madeira: mitigating the impacts of fisheries
Rosa Pires

Historically (from at least the early 1400s), the now critically endangered monk seal was abundant on Madeira Island – the main island of the archipelago. By 1988, only 6-8 seals remained, and they were restricted to the uninhabited Desertas Islands, also part of the Madeira archipelago. Direct hunting had been the main factor responsible for the historical decline of monk seals, and, more recently, negative interactions between seals and fishermen have been an important factor inhibiting their recovery. Before protective measures were implemented, the seals died accidentally in nets and from illegal explosives, and fishermen killed seals intentionally because they regarded them as pests.

Currently, the monk seal population in the Desertas is increasing, thanks to an active conservation program implemented by the Parque Natural da Madeira. Conservation measures include (a) strictly enforced prohibitions on potentially harmful human activities in portions of the islands inhabited by monk seals and (b) aggressive habitat protection. These active conservation efforts are supported by scientific research and public awareness programs. The current seal population on the Desertas is estimated at about 35 individuals. There are signs that monk seals are slowly beginning to re-colonize

Madeira Island, likely due at least in part to the growth and expansion of the colony at the Desertas. The inevitable interactions with fishermen in waters around Madeira Island represent a new and emerging challenge for managers. The success of measures implemented at the Desertas should be helpful in guiding the management response at Madeira.

Incorporating underwater noise concerns into MPA design and management
Lindy Weilgart

Well-managed protected areas can be effective tools for protecting cetaceans and their habitat from the cumulative and synergistic impacts of noise and other anthropogenic stressors. Noise is a transboundary pollutant capable of affecting vast areas and whole ecosystems. Documented responses of cetaceans to human-generated underwater sound include cessation of vocalizations, reduced foraging, abandonment of habitat, and stress. In some circumstances, exposure to noise can even lead to death. The most significant sources of anthropogenic sound in the marine environment are underwater explosions, seismic surveys used to find and characterize oil and gas deposits, shipping, naval sonar, and oceanographic experiments.

Very few existing MPAs that contain cetacean habitat are large enough to confer substantial protection from some noise sources. Spatio-temporal restrictions have been implemented in some areas to address concerns about specific noise sources. Especially in the case of MPAs inhabited by noise-sensitive cetacean species engaged in critical behavior such as feeding or breeding, and which are presently threatened by noise or are expected to be in the future, managers should incorporate noise considerations into their management plans through, for example, the use of buffer zones. International or national (EEZ) cetacean sanctuaries, or areas without formal protection, could add noise-related spatio-temporal restrictions to their array of protection measures. Diversion of shipping lanes or limits on ship speed also may reduce the exposure of cetaceans to noise. Long-term visual and passive acoustic monitoring of cetaceans, and acoustic monitoring of noise levels, are particularly important in MPAs. Passive acoustic monitoring can be a cost-effective means to detect trends in cetacean distribution and noise levels, to study the impacts of noise on cetaceans, to correlate noise levels with population and ecosystem health, and to assist in enforcement and compliance. Management for noise should include the cumulative, long-term effects of noise, as well as interactions with other stressors on marine mammals.

Southern Right Whale Environmental Protection Area
Maria Elizabeth Carvalho da Rocha

The Southern Right Whale Environmental Protection Area (EPA) in southern Brazil is managed through a participatory process involving government agencies, NGOs, traditional communities, researchers, private businesses, and interested individuals. This process is run by a Council, which was established in 2005 under Brazilian legislation regarding National Protected Areas. There is an emphasis on public education and capacity building in order to address and mediate conflict and create consensus. Equitable distribution of costs and benefits among stakeholders is a key principle. In this

context, environmental education is considered an ideological and political act based on values for social transformation.

The Council meets in plenary four times per year to discuss and decide on aspects of management, while various technical committees and special working groups carry on their work throughout the year. Tourism, including whale watching, is a major topic of discussion and decision-making. Several other types of human activity are also permitted inside this EPA and are therefore subject to oversight by the Brazilian Government (ICMBio/MMA) and civil society. The reconciliation of economic development and nature conservation through a process involving transparency and broad-based public participation is the greatest challenge for this MPA, as it is for many others.

What is the role of culture (indigenous, historical, modern) in managing MPAs?
Nikolai Pavlov

Although the Commander Islands are viewed in popular culture as an area inhabited by indigenous Aleuts, the historical record indicates that Aleuts were relocated from the Aleutians to the Commanders by Russians in the 19th century, with the expectation that they would assist in the commercial exploitation of the region's marine mammals for fur and oil. Today, some 300 Aleuts (out of approximately 750 inhabitants all told) live on Bering Island, where they subsist in part through hunting marine mammals. The Commander Islands State Nature Reserve was established in 1993. Despite efforts at the time to ensure that all pre-existing access and activities on the part of the Aleuts would be duly protected, local residents resisted the designation of the reserve and viewed it as a hindrance and a threat to their livelihoods and welfare. However, since the site was designated as a Biosphere Reserve in 2002, the stage has been set for the reserve to play a more constructive and positive role in the socio-economic life of the Aleuts.

Current policy in Kamchatka is to promote the region's commercial fishing and recreational (tourism) potential. The Commander Islands attract foreign and Russian tourists because of their large, diverse marine mammal populations and bird colonies as well as the famous gravesites of Vitus Bering and his exploration team members. Efforts are underway to address misconceptions and demonstrate the potential economic value of the reserve to local communities. For example, indigenous cultural practices (such as dances) have been integrated into tourism activities. As a Nature Reserve, this MPA has the dual responsibility of preserving aspects of the islands' heritage while also supporting the socio-economic development of the local people.

Sister sanctuary: core of marine mammal protected areas beyond borders – an innovative management tool for transboundary species
Nathalie Ward and Craig MacDonald

A "sister-sanctuary" relationship was established in 2006 between Stellwagen Bank National Marine Sanctuary (SBNMS) and Santuario de Mamíferos Marinos de la República Dominicana (SMMRD), marking a new chapter in the multilateral management of threats to North Atlantic humpback whales. The "Santuarios Hermanos" is the first bilateral agreement to protect a migratory cetacean species at both ends of its range – in a high-latitude feeding and nursery area (SBNMS) and a lower-

latitude mating and calving area (SMMRD). The agreement facilitates an ecosystem-based approach to cooperative sanctuary management through capacity building, research, monitoring, and education. It is hoped that this sister-sanctuary model will increase national and international awareness of the importance of recognizing ecological links between protected areas and establish the value of, and indeed the feasibility of, transboundary, multilateral approaches to species conservation.

Awareness of marine mammals and their habitat in the Caribbean Sea and Gulf of Mexico has increased rapidly during the past two decades, and the sister-sanctuary concept is part of a larger global vision of MMPAs. UNEP's Specially Protected Areas and Wildlife program recently (September 2008) adopted the Marine Mammal Action Plan for the Wider Caribbean Region, which assigns a high priority to management regimes (such as sister sanctuaries) that maintain ecological connections between MPAs in order to satisfy the requirements of species and populations and to promote protection for transboundary resources. This type of initiative reflects the true spirit of regional cooperation.

Dominican Republic Marine Mammal Sanctuary: a hope for the recovery of the humpback whale
Idelisa Bonnelly de Calventi

Whales have long been known to visit the coastal waters of the Dominican Republic, especially Samaná Bay, where concentrations of humpback whales were reported prior to the 19th century. There is no whale hunting tradition on Hispaniola, and foreign commercial whaling from ships apparently was never intensive in these waters either. The Humpback Whale Silver Bank Sanctuary (Santuario de Mamíferos Marinos de la República Dominicana, SMMRD) was established in 1986 off the north coast, and expanded in 1996 to include two breeding areas covering a total of 19,438 nmi^2. The offshore banks – Silver, Christmas, and Mouchoir – host the largest breeding concentration of humpback whales in the North Atlantic (2,000-3,000 individuals), and they come from all of the known high-latitude North Atlantic feeding grounds. Research started at Silver Bank in 1975 and later included the YONAH (1992-1993) and MONAH (2004-2005) projects, addressing basic questions concerning population structure, abundance, rate of increase, and migratory movements. Current research includes satellite tagging to determine residency and movement patterns throughout a season, analysis of humpback song patterns, and assessment of behavioral effects from cruise ship noise.

The SMMRD is part of the National Protected Area System administered by the Secretary of Environment (SEMARENA). A whale watching industry that began in 1985 now attracts some 26,000 tourists each season. It is managed by a committee of public and private institutions and non-profit organizations. The Sister Sanctuary Action Plan (2008) under the 2006 Sister Sanctuary Agreement between SMMRD and Stellwagen Bank National Marine Sanctuary includes projects that involve training, research, tourism, pollution abatement, and evaluation of the impacts of human activities on whales. Further collaborative efforts are anticipated in the future. The recent grounding of a cargo vessel (M/V *Dunlin Arrow*) demonstrates the need to develop a rigorous oil spill response protocol.

The Micronesia Conservation Trust
Lisa Ranahan Andon

The Micronesia Conservation Trust was established in 2002 as a not-for-profit financial institution incorporated in the Federated States of Micronesia (FSM) and serving the Micronesia region, which includes the FSM, Republic of Palau, Republic of the Marshall Islands, U.S. Territory of Guam, and Commonwealth of the Northern Marianas Islands. The trust provides long-term, sustained funding (through grants), coordination, capacity building, and technical assistance for biodiversity conservation and related sustainable development in the region. Among other roles, it serves as coordinator and regional host of NOAA's Pacific Islands MPA Community Program and as marine sub-regional coordinator of IUCN's World Commission on Protected Areas, and participates in the Micronesians in Conservation Learning Network. Approximately 80% of the trust's revenue is re-granted for project work, while the remainder covers administration and overhead costs. Among the projects and initiatives supported are management plan development and capacity building for MPAs. It provides administrative support for, and serves on the regional steering committee of, the Global Environment Facility and Pacific Environment Fund Small Grants Program, which contributes approximately a million US dollars annually in grants to local organizations and communities.

The trust was selected in 2006 to serve as the financial mechanism for the Micronesia Challenge, a regional initiative announced by the heads of state of Palau, FSM, Marshall Islands, Guam, and the Northern Marianas Islands, pledging to achieve targets of at least 30% of near-shore marine resources and at least 20% of terrestrial resources being under effective conservation by the year 2020. Protected area networks, including MPAs, in each of the five Micronesia Challenge jurisdictions will serve as the primary vehicles for achieving those targets. Each jurisdiction will develop its own strategy for implementation. A coalition of international donors, local NGO partners, government agencies, and political leaders is expected to ensure that the technical, human, and financial resources needed for this endeavor are available. A much greater understanding of threats facing marine mammals in the Micronesia region will be necessary.

Several key issues have been identified. For example, the dugong population in Palau is one of the most isolated and endangered populations of that species in the world. Seagrass, which largely defines critical habitat for dugongs, must be well represented in Palau's protected area network. Also, it will be important to integrate Palau's laws and traditional rules for dugong management with any protective measures included in MPA management plans. The rapid growth of whale- and dolphin-watching tourism is another key issue. Guam currently has the largest such industry in the region, generating an estimated USD 16.2 million of total expenditure by more than 80,000 tourists in 2005. Boat tours in Guam can involve up to 500 tourists per day, raising concern about the potential impact on the animals (e.g., in resting bays) and suggesting the need for regulation of the industry. Other issues include the effects on marine species and habitat in Guam from U.S. military installations and the problem of deliberate misinformation concerning cetacean interactions with fisheries in the region (i.e., justification of whaling to protect fishery resources).

Symposium 3: Networking for the Future of MMPAs and MMPA Networks

Moderator: Tundi Agardy

Key Theme: MMPA Networks and beyond – new and visionary approaches

Summaries of Presentations:

Passing MPAs and MPA networks on the way to a brave new world
Tundi Agardy

Marine protected areas have been used in some form or another for centuries to address marine conservation issues. Unfortunately, the vast majority of MPAs are too small, overly simplistic, opportunistic in their design, ineffective in addressing some of the most serious threats, and too concentrated on protecting near-shore biomes and sessile species. Fishery management has failed frequently and spectacularly, high-seas issues are becoming ever more pressing, and coastal zone management has proven incapable of addressing threats from afar and of linking effectively with marine management. We are now at a turning point, however, where piecemeal attempts at saving species, recovering depleted populations, and protecting fragments of habitat are abandoned in favor of more holistic and integrated approaches. Tackling ocean issues at ocean basin or large marine ecosystem levels allows us to practice management at appropriate, ecosystem scales. MPAs and MPA networks are important tools for achieving this large-scale management, but they are strategic mechanisms, as opposed to ends in themselves. Networks can enable the incorporation of ecological linkages and connect people and institutions in ways that discrete MPAs cannot, and they can take advantage of economies of scale.

A rational approach to conserving and even restoring marine mammal populations is to use strictly protected areas to safeguard critical habitats such as feeding areas, breeding areas, and calving or pupping grounds. But since these areas are often separated by hundreds of kilometers, conservationists must also concern themselves with the areas between critical habitats. Identifying and then protecting migration corridors is one technique to ensure that the links between the critical habitats remain unbroken. Another is to think more broadly about the context in which these discrete islands of protection are situated. Region-scale spatial management, using comprehensive ocean zoning, can help address threats throughout an animal's home range. Considering suites of species, instead of single threatened species individually, may lead to greater precision in determining what needs to be protected and provide a stronger rationale for needed management measures.

Some marine mammals can be viewed as umbrella species. Conservation measures aimed at mitigating threats to such species are expected to result in protection for whole communities of organisms, and indeed whole ecosystems. In light of this, investments in the conservation of marine mammals would represent investments in the preservation of marine biodiversity and maintenance of ocean health. But this can only be true if the

threats are adequately understood and management is tailored to address the threats. Regulations within MPAs, within networks, and in the buffer areas in-between must be designed in relation to threats. As we enter the brave new world of comprehensive ocean zoning, we will do well to keep our focus on threats, and not revert to cookie-cutter MPAs in the hope that they will solve all of our conservation problems.

Dynamic habitats and ephemeral features as critical parts for MPA networks
David Hyrenbach

A major challenge in MPA design is to accommodate diverse oceanic habitats (static, persistent, or ephemeral) that are critical for marine mammals and their food webs, which requires spatially explicit marine zoning and conservation. Upper trophic-level oceanic predators make their living in a vast, dynamic, and heterogeneous environment although at any one time they may be concentrated within relatively small-scale foraging areas of only tens or hundreds of square kilometers. They respond to changes in water mass, productivity, and prey availability. In principle, MPAs could, and should, be designed to protect "predictable" concentrations of predators. Size alone will not necessarily accomplish this. Rather, it may require scale-explicit management and the incorporation of dynamic metrics.

In considering such design and to identify aggregations or hotspots, it is necessary to examine spatial and temporal (seasonal and annual) variability. This requires one to address a hierarchy of scales, from the species to the population to the individual level. Hotspot definitions may reflect this, as follows:

- Species hotspot: foraging ground or migratory route.
- Food web hotspot: defined by energy transfer to predators –
  - Standing stock or aggregation.
  - Indicator species with high energetic requirements (e.g., alcids, balaenopterid whales).
- Ecosystem hotspot: locality of high biodiversity –
  - Ecotone or "transition zone".
  - Area of high species richness and diversity.

Spatial scaling in seabirds can range from ocean productivity (macro-scale analysis of standing stocks over thousands of kilometers) to water mass distributions (meso-scale analysis of community structure over hundreds of kilometers) to prey availability and concentration (coarse-scale analysis of abundance over tens of kilometers). One approach to analysis is to use all available data to establish the presence or absence of a species, then use the presence-only subset of the data to explore where and when high abundance (concentration) of the species occurs. The entire species range might be appropriate for diffuse management measures (e.g., limits on types of gear or fishing practices) and monitoring, while concentrations are used for focused management (e.g., MPAs and spatio-temporal fishing closures).

Seabirds provide instructive examples. The Balearic shearwater occurs over shallow and productive shelves with low bottom relief and high concentrations of chlorophyll-a. The

spatial extent of such "habitat" varies from year to year and can be defined probabilistically. For other seabird species, dynamic management measures can be developed using cross-correlations with environmental conditions. For example, sooty shearwaters *avoid* warming and black-vented shearwaters *follow* warming. Antecedent conditions can be measured directly or inferred from remote-forcing indices such as sea surface temperature and Pacific Decadal Oscillation. An applied example is the January and August closures of drift gillnetting off southern California during El Niño years in order to mitigate bycatch of loggerhead turtles.

Insights from rezoning the Great Barrier Reef Marine Park – lessons for the development of MMPAs
Kirstin Dobbs and Jon Day

Australia's Great Barrier Reef Marine Park extends nearly 250 km offshore and spans more than 14º of latitude. It is zoned in a complex manner to accommodate multiple uses. The Marine Park Authority's Representative Areas Program has provided an opportunity to increase the resilience of the Great Barrier Reef to current and future activities that may have impacts on the ecosystem. The program is aimed at protecting the reef's biodiversity by protecting "representative" examples of all of the different habitats and communities in the park. The program is guided by the following key biophysical principles:

- Minimum area size should be 20 km across if possible.
- The larger, the better.
- Replicate no-take areas within bioregions to reduce risk.
- Avoid "split-zoning" of reefs if possible.
- Minimum of 20% of each bioregion to be protected, including both reef and non-reef habitat.
- Consider cross-shelf and latitudinal diversity.
- Include examples of all community types and physical environments.
- Consider connectivity.
- Consider special and unique sites or locations.
- Consider adjacent uses.

The habitats of iconic marine species (e.g., foraging areas and nesting sites) have been incorporated into the identification process for a new network of no-take areas, which includes about 30 known major turtle nesting and foraging sites and more than 40% of all high-priority dugong habitat. Special or unique sites include the lagoon waters west of Ribbon Reefs where dwarf minke whales are found regularly and the waters surrounding the Whitsunday Islands where humpback whales calve and whale watching is prohibited. There are special regulations to manage swimming with dwarf minke whales; it is allowed only in a specific location and permits are limited.

Less than 5% of the total area of the park was zoned as "no take" for the first 28 years, but with rezoning in 2004 it increased to more than 33%. The success of the rezoning effort can be attributed to reliance on the best available scientific knowledge, a high level of public participation, effective leadership, and consequently strong socio-political support. Among the "lessons learned" are that, especially when considering highly

migratory species, a multi-layered approach is often appropriate: special management areas may be needed (in addition to zoning) so that specific controls can be imposed on a case-by-case basis (e.g., reducing whale-vessel interactions); individual agreements may need to be made with users (e.g., in the case of subsistence hunting of marine turtles and dugongs); and international cooperation (e.g., IWC) may be relevant.

Promoting the Conservation Status of Large Whales: MPAs
Doug DeMaster and Robert L. Brownell, Jr.

Throughout the world's oceans, the 13 currently recognized species of large whales occur in more than 100 separate populations. Individual whales from more than 50 of those populations are reported to have been taken as bycatch in commercial fisheries. Unfortunately, the impacts of fishery bycatch on most whale populations are unknown, but for at least three populations the impact is known to be significant: (1) "J stock" of common minke whales in the western North Pacific, (2) western North Pacific gray whales, and (3) western North Atlantic right whales. From a conservation perspective, promoting the recovery of these populations depends at least partly on mitigating bycatch.

Considerable effort is underway to address the threat of bycatch to North Atlantic right whales, including the establishment of MPAs and restrictions on fishing. However, the bycatch threat to both western gray whales and J-stock minke whales remains largely unmitigated. For minke whales, reported bycatch in the western North Pacific has increased from very low levels in the early 1980s to more than 200 whales per year since 2001. In waters off Korea, all bycaught minke whales are likely to be J-stock animals, and off Japan, a significant fraction of the bycaught animals are likely to be from J stock. If the current annual level of removals is maintained, the population of J-stock minke whales will be extirpated in less than 50 years.

While reported bycatch of gray whales in the western North Pacific is limited to waters off Japan, there is an urgent need to eliminate any bycatch of these gray whales because of their critically endangered status. For J-stock minke whales, as noted above, bycatch rates, along with other types of anthropogenic removals, must be reduced significantly for the population to recover. Where seasonal restrictions on commercial fishing or modifications of fishing gear or practices are not effective, complete closures to those gear types that entangle either species (e.g., no-use MPAs) should be established in key areas.

Panel 1: Marine Mammal Research within MPAs and the Link to Networking

Convener and coordinator: David Mattila
Rapporteur: Jeff Walters

Objectives:

The focus of this panel was on how research contributes to the design, management, and adaptation of marine mammal protected areas. Case studies were presented from a range of locations and species and they involved a variety of methods, from high-tech and expensive to low-tech, simple, and relatively inexpensive. New, innovative research tools or approaches were to be highlighted, with the expectation that this might help ensure that they are more widely used. In keeping with the theme of the conference, panelists were encouraged to address the issues of linkages and networks, e.g., to identify aspects held in common, such as species, populations, research challenges, or management issues.

The following questions were posed as a basis for discussion:

- How does the research address key issues for managers, such as
  - Definition of critical habitat;
  - Monitoring animal health and population trends;
  - Identification and mitigation of primary threats;
  - Cost-effectiveness of the approach and its transferability to other MPAs, including those with limited resources?
- Does the research help identify areas outside the current MPA that deserve consideration in reassessment (and even reconfiguration) of the existing boundaries, or does it confirm that the existing boundaries (which may have been established based on less definitive data) are appropriate?
- Does the research help identify other MPAs for the species or population, thus illuminating linkages and suggesting the potential value of a network?

Summary of Findings:

Scientific understanding is generally regarded as essential to the establishment and management of protected areas. Although such understanding often comes from active science programs, it can also come from appropriately trained and motivated vessel operators, divers, and other stakeholders. Stakeholder involvement in research can mean gathering baseline data, contributing to monitoring programs, helping develop science-based management plans, or simply giving advice.

A common theme among the geographically and topically diverse case studies was the need to link stakeholders, the public, scientists, and decision-making authorities. Public and government support for MPAs depends on the effective transfer of knowledge and awareness through linked research and education programs. Participants reported that

they were encouraged by the evident willingness, even eagerness, of some authorities to use science in the design and management of protected areas. In some cases, however, funding constraints were regarded as having prevented the completion of science projects and slowed the designation of protected areas where the results of those projects could have been applied.

Spatial modeling, along with field verification from surveys, can be a powerful tool to justify and promote new protected areas and to guide the redesign, expansion, and management of existing ones. Such modeling can characterize and predict the distribution and behavior of marine mammals and their prey and illuminate threats (e.g., vessel traffic, tourism, fishing). It can also be an important component of monitoring.

Despite the progress in scientific understanding demonstrated by the case studies, large gaps remain, and the scientific underpinnings of most MMPAs are still far from adequate. Even where ongoing programs are in place, researchers and managers struggle against funding limitations to maintain time series and develop or refine conservation measures. The need to form partnerships to achieve success and continuity was a common theme, as exemplified by the technologically innovative but complex studies of whales and their prey in Stellwagen Bank National Marine Sanctuary and by the geographically broad-scale SPLASH study of humpback whales in the entire North Pacific. The SPLASH project produced new insights on whale entanglement, seasonal migrations, and breeding and feeding habitat and extended knowledge of the distribution and abundance of humpback whales to poorly studied countries and territories.

Summaries of Presentations:

Hector's dolphins: research on the effectiveness of MPAs
Liz Slooten

New Zealand's Banks Peninsula Marine Mammal Sanctuary was established in 1988 in response to research showing that unsustainable numbers of Hector's dolphins were being caught in fishing gear in this area. A second protected area was created in 2001, this time under the Fisheries Act rather than as a marine mammal sanctuary under the Marine Mammal Protection Act. While gillnetting is banned in both of these protected areas, other fishing methods (e.g., fish traps, line fishing) are permitted. This benefits not only Hector's dolphin and other dolphin species, but also seabirds and non-target fish that are caught in gillnets.

Research in the two protected areas since 1988 has included line-transect surveys, acoustic monitoring, photographic identification (to estimate survival, reproductive rate, and movements), necropsies of dolphins found dead ashore or caught in fishing gear, and population viability analysis. Although survival rates of Hector's dolphins have increased since the Banks Peninsula sanctuary was created, the local population is still believed to be declining. A series of surveys carried out over three summers and three winters helps to explain why. In summer, about 80% of the dolphins are inside the 4 nmi sanctuary boundary and protected, but in winter this drops to about 45%. Since the dolphins occur in water depths of up to 100 m, their range extends to about 20 nmi offshore, i.e., well beyond the 4 nmi sanctuary boundary. Acoustic surveys have been

used to study smaller-scale habitat use, including the extent to which dolphins overlap with gillnets which are allowed to be used inside harbors in both protected areas. Twelve months of acoustic monitoring of Akaroa Harbour showed Hector's dolphins to be present on 41% of the days at the time of year when gillnets are legal. This helps explain the eight reported catches of dolphins inside the sanctuary during 1995-2005. Our research approach was to estimate the sizes of protected areas needed to achieve sustainable dolphin populations rather than to identify "critical" areas for the animals or areas with the greatest overlap between dolphins and certain types of fishing gear. This is partly because fisheries are relatively mobile and past protection measures had resulted in substantial displacement of fishing effort to adjacent unprotected areas with relatively high dolphin densities.

New protection measures announced by the Minister of Fisheries in 2008 are a major improvement. In addition, the Minister of Conservation created three new marine mammal sanctuaries. In these and the two existing protected areas, seismic exploration and mining will be regulated, but fishing restrictions are no longer part of the sanctuary regulations. This new package of protection measures is likely to mean that Hector's dolphin numbers will, at best, remain stable or, at worst, continue to decline. By comparison, without fishery bycatch the populations would be expected to recover to approximately half of their original levels in less than 40 years. Under the new protection measures, this is expected to take more than 1,000 years.

Scientific innovation at the Stellwagen Bank National Marine Sanctuary
Leila Hatch

Stellwagen Bank National Marine Sanctuary provides feeding and nursery habitat for numerous cetacean species, including humpback, right, sei, and fin whales. Situated in the middle of Massachusetts Bay, the sanctuary is heavily used for commerce and recreation; it is sometimes regarded as an "urbanized" MPA. Meeting the protection and management objectives of the sanctuary requires a good understanding of large whale behavior and habitat use, information about the spatial and temporal characteristics of human activity in the region, and mechanisms for assessing the effects of human activities on whales in sanctuary waters.

Low-frequency acoustic data are being used to address multiple questions regarding the locations, movements, and behavior of vocally active species in the sanctuary, and to assess the potential for hearing loss and masking of those animals' sounds. State-of-the-art multi-sensor tags and custom visualization software make it possible to examine the behavior of individual whales, including foraging behavior and responses to vessels. Ship tracking data allow researchers to characterize patterns of commercial traffic in the sanctuary and, when integrated with acoustic data, to estimate the "acoustic footprints" of vessels within the frequency ranges used by whales for communication. By integrating empirical noise measurements, ship tracks, and data from tagged whales, water-column sampling, bottom mapping and surface buoys, it is possible to examine whale behavior and distribution in relation to variation in the physical and ecological environment.

Northern bottlenose whale research in the Gully, eastern Canada
Sascha Hooker

Much of the recent research on northern bottlenose whales in the Gully was conducted while the area was under consideration to become Canada's first offshore Atlantic MPA. Therefore, many of the findings were incorporated into recommendations related to designation and design of that MPA.

The whales are present year-round, with a suggested preference for areas of 750-1750 m water depth. This was interpreted to mean that the permanent MPA boundaries should be defined by depth. Using photographic data, it was estimated that somewhat over 160 bottlenose whales use the Gully, and about a third of that number are present at any one time. Comparative analyses of DNA from whales biopsied in the Gully and DNA from teeth of whales killed by Norwegian whalers in Davis Strait showed regional differentiation, leading to the suggestion that the whales in the Gully should be considered a separate management stock, and to the designation of the Gully population as endangered by COSEWIC (Committee on the Status of Endangered Wildlife in Canada). Suction-cup time-depth recorders attached to two whales confirmed suspicions as to this species' remarkable diving abilities and that bottlenose whales prey on benthic or bathypelagic organisms. Stable isotope and fatty acid analyses of the biopsies indicated a strong correspondence between dietary markers in bottlenose whales and adult squid (*Gonatus* sp.).

The primary production needed to support this whale population was calculated from the area used, the population size, the trophic level, and the estimated basal metabolic rate. It implied that there is a substantial spatial subsidy and therefore that protection of the whales and their habitat over a wider area may be required. Also, contaminant concentrations in biopsies collected from these whales before and after initiation of nearby drilling (major gas fields have been developed in the vicinity of the Gully) showed increases in total blubber DDTs. While this is unlikely to be associated directly with the drilling activity, it could be related to sediment remobilization, with the implication that MPA boundaries should take account of sediment processes, either via feeder canyons or headwaters.

The Gully MPA was fully designated in 2004. However, recent survey work along the 1000 m depth contour has shown that two adjacent canyons are also important to this population, with individuals moving among the three canyons. Successful risk mitigation at the population level therefore may require a network of MPAs.

New methods to identify and understand the importance of critical habitat for cetaceans in British Columbia
Rob Williams

The Robson Bight (Michael Bigg) Ecological Reserve in Johnstone Strait, British Columbia, was established in the 1980s to "protect key habitats for killer whales and prevent their harassment, while at the same time provide unique opportunities for killer whale research." The whales' behavior and habitat use have been monitored regularly since the reserve's designation. The whales at Robson Bight rub on two gravel beaches, a

behavior and cultural trait considered unique to this population. The site has been formally designated as "critical habitat" of northern resident killer whales, in recognition of both biotic (prey) and abiotic (acoustic) habitat elements.

The reserve has facilitated research on the effects of boat traffic on killer whale behavior and energetics. A cliff-top vantage site opposite the reserve allows researchers to monitor whale behavior in the presence and absence of boats. Long-term collaboration with whale watchers has made it possible to conduct several controlled exposure experiments. In addition, the reserve has prompted inexpensive, land-based studies of killer whale sociality and foraging ecology and contributed to a long-term, systematic study of boat and killer whale use of the strait. The reserve contains only 0.001% of the total range of northern resident killer whales, but on average, about 6.5% of the population visits the area on any given day. Insights from the research in Robson Bight have also been applied to endangered southern resident killer whales, which are more exposed to vessel traffic. On average, 20 vessels are present within 1 km of southern residents during daylight hours, and it has become nearly impossible to observe these whales in the absence of boats. A 3-season study of southern residents, using complex statistical modeling, concluded that they respond to boats much like northern residents, namely by adopting erratic swimming paths and reducing their foraging time.

One lesson learned from Robson Bight is that, while the reserve offers a way to manage whale watching traffic, this does not eliminate the need for careful management of human activities in adjacent waters. In August 2007, a barge carrying ~20,000 L of petroleum products sank in Robson Bight, exposing 25% of the northern resident killer whale population to diesel. Given the importance of this tiny area to a threatened whale population, it may be necessary to reconsider the somewhat modest current objectives of the reserve and also to incorporate lessons learned there in planning future protected areas for southern resident killer whales and other cetacean populations.

Spatial modeling as a tool for designing MPAs for small cetaceans in Spain
Ana Cañadas

A stepwise process has been used to select proposed MPAs in southern Spain. The premise is that effectiveness depends on three critical steps: (a) setting clear, quantified conservation objectives, (b) developing a well-supported long-term management plan to achieve the objectives, and (c) establishing a monitoring program to assess whether the conservation objectives are being met. Once the conservation objectives are agreed, the following steps (as recommended by Rod Salm and others in 2000) should be taken:

- Data collation, including both a literature search and collection of new data on the animals, human activities, and threats;
- Data analysis to determine areas with concentrations of the animals, human activities, and threats;
- Data synthesis to create maps, establish priorities for protection, and better understand spatial relationships among the animals, ecological processes, and human activities;
- Application of selection criteria to ensure objectivity in the choice of the sites, based on the objectives and the legal framework.

Spatial modeling incorporates data on the environment to predict relative density of organisms based on their preference for habitats defined by combinations of environmental covariates. It allows areas to be identified as candidate MPAs based on the best description of distribution available, as informed by features of the habitat that have been shown to be important. The spatial modeling approach represents a great improvement over approaches that rely simply on measures of animal occurrence, such as distribution maps or encounter rates. When combined with line-transect sampling (called the model-based method), spatial modeling becomes an alternative technique to conventional line-transect sampling (design-based method), suitable for estimating abundance of biological populations from surveys that have not been designed to achieve equal coverage probability. Modeling allows the identification of contiguous areas of highest predicted relative densities, and this, in turn, makes it possible to design potential MPA boundaries that incorporate predicted proportions of relative abundance. It also allows areas with apparently good habitat but few sightings due to low search effort to be identified and further explored. Models can be refitted to incorporate new sightings and additional environmental data, thereby clarifying preferences (and associated mechanisms) and exploring possible changes in habitat preferences. Reassessing the relationships between relative abundance and environmental covariates is one way to monitor MPA effectiveness.

The modeling results for bottlenose dolphins off southern Spain are based on almost two decades of data. Three new Special Areas of Conservation for bottlenose dolphins have been proposed. Also as a result of spatial modeling, other areas have been proposed for other species, including the Oceanic Area and a multi-species Specially Protected Area of Mediterranean Interest.

Panel discussions were an integral part of the ICMMPA.

Bryde's whales in Southeast Brazil – integrating research with MPA management
Mabel Augustowski

The broad continental shelf along the southeastern coast of Brazil supports a large sardine fishery, especially off the states of São Paulo and Rio de Janeiro. The many islands of the region serve as natural barriers for water circulation and contribute to the upwelling of nutrients, thus enhancing the availability of plankton for sardines. Bryde's whales feed in this region, mainly during the spring and summer. Little was known until recently by scientists, MPA managers, and the general public about the Bryde's whales of this region.

The Bryde's Whale Project developed by CEMAR began in 2001 in Laje de Santos Marine State Park, an MPA used mostly by divers about 25 mi offshore. With the cooperation and involvement of dive tour operators and using the dive boats as platforms of opportunity, data have been collected on the occurrence and behavior of Bryde's whales in all months and in areas both inside and outside the park. Also, cruises offshore to the 3,000 m isobath aboard the oceanographic vessel of the Instituto Oceanografico/Universidade de Sao Paulo have enabled observations of possible breeding behavior by Bryde's whales. Sites near coastal islands with potential for whale watching have been identified. Oil and gas development is regarded as a primary threat. Another potential threat, entanglement in commercial fishing, has yet to be evaluated.

The Bryde's Whale Project emphasizes the development and maintenance of close working relationships with local villages and cities. Also, efforts are made to ensure that team members are included on MPA advisory or management boards. The government of Sao Paulo State recently designated three new multiple-use MPAs, covering almost the entire coast from shore to depths of 25-50 m, thus encompassing much of the habitat used by Bryde's whales. A research program established to support management of these MPAs involves, at least in principle, formal links with universities and other scientific and technical institutions. The program's success will, as always, depend on adequate, sustained funding.

Understanding our waters – A proposed Protected Area Network for Cetacean Diversity in Bangladesh
Rubaiyat Mansur Mowgli

The Wildlife Conservation Society's Bangladesh Cetacean Diversity Project has conducted a wide range of research on cetaceans in estuarine, coastal, and submarine canyon waters. The results include: (1) a population estimate of Ganges and Irrawaddy dolphins in the Sundarbans mangrove forest, (2) an assessment of occurrence and distributional ecology of near-shore marine cetaceans, with abundance estimates for Irrawaddy dolphins and finless porpoises, (3) an investigation of habitat selection of freshwater-dependent cetaceans and the potential effects of declining freshwater flows and sea-level rise in waterways of the Sundarbans, (4) a study of fishing gear entanglement of Ganges River dolphins in the Sundarbans, and (5) identification of channel characteristics and locations of hotspots for freshwater-dependent cetaceans in the eastern Sundarbans.

Ongoing studies include: (1) an intensive study of the ecology and human use of hotspots for freshwater-dependent cetaceans in the Sundarbans, (2) an investigation on the abundance, movement patterns, and fishery interactions of Indo-Pacific bottlenose dolphins using photo-identification techniques, (3) a genetic study on the population structure of cetaceans in coastal and submarine canyon regions of Bangladesh, and (4) development of a mortality monitoring network among coastal gillnet fishermen. All of these research projects have been facilitated by a network of student volunteers from local universities and by the participation of captains and crews of local nature tourism vessels. The ultimate goal is to provide a strong scientific foundation for the establishment of a Protected Area Network for Cetacean Diversity in Bangladesh.

Cetacean surveys of the French Caribbean and Guiana: their implications for current and potential MMPAs
Vincent Ridoux

The aim of this study is to obtain scientific information that can be used as a basis for proposing MMPAs in the pelagic waters under French jurisdiction in the western tropical Atlantic (French Caribbean: 123 000 km²; French Guiana: 138 000 km²). It is part of a long-term effort to map marine megafauna throughout the French EEZ, which covers 11 million km² in all oceans. Standard aerial line-transect surveys covering 8400 km in the Caribbean and 7800 km in Guiana were conducted in February and October 2008, respectively, resulting in 234 cetacean and 698 seabird sightings. Seventy of the cetacean sightings (11 species) were in the Caribbean, 164 (10 species) in Guiana. The most commonly observed cetacean species were sperm and humpback whales in the Caribbean and common bottlenose and Guiana dolphins in Guiana. For seabirds, 407 sightings (12 species) were in the Caribbean, and 291 (11 species) were in Guiana.

These surveys highlighted huge differences between the two areas, with relatively high abundance of large whales and seabirds around Caribbean islands and with small delphinids the predominant cetaceans along the coast of Guiana. The spatial distribution of the most common cetacean species and of species richness for cetaceans and seabirds were examined using generalized additive models (environmental parameters: bathymetry, surface temperature, surface chlorophyll a, wind strength and divergence, sea surface height anomaly, and associated gradients) in order to identify areas of highest abundance and diversity. Estimates of dolphin abundance in Guiana were 45 960 (CV=0.24, 70 sightings) bottlenose dolphins and 2 280 (CV=0.3, 22 sightings) Guiana dolphins.

This work provides the first quantitative information on top marine predators in these areas, constituting a valuable baseline for management and conservation. The Atlantic side slope of the Caribbean region and the coastal waters of Guiana appear to be of critical importance for both marine mammals and seabirds. It is anticipated that this initial study will stimulate further cooperative research as well as conservation action at a regional level. Also, there are plans for similar investigations in the southwestern Indian Ocean and around New Caledonia and French Polynesia.

Ocean-wide, international, collaborative studies of humpback whales: rationales for MMPA participation, key findings, and the link to networking

David Mattila

The SPLASH project (Structure of Populations, Levels of Abundance and Status of Humpbacks) involved coordinated effort by approximately 400 researchers from 50 organizations who used standard photo-identification, biopsy, and body-condition imaging methods to study humpback whales in the North Pacific Ocean during three winters and two summers between 2003 and 2006. The Hawaiian Islands Humpback Whale National Marine Sanctuary was a primary driving force for this large, international, collaborative study because managers recognized that the migratory humpback population could be influenced by factors outside the sanctuary's boundaries. The project attempted to sample all known feeding and breeding grounds, and teams of researchers were deployed from existing small-scale coastal programs and as part of dedicated large-vessel surveys of previously unsurveyed historical habitat, often in remote, offshore waters. More than 10,000 individual humpbacks were identified using images of the color pattern on the undersides of their flukes, and more than 5,600 biopsies were collected for sex determination and genetic, toxin, stable isotope, and fatty acid analyses. In addition, images of flanks and tail stocks were obtained to allow assessment of levels of non-lethal interactions with vessels and fishing gear by reference to the characteristic wounds and scars left by encounters with vessels and gear.

Initial analyses indicate there are as many as seven distinct breeding areas and seven distinct feeding grounds, with complex types and degrees of mixing among them. In addition, a previously unrecognized breeding ground used by animals that feed in the Bering Sea and near the Aleutian Islands was inferred from the proportion of those animals identified in the sampled breeding grounds. Of particular interest from the perspective of the Hawaiian Islands sanctuary is the finding that some whales from Hawai'i feed near the Russian portion of the Aleutian Chain (this is in addition to the well-known link between Hawai'i and Southeast Alaska). The data demonstrate links between the sanctuary in Hawai'i and the Commander Islands (Komandorsky) State Biosphere Reserve (Russia), Glacier Bay National Park (Alaska), and the proposed Gwaii Haanas Marine Conservation area in northern British Columbia. Other findings suggest that the U.S. west coast sanctuaries are linked to the small, genetically distinct breeding stock off Central America. Finally, analyses of the flank and tail stock images showed that whales were at high risk of entanglement in all areas.

Panel 2: Whaling Sanctuaries: Conflicts and Synergies

Convener and coordinator: Arne Bjørge

Objectives:

- To elucidate the nature of IWC whaling sanctuaries and identify their strengths and weaknesses.
- To identify potential opportunities for integrating MPA concepts in the IWC sanctuary framework.
- To consider ways of increasing the effectiveness of existing MPAs in the context of IWC sanctuaries.

Summary of Findings:

Background

The history of international whaling sanctuaries (meaning sanctuaries that limit or exclude commercial whaling) is longer than the history of the International Whaling Commission (IWC). The first such sanctuary was established in the Antarctic in 1938, covering waters south of 40°S and between longitudes 70°W and 160°W. Very little commercial whaling had targeted whales in this sector before 1938. At the time, it was apparent to some scientists that whaling in the Southern Ocean was not sustainable, and they considered it desirable that part of this vast region should remain free from commercial whaling. When the IWC was established in 1946/47, the sanctuary was maintained. However, in 1955 the area was opened, initially for a period of three years, as a means of reducing the pressure on other Antarctic whaling grounds. Although conservation was the main argument for terminating the sanctuary, it is apparent that the discussions within the IWC were influenced by other, hidden agendas.

The IWC subsequently established the Indian Ocean Sanctuary in 1979 and the Southern Ocean Sanctuary in 1994. These sanctuaries are scheduled for review every ten years. Additional proposals for sanctuaries in the South Atlantic and South Pacific have been submitted to the Commission for a number of years. To date, both have failed to achieve the three-quarters majority of votes needed to change the IWC Schedule, and therefore they have not yet been designated.

Current status of IWC sanctuaries

A recent State of the Cetacean Environment Report submitted to the IWC Scientific Committee stated that there had been surprisingly little research effort on cetaceans in the Indian Ocean. Currently, the world's largest whaling operation occurs in the Southern Ocean Sanctuary, where about 850 Antarctic minke whales and 50 fin whales are taken annually by Japan as part of a scientific research program. The legal basis for this hunt is Article VIII of the 1946 International Convention for the Regulation of Whaling (ICRW), which allows any member government to grant special permits for the taking of whales for scientific research purposes. This loophole in the convention brings

into question the efficacy of IWC whaling sanctuaries. Nonetheless, Latin American countries and South Africa have proposed, and continue to campaign for, establishment of a South Atlantic IWC sanctuary in addition to existing ones.

Future of IWC sanctuaries

The IWC is currently plagued by deep disagreements over a number of issues. Hidden agendas remain an obstacle to consensus and make it extremely difficult to achieve a three-quarters majority vote. If the IWC is to become an efficient organization that brings commercial whaling back under international control, member nations will need to soften their firm positions on a number of issues, including scientific whaling, the moratorium on commercial whaling, and the issue of sanctuaries. The management measures and other features of IWC whaling sanctuaries need to be clarified and strengthened, and relations between those sanctuaries and various national MPA initiatives must be addressed.

Alternatives

The concept of protected area designation can be pursued not only through international conventions such as the ICRW, but also through regional bodies (e.g., the Secretariat of the Pacific Regional Environment Programme, or SPREP) that may be more efficient at involving stakeholders in planning and management, promoting collaboration and sharing of resources among countries, and avoiding some of the political difficulties faced by larger international organizations. Other instruments and mechanisms, such as memorandums of agreement, bilateral or multilateral treaties, and international conventions, can be used to establish international protected areas. Also, the ongoing establishment of whale sanctuaries in individual country EEZs, particularly in regions such as the South Pacific, can provide protection across large ocean areas when they form virtual or formalized MPA networks.

It is the view of many researchers and managers in Latin American countries that an IWC sanctuary, such as that proposed for the South Atlantic, could serve purposes that go beyond simply the prohibition of commercial whaling. Such sanctuaries could be used to promote non-lethal research and other non-lethal "uses" of cetaceans, e.g., whale watching. Also, the IWC could help develop basin-wide conservation and scientific initiatives aimed at cetaceans.

Recommendations:

- Continue working to make the IWC relevant to whale conservation, including support for the establishment of whaling sanctuaries in the South Atlantic and South Pacific Oceans.
- Encourage efforts by individual countries to establish EEZ whale sanctuaries, and use other available mechanisms (such as Port State Controls) to address specific conservation issues. Such efforts should be coordinated to the extent possible.
- Pursue regional mechanisms to promote whale conservation.

Panelists and titles of presentations:

History and status of IWC whaling sanctuaries
Arne Bjørge

The history and current status of IWC whaling sanctuaries was presented to launch discussion of the topic.

IWC whaling sanctuaries: the Brazilian perspective
José Truda Palazzo, Jr.

Prior to the 1982 global moratorium on commercial whaling, the International Whaling Commission was failing to achieve its stated objective of conserving whales for future generations. The prohibition, rather than simply the management, of commercial whaling was seen by many as necessary to ensure conservation of the world's stocks of whales. This position has become even more compelling as novel threats to cetaceans and ocean ecosystems have come to be recognized (e.g., climate change, ocean acidification). Sanctuaries are consistent with the conservation mandate of the IWC. Member nations, especially developing ones, increasingly see sanctuaries as important tools for promoting both the recovery of whale populations and their use for scientific and socio-economic benefits through entirely non-lethal means.

High-seas sanctuaries, by preventing the encroachment of pelagic whaling fleets from faraway countries, reinforce the policies of coastal States that prohibit whaling in their own jurisdictional waters and reserve whale resources for non-lethal appropriation by coastal communities. In addition, IWC sanctuaries can help protect whales as they move between other MPAs and provide a framework for MPA managers, policy makers, and other actors to communicate and cooperate. For these conservation benefits to be realized, however, the IWC and its Scientific Committee will need to move from a "pro-whaling" perspective to one that embraces non-lethal uses as legitimate and essential for the future of whale species and populations.

A review of IWC whaling sanctuaries
Doug DeMaster

The International Convention for the Regulation of Whaling (ICRW) was signed in 1946 as a direct result of over-harvesting of whale species worldwide. The IWC periodically adopts new or revises existing regulations by amending the Schedule, which is an integral part of the ICRW. Amendments to the Schedule require a three-quarters majority of those member countries voting. The Indian Ocean Sanctuary was established in 1979, while the Southern Ocean Sanctuary was established in 1994. Schedule amendments prohibit commercial whaling in these sanctuaries, although other human activities that could have impacts on whale populations (e.g., fishing, scientific whaling) are not regulated. At 10-year intervals, the IWC is required to review the effectiveness of each sanctuary relative to its associated objectives. This review process has proven contentious within the IWC. To some extent, the lack of consensus is related to how the objectives of these sanctuaries were originally developed. Any review of future

sanctuaries would benefit from careful consideration of how progress on realizing objectives (i.e., effectiveness) could and should be evaluated over time.

Two additional sanctuaries – one in the South Atlantic and one in the South Pacific – have been proposed for a number of years but have failed to achieve the necessary three-quarters majority to change the Schedule and become designated. Recently, the government of Australia initiated an international non-lethal research program in the Southern Ocean designed to improve understanding of the role of large whales in the ecosystem and of the ecosystem-level impacts of climate change and to provide information needed to promote the recovery of depleted whale populations. Australia has committed $32 million over the next five years to support this research and is seeking supportive international partnerships. Many countries, including the United States, have expressed strong support for the program.

Agoa: a project for a marine mammal sanctuary in the French West Indies
Christophe Lefebvre

A special decree in 1976 accorded protection to all mammals in marine waters under French jurisdiction. Also, France has consistently supported three major international marine mammal sanctuaries: the IWC's Indian Ocean and Southern Ocean sanctuaries and the Pelagos sanctuary in the Mediterranean Sea. The French MPA agency, created by new legislation in 2006, is currently implementing a project initiated by the Eastern Caribbean Coalition for Environmental Awareness to establish a marine mammal sanctuary in the Caribbean region (Agoa). The Agoa project was recognized internationally at the 58th Annual Meeting of the IWC in 2006. Its goals are to promote the recovery of marine mammal populations in the region and ensure that both the species and their habitat are given the protection intended under French law. Non-lethal research will be supported in the sanctuary, and outreach and awareness efforts will be aimed at policy makers and mariners in the region. Measures to restrict human activities likely to jeopardize marine mammals will be developed and implemented through a stakeholder consultation process. Any Caribbean country that shares the objectives of Agoa is welcome to become associated with the project. Dominica has already indicated its willingness to join.

The positives (and challenges) of national (EEZ) whale sanctuaries in Oceania and the SPREP whale and dolphin action plan
Lui Bell

The Pacific Islands region that is served by SPREP covers 32 million km^2 and is in the middle of the Pacific Ocean, the largest continuous marine habitat on the planet. Over half of the world's known species of cetaceans occur in the region. Cetaceans, along with marine turtles and dugongs, are widely regarded as flagship species and are also recognised as fundamental elements of Pacific Islanders' culture and heritage.

Considerable effort has been devoted in the region to the conservation and protection of these species. SPREP has a 5-year (2008-2012) regional action plan for cetaceans that encourages creation of EEZ-wide sanctuaries as well as other mechanisms or tools, e.g., legislation, arrangements under international conventions, and specific threat-reduction

measures. Almost all SPREP member countries and territories have legislation that calls for protection of cetaceans; ten have declared national sanctuaries. In partnership with the Convention on Migratory Species (CMS), a Memorandum of Understanding has been concluded and signed, thus far, by 11 member countries and five collaborating agencies. Participation in the three international species conventions – CITES (8 member countries and 7 territories), IWC (8 member countries), and CMS (5 member countries) – is widespread in the Pacific Islands region.

How can the IWC better contribute to both IWC and non-IWC whale sanctuaries?
Mike Donoghue

Getting the IWC to play a more positive role in the development of whale sanctuaries will require that: (a) the International Convention for the Regulation of Whaling and/or its Schedule is amended, (b) either the review process for Special Permit ("scientific") whaling is modified or Special Permit whaling is ended altogether, (c) the current opt-out provisions are eliminated, (d) a conflict resolution process is established, and (e) sanctuaries are respected as such. Also, there is a need for improved cooperation between the IWC and other international bodies, especially the Convention on Migratory Species, the Convention on International Trade in Endangered Species, and the International Maritime Organization. Finally, there should be (a) greater involvement of scientists from developing countries in the IWC Scientific Committee, (b) more sharing of new research (and management) tools and techniques and of expensive technologies and platforms, (c) more mentoring, and (d) continuation and expansion of collaborative non-lethal research in the Southern Ocean Whale Sanctuary (particularly through the exciting new Southern Ocean Research Partnership).

International law in relation to IWC and other international whale sanctuaries
Irini Papanicolopulu

From a legal point of view, whale sanctuaries can be created under a number of different treaties, including the International Convention for the Regulation of Whaling, Convention on Migratory Species (CMS), regional seas conventions (e.g., the Barcelona Protocol on Specially Protected Areas), and ad hoc agreements (e.g., the Mediterranean Marine Mammals [Pelagos] Sanctuary). In addition, whale sanctuaries can be created independently by individual States. For example, a State can proclaim its EEZ as a whale sanctuary, as some Pacific States have done. Individual agreements relating to migratory species that have an unfavorable conservation status and require international agreements for their conservation have been adopted on the basis of Article IV of the CMS. These include ASCOBANS, ACCOBAMS, the Pacific memorandum of understanding (MOU), and the West Africa and Macaronesia Small Cetacean and Manatee MOU.

Treaties, regardless of what they are called (e.g., agreement, convention, treaty), provide for binding obligations on State Parties. Memoranda of understanding imply political commitment. In all cases, the parties to the instrument need to address the issue of third States, that is, States that do not belong to the agreement.

Panel 3: How Can MPAs and Networks of MPAs Ensure Threat Mitigation to Cetaceans?

Convener and coordinator: Simone Panigada
Rapporteur: Christine Gabriele

Objectives:

The general aim of this panel was to consider whether existing MPAs and MPA networks provide sufficient protection for marine mammals. A number of specific threat factors, along with the mitigation measures that have been used to address them, were illustrated and evaluated. Panelists were also asked to consider how and whether broader national action plans and regional conservation plans could be used to create more effective MMPA networks.

Among the specific questions to be addressed were the following:

- Do existing MPAs effectively protect marine mammals from ship strikes, bycatch, chemical pollution, acoustic pollution, prey depletion, and habitat degradation?
- What elements need to be included in management plans to ensure that MPAs are achieving their goals?
- What methods are available to characterize, assess, and manage synergistic effects?
- Is critical habitat adequately identified and protected within existing MPAs?
- What approaches are available to protect and manage critical habitat that is temporally and spatially dynamic?
- How can multi-national and high-seas MPAs be designed and managed?
- What real-time tools are available to mitigate the risk of ship strikes in MPAs?

Summary of Findings:

A basic principle for ensuring that an MMPA or MMPA network is effective is articulation of the management goals that address both ecological and socio-economic dimensions. Objectives should be clear, achievable, and measurable. The success of any MMPA is founded on scientific understanding of the ecology and critical habitat of key species and awareness of human activities and potential threats. Science should, among other things, seek to understand the physical mechanisms that cause formation and persistence of biological "hotspots," focusing on patterns and processes such as retention zones, bathymetric gradients, and upwelling. New design concepts, including dynamic boundaries that can be changed in "real time" and extensive buffers, should be considered where appropriate. Periodic reassessment and re-evaluation of objectives and effectiveness, both internally and by interdisciplinary panels of outside peers, is recommended. Establishing and maintaining public acceptance of an MMPA is accomplished through good stakeholder relations and a broad-based education program. All aspects should incorporate consideration of local, traditional knowledge.

The four specific MMPAs discussed by this panel – Pelagos Marine Sanctuary in the Mediterranean, Glacier Bay National Park in Alaska, Stellwagen Bank National Marine Sanctuary in the western North Atlantic, and the Hawaiian Islands Humpback Whale National Marine Sanctuary in the Pacific – must deal with similar threats to cetaceans: ship strikes, entanglement in fishing gear, and underwater noise. Therefore, scientific research to quantify the magnitude of threats and provide a basis for designing mitigation measures and verifying their effectiveness is a priority in all cases. Not surprisingly, the four MMPAs use, or plan to use, similar tools to deal with the threats, including vessel speed and course restrictions, methods to disentangle whales (or preferably prevent entanglement), and technology to quantify underwater noise. Partnerships between individual MMPAs can enhance the sharing of technology and insights on conservation measures that do and do not work.

Regarding large whale entanglement in fishing gear, it is important for MMPAs to investigate the incidence, as in most areas where it has been studied, the rate of entanglement has been found to be an order of magnitude greater than originally suspected. MMPAs should not hesitate to look beyond their own boundaries and network with regional, national, and international groups to determine if, where, and when "their" marine mammals are at risk of entanglement. If a problem is found, the MMPA should use closures or safer fishing practices (or both) within its boundaries and encourage similar efforts in other high-risk areas visited by the same marine mammal population(s).

There is a recognized need for better protection of marine mammals on the high seas. The necessary legal instruments exist, but little advantage has been taken of these to move ahead with establishment of high-seas MPAs and international networks of MPAs. In addition to the United Nations Convention on the Law of the Sea, regional instruments such as CCAMLR, OSPAR, and NEAFC are available. Finally, climate change is a direct threat to some marine mammal species and populations and an indirect threat to many others. It will be important to anticipate and consider the implications of climate change in MMPA planning.

Recommendations:

- Consider the potential for acoustic impacts in the design and management of MPAs (e.g., size, buffer zones, noise-reduction measures).
- Look beyond the borders of the MPA and consider potential "external" threat factors throughout the seasonal migrations of the protected species.
- Encourage MMPAs to serve as catalysts, partners, or supportive agents for investigating and mitigating regional, national, or international threats.

Summaries of Presentations:

Ship strikes in the Mediterranean Sea
Simone Panigada

Globally, evidence of ship strikes has been reported for 11 species of large whales, with the fin whale the species hit most frequently. Based on data from stranding networks and

historical and anecdotal sources in the Mediterranean, there are 281 records of dead fin whales from 1971 to 2001, of which 42 (14.9%) were killed by a vessel collision. More than 85% of the reported ship strikes occurred in or adjacent to the Pelagos Sanctuary for Marine Mammals, an MPA characterized by very high levels of ship traffic and a high density of fin whales. Ship strike rates are unquestionably underestimated because not all collision events are reported. The rates are nevertheless high enough to justify management and mitigation efforts, e.g., ship traffic control measures, to reduce accidents and keep mortality rates at sustainable levels.

Reducing humpback whale disturbance and risk of ship strike using vessel speed and course restrictions in Glacier Bay, Alaska
Christine Gabriele

Glacier Bay National Park is a glacial fiord in southeastern Alaska that serves as a summer feeding ground for humpback whales, which are listed under the U.S. Endangered Species Act. Park regulations aim to reduce whale disturbance and the risk of whale-vessel collisions. Vessel traffic in park waters is mainly tourism-related and consists of motor vessels ranging from 300 m cruise ships to 5 m fishing or recreational craft. Whale protection regulations include daily limits on the number of vessels allowed in the bay, a minimum vessel approach distance to whales, and vessel course and speed rules. Research is ongoing on the whale population and the effects of vessel noise on the underwater acoustic environment. Information from such research is essential for understanding the effectiveness of vessel management actions and modifying them if necessary.

Entanglements and networking: how MMPAs can improve understanding and mitigate this human impact on large whales
David Mattila

It has been estimated that hundreds of thousands of cetaceans die each year as a result of entanglement (bycatch) in ropes and nets. However, the extent of this problem for large whales is very difficult to determine because they often drag entangled gear away from the initial point of encounter (a distance of more than 2,400 nm has been documented). The whale may die offshore and never be found or necropsied. Many countries and MPAs rely on opportunistic reports, which can vary greatly in accuracy, depending on the source. Direct evidence from disentanglement networks and indirect evidence from scar analyses has been used to improve understanding of the issue and identify sources of entangling gear and debris. The large whale disentanglement network initiated and maintained by the Hawaiian Islands Humpback Whale National Marine Sanctuary and its partners provides an example of how MMPAs can network within and beyond their boundaries to learn about and mitigate this major threat to cetaceans.

Effectiveness checklist: Elements to ensure that MPAs are achieving their goals
Randall Reeves

A checklist of items to help assess the effectiveness of an MMPA should include, as a first requirement, determination of whether the MMPA has clearly stated management goals against which effectiveness can be measured. Among other items to consider for

such a checklist are legal designation, institutional infrastructure and staffing, long-term financial support, an ongoing scientific research and monitoring program, an ongoing outreach program to maintain and, if necessary, improve stakeholder relations, and mechanisms for regular re-evaluation and adaptation of boundaries, zonation policies, and other features. It is important for protected area managers to be acquainted with state-of-the-art concepts, techniques, and devices (e.g., telemetry, underwater listening systems, pingers) both to ensure effective monitoring and mitigation of threats and to avoid misapplication and harm (e.g., inappropriate use of acoustic devices).

Using real-time tools to manage ship strike risk in marine protected areas
Leila Hatch

Because of the overlap between high densities of large whales and high volumes of ship traffic, Stellwagen Bank National Marine Sanctuary is a "hotspot" for ship strikes along the east coast of the United States. Through extensive collaborations, multiple technological approaches are being applied to mitigate the risk of ship strikes in the sanctuary. A long-term database of whale sighting information has been used to shift the Boston shipping lanes into an area with lower densities of feeding whales, and Automatic Identification System (AIS) data are being used to evaluate vessel compliance with this and other routing and speed measures. An array of real-time passive acoustic buoys is used to detect the presence of right whales and a system is being developed to transmit right whale alerts directly to a ship's bridge via AIS.

Studying and managing noise within MPAs
Leila Hatch

Sound in the oceans is generated by natural sources, including marine animals, and by anthropogenic sources, including commercial ships. Reports addressing impacts of noise on marine animals have recommended the use of area-based rather than species-based management tools. The tendency of noise to disregard artificial boundaries (such as those delimiting an MPA), however, challenges managers to devise methods and regulatory frameworks to control noise, including that generated by distant sources. Stellwagen Bank National Marine Sanctuary is attempting to manage noise in a spatially explicit manner. Researchers there have developed methods to quantify the relative noise contributions made by different types of vessels and evaluate the implications of regulations that would alter ship traffic in various ways. NOAA has developed guidelines for use of passive acoustic listening systems in mitigation and monitoring programs, and such systems are being used to manage noise in relation to offshore liquefied natural gas (LNG) development.

How to deal with temporally and spatially dynamic critical habitats
David Hyrenbach

Differences in scale and predictability distinguish highly dynamic pelagic systems from the terrestrial and benthic systems where wildlife reserves were first implemented. As in more static systems, many pelagic species use predictable habitat to breed and forage. In principle, MPAs could be designed to protect breeding and foraging aggregations of pelagic organisms. However, designing and implementing spatially explicit protective

measures will require a sophisticated understanding of the physical mechanisms that influence formation and persistence of such aggregations. To this end, pelagic habitats can be classified according to their dynamics into three broad categories: static, persistent and ephemeral. While traditional reserve designs may be effective in static habitats, many important pelagic habitats are neither fixed nor predictable. Thus, pelagic protected areas will require novel concepts and designs, such as dynamic boundaries and extensive buffers, defined by the location and extent of specific ocean features.

How to deal with multi-national and high-seas MPAs
Colleen Corrigan

The high seas are vulnerable to human activities but are currently underrepresented by protected areas when compared to terrestrial and near-shore marine environments. Thus, there is a growing movement within the conservation community to increase measures, such as MPAs, that can ensure protection of the largely undiscovered but important biodiversity of the high seas, including marine mammals. Experience with existing transboundary MPAs under national jurisdiction can provide lessons relevant to the establishment of high-seas MPAs.

Existing regulations: have they worked?
Irini Papanicolopulu

Customary international law, as embodied in the United Nations Convention on the Law of the Sea, obliges States to protect and preserve the marine environment, including rare and fragile ecosystems. To this end, States have elaborated juridical instruments for the creation and management of MPAs, both unilaterally (domestic legislation) and multilaterally (international treaties). However, although these instruments constitute an important first step, they do not assure sufficient protection to marine mammals, particularly endangered species on the high seas. It is time, therefore, for States to elaborate new mechanisms for complying with their obligations: on one hand, through the establishment of MPAs on the high seas and on the other, through the creation of networks of MPAs that cover all marine areas (whether falling under the sovereignty or jurisdiction of a coastal State or being part of the high seas). Mechanisms for ensuring compliance by non-signatory States also have to be envisaged.

Panel 4: Managing the Balance between Conservation and Economic Interests within MPAs for Cetaceans

Convener and coordinator: Naomi Macintosh

Objectives:

- Discover common issues based on the experiences of people involved in a variety of MMPA contexts and to find ways of translating the lessons learned into improved management of stakeholder activities, marine mammals, and marine mammal habitat.
- Consider the value of flexibility in MPA design, i.e., allowing for adaptive management to cope with the emergence of new issues and stakeholders.
- Determine ways of identifying and engaging stakeholders and getting their involvement in marine conservation efforts.
- Seek "common ground" strategies that balance the interests of various stakeholder groups without compromising the protection of marine resources.

Summary of Findings:

Achieving effective conservation of marine mammals is a universal challenge faced by all managers of MMPAs. There is always tension between offering the public a chance to see and experience marine mammals in their natural habitat and protecting the animals from potentially harmful effects of activities intended to give economic opportunities to local communities. Often, tradeoffs need to be made.

Management needs to be informed by research on the interactions between marine mammals and human activities, including marine mammal watching and tourism more generally. The potential impacts need to be assessed, and monitoring programs need to be put in place to verify impact assessments. Research and monitoring both require stakeholder engagement. Management may include such things as time-area closures in key habitat areas within the MMPA, and permitting mechanisms for marine mammal watching operations, but regardless of what measures are used, they require monitoring, measuring effectiveness, and adaptive management.

Conclusions and Recommendations:

- Stakeholder engagement is essential. For example, tour operators can be valuable partners in ensuring that their activities are sustainable. After all, their livelihoods depend on providing a quality experience for their clients.
- Funding to support research, monitoring, and management initiatives needs to be sustainable and reliable.
- Education and outreach to the public is needed to build and maintain confidence that the MMPA is being managed effectively and that the marine mammals are not being harmed by tourism and recreational activities.
- There is a need for better information on existing permitting or licensing mechanisms and entrance or user fees in MMPAs. How well do these

mechanisms work? What are the accompanying challenges and opportunities? More generally, MMPA managers need to share their experiences in trying to limit the numbers and types of tour operations in their jurisdictions.

Summaries of Presentations:

Experience in Commander Islands State Nature Biosphere Reserve, the largest MPA in Far East Russia
Nikolay Pavlov

Although the Commander Islands are viewed in popular culture as an area inhabited by indigenous Aleuts, the historical record indicates that Aleuts were relocated from the Aleutians to the Commanders by Russians in the 19th century, with the expectation that they would assist in the commercial exploitation of the region's marine mammals for fur and oil. Today, some 300 Aleuts (out of approximately 750 inhabitants all told) live on Bering Island, where they subsist in part through hunting marine mammals. The Commander Islands State Nature Reserve was established in 1993. Despite efforts at the time to ensure that all pre-existing access and activities on the part of the Aleuts would be duly protected, local residents resisted the designation of the reserve and viewed it as a hindrance and a threat to their livelihoods and welfare. However, since the site was designated as a Biosphere Reserve in 2002, the stage has been set for the reserve to play a more constructive and positive role in the socio-economic life of the Aleuts.

Current policy in Kamchatka is to promote the region's commercial fishing and recreational (tourism) potential. The Commander Islands attract foreign and Russian tourists because of their large, diverse marine mammal populations and bird colonies as well as the famous gravesites of Vitus Bering and his exploration team members. Efforts are underway to address misconceptions and demonstrate the potential economic value of the reserve to local communities. For example, indigenous cultural practices (such as dances) have been integrated into tourism activities. As a Nature Reserve, this MPA has the dual responsibility of preserving aspects of the islands' heritage while also supporting the socio-economic development of the local people.

Experience in Ecuador's Machalilla National Park, with particular attention to humpback whales
Cristina Castro

Machalilla National Park, located midway along the Ecuadorian coastline, was created in 1979 with the vision of preserving the adjacent terrestrial and marine ecosystems. The park contains pre-Colombian archaeological ruins and artifacts, beaches, and tropical dry forest. More than 200 animal species have been identified there, including coastal parrots, seabirds, deer, iguanas, snakes, and anteaters. It is also a winter breeding area for humpback whales.

Whale watching tourism began in this area in 1989 when local fishermen took people out to see the whales. Since then, there has been a dramatic increase in such tourism. As a result of the efforts of Pacific Whale Foundation to link researchers and the community, tour boats are used as observation platforms for research, and more than 1,000 individual humpback whales have been photo-identified to date. Also, more than 1,500

students and teachers participate in environmental education workshops each year. A whale festival, which began in 1999 and has become an annual event, celebrates the arrival of both the whales and the tourists. It contributes significantly to the local economy.

In 2005 at a stakeholders meeting, the idea of developing whale "birth certificates" was born. In May 2007 Ecuador formally joined the IWC. In 2008 the Ministry of Tourism declared "Whale Day" as a celebratory to be held each year on 22 June. More MPAs have been established in Ecuador in recent years. Pollution and over-fishing are among the main threats to marine mammals in the region. Efforts are underway to get government agencies, park officials, and local people to cooperate in providing more safe areas for humpback whales while at the same time providing greater economic opportunities for local communities.

Are time/area closures the solution for the long-term sustainability of spinner dolphin tourism in Hawaiian waters?
Lars Bejder

Research is showing that cetacean-oriented tourism (boat-based and swim-with) can have biologically significant impacts on dolphin communities. Repeated exposure to whale watching vessel traffic can compromise the fitness of individual dolphins, creating the potential for population-level effects. Spinner dolphins in Hawai'i have a predictable daily movement pattern: they forage offshore at night and return to sheltered bays to rest during daytime. This set pattern renders them particularly vulnerable to disturbance, given the limited availability of sheltered waters to rest, socialize, and avoid predators. Considering the documented effects of tourism on dolphins in locations where tourism pressure is substantially less, it is likely that tourism is having an impact on spinner dolphins in Hawai'i. Out of concern that this is the case, the Pacific Islands Regional Office of NOAA Fisheries, in collaboration with the Pacific Islands Fisheries Science Center, is developing a management plan to reduce the exposure of resting spinner dolphins to human activity in Hawaiian waters. One potential approach would focus on time/area closures of specific bays to reduce the number and intensity of interactions between humans and dolphins during critical rest periods.

Worldwide, there are various cetacean-watching codes of conduct, guidelines, and regulations. The United States was the first country with legislation to protect cetaceans from harassment, but the Marine Mammal Protection Act (1972) was not originally intended to license and regulate the commercial cetacean-watch (and swim-with) industry. Rather, it was designed primarily to minimize harassment and disturbance in a general way and to require permits for "taking" marine mammals, e.g., by deliberate hunting or through bycatch in fisheries. Therefore, commercial dolphin-watch operators in the United States are not required to obtain specific permits or training, and there is no legislative framework to regulate the commercial dolphin-watch industry in Hawai'i. Such a framework does exist in Australia and New Zealand.

A key question is: Are time/area closures sufficient for long-term sustainability of dolphin tourism given that spinner dolphins are likely more susceptible to disturbance than, for example, bottlenose dolphins? In the short to medium term, time-area closures

are likely to provide some protection for spinner dolphins. However, during daylight hours spinner dolphins spend considerable amounts of time not only in sheltered bays, but also in near-shore waters outside sheltered bays. They may be exposed to human activities (boat-based, swim-with, and kayaks) throughout much of their daytime home range. Therefore, an appropriate long-term strategy would be to regulate the commercial dolphin-viewing (and swim-with) industry through an enforceable permit system similar to those currently in place in Australia and New Zealand.

Red Sea spinner dolphins protected, supported by controlled nature tourism
Giuseppe Notarbartolo di-Sciara

Spinner dolphins throughout the tropics seek the shelter of coral reefs during daylight hours to rest. This habit brings them within easy reach of tourists and makes them vulnerable to disturbance. This had long been the case in Samadai, a small reef off the coast of southern Egypt, where tourists in increasing numbers converged daily to swim with the resting dolphins, creating a situation seemingly beyond control. Growing concern that the dolphins would abandon the reef as a result of the disturbance was brought to the attention of the Egyptian management authorities, and they responded by suspending all access to Samadai in December 2003.

A provisional management plan was prepared immediately, based on precaution and on the scant knowledge available at the time. In January 2004 the reef was again opened to visits, but only under tight control and within the conditions set down in the management plan. The plan envisaged (1) subdivision of the reef into zones, including a large no-entry zone encompassing the dolphins' preferred resting area, (2) limitation of daily visits to a maximum of 100 snorkelers and 100 divers who could visit the reef aboard 10 large boats, (3) time limits for visits (between 10:00 a.m. and 2:00 p.m.), (4) a restricted zone adjacent to what was considered critical dolphin habitat, where swimming visitors were admitted only under the guidance of certified guides, (5) a code of conduct, (6) payment of a 15 Euro entrance fee for each visitor, and (7) daily collection of data on dolphins and visitors to support adaptive management.

Today, the use of Samadai by spinner dolphins as a resting place is stable and regular, as documented by ongoing monitoring. Enforcement of the management regulations is constantly assured. At the same time, tens of thousands of tourists every year are able to enjoy the extraordinary opportunity of watching these animals in their natural habitat. Just as importantly, revenues from the Samadai entrance fees are, in large part, reinvested locally. This has allowed the Red Sea Protectorates to hire more than 50 technical and administrative personnel who ensure the protection of a much wider area, all thanks to the Samadai dolphins that rest inside a reef no wider than a couple of football fields

The Whale Watch story
Kauahi Ngapora

Whale Watch is committed to providing a world-class whale watching experience while carefully managing the use of a rare natural resource within a unique environment. We are visitors to the world of the whales and respect it as such at all times. As a Maori-

owned company, Whale Watch cherishes the twin values of *manaakitanga* (hospitality) to visitors and reverence for the natural world. Ngati Kuri also assumes the role of K*aitiaki* (guardian) of the natural environment. This philosophy embraces people, the land, the sea, and all living things as one. Our people have lived with whales for more than a thousand years, and we intend to live with them for another thousand.

Whale Watch was founded in 1987 by the local Ngati Kuri people of Kaikoura (east coast of South Island, New Zealand), where sperm whales, dusky dolphins, Hector's dolphins, and New Zealand fur seals can be encountered year-round, along with numerous other migratory cetacean species. The people raised the capital required to start the business by mortgaging their homes. Although Whale Watch was established to create employment for local Maori and to give Ngati Kuri an economic base, it has developed into more than that. It has created employment for the whole community and it has been instrumental in the growth and development of the entire town. In the first year, a single 6.7 m inflatable was used to take 3,000 passengers out to see whales and only a handful of staff was employed. In recent years, the staff has grown to 55 full-time, with 20 more employed during peak season. The whale watching fleet now consists of five 18 m, 48-seat catamarans that carry more than 90,000 passengers per year. Whale Watch Kaikoura has become one of the leading tourism attractions in New Zealand.

The company has two permits from the Department of Conservation (DOC) authorizing 16 commercial tours per day to observe sperm whales. Although it also has swim-with permits for dolphins and seals, these have not yet been acted upon. New Zealand's Marine Mammal Protection Regulations provide a basis for minimizing the effects of cetacean watching, e.g., by limiting the number of vessels that can view an animal or group of animals at one time, limiting the number of swimmers permitted in the water at one time, specifying allowable speeds and angles of approach, and discouraging close approaches to whales. Local operators are requested to share with DOC (on a 50:50 basis) responsibility for covering the costs of administration and research on the effects of whale-, dolphin-, and seal-watching and of the dolphin and seal swim-with operations in Kaikoura. Whale Watch Kaikoura contributes the largest proportion of funding of any operator.

Our experience shows that a commercial cetacean-watching and swim-with operation can be successful and sustainable in a sensitive area if the following conditions are met:

- A precautionary approach is taken by the authority on the number of watching and swim-with with permits issued for an area, allowing for both the long term protection of marine mammals and the sustainability of the industry.
- Clear guidelines and standards are developed, adopted, monitored, and enforced collaboratively, with input from the authority, scientists, operators, and the local community.
- Permits are issued on a long-term basis so that operators can invest in the staff and infrastructure needed to support high-quality service.
- Robust and regular research is carried out on the effects of tourism (and other potential stressors) on the animals and their environment.
- A mutually respectful and cooperative relationship is maintained between the operator and the management authority (in this case, DOC).

- There is a common goal to protect the natural environment.

Our people intend to continue building on the legacy created by those who went before us and who risked so much so that the vision could be realized. This commitment will ensure that they are honored and that the story of Whale Watch Kaikoura continues, giving future generations the opportunity to add to it.

Maintaining flexibility in sanctuary design and management
Naomi McIntosh

The Hawaiian Islands Humpback Whale National Marine Sanctuary (Sanctuary) is one of 14 MPAs managed by NOAA's Office of National Marine Sanctuaries (ONMS). The sanctuary was designated by Congress in November 1992 to protect one of the world's most important areas of habitat for humpback whales. More than half of the North Pacific population of humpback whales, as many as 10,000, migrate to Hawaiian waters to breed, calve, and nurse their young. The sanctuary consists of five separate areas located adjacent to the islands of Kauaʻi, ʻOahu, Maui, Molokaʻi, and Lanaʻi, and Hawaiʻi Island. The boundaries originate at the shoreline and extend to the 100-fathom isobath. The sanctuary as a whole encompasses approximately 1,400 mi^2 (3,600 km^2) of both federal and state waters of the main Hawaiian Islands.

Full designation of the sanctuary was achieved with the finalization of its first management plan in 1997. Management plans are site-specific documents that ONMS uses to manage individual sanctuaries. The first such plan for this sanctuary emphasized education, research, and programs to protect humpback whales and their habitat through a cooperative management agreement between NOAA and the State of Hawaiʻi. Marine sanctuaries in the United States are required to evaluate progress made toward implementing their management plans and meeting their goals every five years. Necessary revisions are then made to the management plans and regulations to ensure that the sanctuaries continue to achieve their resource protection purposes. A review of the management plan of the Hawaiian Islands Humpback Whale National Marine Sanctuary is expected to begin this year (2009). It will include (a) a public process to evaluate current programs for the protection of humpback whales and (b) consideration of adding other marine resources as focal objects of protection. In this way, it is hoped that the sanctuary can both adapt to changing management needs in waters surrounding the main Hawaiian Islands and provide support to local communities as they seek to protect nationally significant marine resources.

Panel 5: Refining Management for Improved MPAs and MPA Networks

Convener and coordinator: Brad Barr

Objectives:

The objectives of this panel were to discuss how MPA effectiveness is assessed and how the results of such assessment can be translated into improved management performance. The focus was on marine mammals and their habitat. Panelists were asked to provide practical examples of design, monitoring, and evaluation of MMPA networks (or how these should be done); discuss how MMPAs affect and are affected by ecosystem-based management, ocean zoning, and regional ocean governance; and consider ways in which those concepts might be relevant to assessment and improvement of site or network functioning.

Summary of Findings:

Increasing attention is being given to the measurement of management effectiveness of MPAs. Many MPAs still do not have management plans; in fact, many MPAs are not being actively managed at all. However, as more management plans are developed and implemented, measuring their effectiveness is being included as a critical component for driving adaptive management. Networks of MPA managers can help build the capacity for carrying out appropriate evaluations of effectiveness. However, such evaluations require rigorous, sustainably funded monitoring as well as adequate resources for analysis and interpretation of monitoring data.

Once an evaluation of effectiveness has been completed, it is the responsibility of managers to respond appropriately. This should include engagement in education and outreach to ensure that the public is aware of and understands the status of the MPA's resources. Stakeholder and indigenous groups need to be engaged in this process from the beginning.

While methods for measuring and evaluating effectiveness for individual sites are evolving rapidly, this is less true of MPA networks. Attempts to evaluate effectiveness of MPA networks are usually complicated by the challenges of multiple-agency, and often international, coordination.

Recommendations:

- Develop and update management plans with elements that ensure appropriate monitoring and measurement of effectiveness.
- Broadly share experience of measuring management effectiveness, including both successes and failures. From this experience, develop "best practices" to guide future initiatives (including recommendations for engagement of stakeholders and indigenous partners).

- Direct greater attention to the development of methods for evaluating management effectiveness of MPA networks and systems.

Summaries of Presentations:

The CaMPAM experience: a social network to enhance MPA management in the Wider Caribbean and links to marine mammal conservation
Alessandra Vanzella-Khouri

The Wider Caribbean Region encompasses 38 different political entities bordering the Caribbean Sea, Gulf of Mexico, and adjacent Atlantic Ocean. This includes 13 island nations, 12 continental nations, and 13 territories belonging to France, the UK, the United States, and the Netherlands. With so little international waters and so many shared boundary areas, the need is great for coordination between and among nations. Yet there are at least four official languages (Spanish, French, English, and Dutch), two legal systems (common and civil), wide economic disparities, and numerous socio-economic and environmental issues held in common. This is one of the busiest shipping areas in the world, with traffic from oil tankers, cruise ships, and cargo vessels and with exponential growth in coastal and marine tourism. It is also a biodiversity hotspot and thus there is the potential for numerous conflicts between human activities and the preservation of wild species and natural ecosystems.

The World Resources Institute recently evaluated the management effectiveness of 285 Caribbean MPAs and found it to be inadequate or questionable in approximately 80% of them. The main problems identified were inadequate design, planning, and enforcement; insufficient resources; insufficient capacity in the form of trained personnel; and lack of political will. In 1981 many governments in the region adopted an environmental agreement under the UNEP Regional Seas program and in 1983 the Cartagena Convention provided an overall framework for further environmental agreements. Most notable in the present context is the Specially Protected Areas and Wildlife (SPAW) Protocol (adopted 1990, entered into force 2000) which calls on signatory governments to establish, manage, and strengthen MPAs and MPA networks and to protect listed species (Annex 2 includes 32 species of marine mammals). In recognition of the value of better communication and collaboration among MPAs and their staff, the Caribbean Marine Protected Areas Management Network and Forum (CaMPAM) partnership was born in 1997. This network maintains a listserv (> 300 members) and a regional MPA database, provides small grants to support MPA initiatives, and facilitates training of trainers and exchange efforts.

Relatively little is known about Caribbean cetaceans. Direct hunting of cetaceans occurs in several areas, and facilities featuring captive cetaceans are widespread and gaining in popularity, as is whale- and dolphin-watching tourism. Threat factors such as pollution and underwater noise are largely uninvestigated in the region. A specific Marine Mammal Action Plan (MMAP) was adopted in 2008 under the framework of SPAW and after a long consultation process involving scientists, NGOs, and government representatives, with the aim of improving knowledge and capacity. Among the activities being pursued as part of the MMAP, there is training and networking on stranding response and whale-

and dolphin-watching, as well as implementation of a regional manatee conservation plan.

The CaMPAM experience has led to a number of positive lessons, including:

- Objectives need to be clear and realistic but also flexible and adaptable.
- Projects must be demonstrably useful in addressing real needs, and they must produce relevant results.
- Leadership is needed with good knowledge of key issues and stakeholders;
- Communication links (e.g., the listserv) need to be maintained even through "thin periods" when there seems to be little activity.
- The focus of time and effort should be on the most pressing needs in the region;
- There should be a balance among participants, to include national and regional groups, MPA managers, users, researchers, educators, planners, and decision-makers.
- At least one successful program needs to be kept going to serve as a program flagship activity.
- Resource searching can be opportunistic (e.g., take advantage of chances for members to meet face-to-face).

The Latin American MPA network for cetacean conservation focused on MPAs "Red Cetaceos": how can we make it work?
Mabel Augustowski

In 2003, efforts began to develop a South American MPA network for cetacean conservation. Initially, the focus was on the six species of baleen whales in the region needing protection (right, blue, humpback, Bryde's, southern minke, and dwarf common minke) and on the need for scientific research, monitoring, and other management actions. Whale migrations provided a natural rationale for such a network. It was also recognized that whales are excellent flagship species, capable of strengthening the broader role of MPAs in preserving biodiversity, conserving ecosystems and ecological processes, and facilitating sustainable uses. The network was formally established in 2004 and, by 2006, had come to be known as the Latin American Network for Cetacean Conservation focused on MPAs. As indicated by the name, the scope had expanded to encompass small cetaceans as well as whales and a broader geographic area.

The network's first official meeting, in 2007, brought together members of institutions and MPA managers from Brazil, Uruguay, Argentina, Chile, Colombia, Ecuador, Venezuela, and Costa Rica, thus linking various regional initiatives that were already ongoing. In addition to maintaining regular communication among network members, the group has established a structure with clear functions, criteria, and principles. However, to achieve integrated regional actions for cetacean conservation, it will be necessary to move from case-specific, one-time projects to coordinated, long-range planning and formal regional agreements, and this will require stable, long-term funding.

Improving MPAs and MPA networks – a New Zealand perspective
Mike Donoghue

Fifty species of marine mammals are recorded from New Zealand waters – two of them endemic. Many species are of cultural as well as scientific significance. Consequently, New Zealanders generally support marine mammal conservation. Marine mammals in New Zealand are exposed to the same suite of threats found elsewhere in the world's oceans – fishery interactions, ship strikes, marine debris, etc. Various Acts of Parliament (including the Marine Mammals Protection Act, 1978) and government policies provide the framework for managing marine mammals in New Zealand, and this involves several government agencies, regional councils, and local Maori (*iwi*). Transparency and public consultation are facilitated through the publication of management strategies, such as the New Zealand Sea Lion Population Management Plan, which is specifically aimed at developing a strategy to reduce fishing-related mortality of New Zealand sea lions in a squid trawl fishery around the sub-Antarctic Auckland Islands. Public involvement has been key to notifying researchers when southern right whales are close enough to the mainland for photography and biopsy sampling. After a protracted period of public consultation, the Ministers of Fisheries and Conservation recently announced the establishment of four new marine mammal sanctuaries, and the expansion of the existing Banks Peninsula marine mammal sanctuary, to protect endemic Hector's and Maui's dolphins from fishing-related mortality.

Key lessons learned from the New Zealand experience are:

- Strong science is essential to underpin management decisions.
- Engagement of the Ministry of Fisheries is vital for addressing fishery bycatch issues.
- Stakeholder consultation and engagement of *iwi* are essential.
- Public support is indispensable.
- Litigation is always likely on fishery-related issues.
- Public awareness and compliance are integral to any conservation strategy.

Using condition reports to guide management and to track performance in an MPA network
Steve Gittings

NOAA's Office of National Marine Sanctuaries manages 14 marine areas ranging in size from less than 1 nmi^2 to almost 140,000 nmi^2, each with its own concerns and requirements for environmental monitoring. A System-Wide Monitoring (SWiM) approach is used to monitor design and reporting in a consistent manner at multiple spatial scales and for multiple types of resources – primarily water, habitat, living organisms, and maritime archaeological assets. The sanctuaries prepare "condition reports" that describe human pressures, address a series of questions about resource condition and trends, and specify management actions taken in response to threats (the "Pressure-State-Response" framework). The questions posed within the monitoring framework provide a tool by which the program can measure progress toward the maintenance and improvement of natural and archaeological resource quality throughout the system. The condition reports also help set the stage for management plan reviews at

each site, and help sanctuary staff identify priorities to address gaps, day-to-day information needs, and new threats.

The process of preparing condition reports is closely related to the Delphi Method. This method involves the administration of questionnaires to a panel of geographically dispersed experts, ultimately facilitating the formation of a group judgment. It relies on repeated interactions with experts who respond to questions with a limited number of choices. Feedback allows the experts to refine their views, and the group gradually moves toward a judgment that reflects consensus. Condition reports contain 17 questions related to the status and trends of sanctuary resources, with accompanying descriptions and five possible choices to describe resource condition.

To answer the questions, sanctuary staff members consult with external experts who are familiar with water quality, living resources, habitat, and maritime archaeology. Either by phone, e-mail, one-on-one meetings, or workshops, the experts are introduced to the questions and asked to provide recommendations and supporting arguments for their suggested ratings. The ratings and text in the report summarize the opinions and uncertainty expressed by the experts, who base their input on knowledge and perceptions of local conditions. Following the expert review, the draft report is sent to other subject-matter experts and key partners in research and resource management for what is called "Invited Review." After the staff has considered and incorporated comments, a draft final report is sent for external peer review. This last step is a federal requirement for information that can reasonably be determined to have a "clear and substantial impact on important public policies or private sector decisions." The comments and recommendations of the reviewers are considered by sanctuary staff and incorporated, as appropriate, into the final condition report.

Latin American cooperation strategy for the conservation of cetaceans
Miguel Iñíguez

Beginning in 2005, IWC member countries in Latin America established a coordination group (Grupo Buenos Aires) to coordinate efforts and develop common positions within the IWC and other international organizations and forums. The IWC commissioners from Argentina, Brazil, Ecuador, Mexico, Panama, and Peru, together with the acting commissioner from Chile, met in Buenos Aires in December 2007. This meeting was also attended by the Ambassadors of El Salvador and Nicaragua, diplomatic observers from Uruguay and Venezuela, and representatives of the governments of Colombia, Costa Rica, Honduras, and the Dominican Republic. Among the specific goals of the group are to: (1) promote the development of responsible whale watching tourism in the region through regional workshops for training and exchanging national experiences, (2) support states in the region that are seeking to establish cetacean-oriented MPAs, (3) share experience in enforcement of protective legislation, (4) identify threats, (5) promote various kinds of habitat protection, (6) strengthen regional capacity for all aspects of cetacean research and conservation, including emergency response, and (7) raise public awareness through environmental education programs. Since 2006, the Argentine Cooperation Agency of the Foreign Affairs Ministry has developed a cooperation program to improve capacity building and provide expertise in countries of Latin America. Seven workshops have taken place under this program to address issues

such as the following: (1) responsible whale watching tourism, (2) stranding response, and (3) assessment of cetacean population status.

Marine mammal protected areas in Mexico
Jorge Urbán-R. and Lorenzo Rojas-Bracho

Of the world's 87 currently recognized cetacean species, 33 (ca. 40%) occur in Mexican waters. The current tally of MMPAs is nine – 4 biosphere reserves, 3 national parks, and 2 refuge areas. The biosphere reserves focus on vaquitas (Alto Golfo y Delta del Rio Colorado, 1993), gray whales (El Vizcaino, 1993 [1971]), and humpback whales (Archipelago de Revillagigedo, 1994; Islas Tres Marias, 2000); the national parks on pinnipeds and fin whales (Bahia de Loreto, 1996; Bahia de Los Angeles, 2006; Archipelago de San Lorenzo, 2008); and the refuges on vaquitas (2005) and all large whales within the Mexico EEZ (2002). Management plans are either in place or under preparation for all of these, with the biosphere reserves most advanced in this regard.

The eastern North Pacific population of gray whales depends on lagoons along the west coast of Baja California as over-wintering, breeding, and nursery habitat. The protection of these lagoons as biosphere reserves and whale refuges is a significant achievement. It has been a key factor in the recovery of this population from depletion by commercial whaling. Humpback whales use three main wintering grounds in Mexico for breeding and nursing their calves – one in coastal waters surrounding the southern part of the Baja California peninsula, one around the offshore Revillagigedo archipelago, and one along the mainland coast including the Tres Marias Islands. Those around the offshore island groups benefit from the protection provided by biosphere reserves, but the whales along the mainland coast, which are generally more exposed to vessel traffic from tourism and recreation and to fishing activities, are given no special protection beyond the prohibition against whaling. As seasonal migrants to Mexico, both gray whales and humpback whales spend much of the year in international waters and in national waters of the United States and Canada (as well as Central American states in the case of some humpbacks). Thus, there is a compelling case for MPA networks that could provide year-round protection to these populations.

Within Mexico, there is an administrative MPA network, but unfortunately this does not ensure coordination of management activities or scientific research. Outside Mexico, there has been good collaboration with Mexican research groups, but this has not yet translated into coordination of management and research between or among MMPAs. Good information on critical habitat is already available, therefore the immediate priorities are to give that habitat effective protection within networks of MPAs.

Panel 6: Protected Areas and Protected Area Networks vs. Conventional Marine Mammal Management Tools – Are they Alternatives or to be Integrated?

Convener and coordinator: Randall Reeves
Rapporteur: Michael Simpkins

Objectives:

The main purpose of this panel was to explore relations between the use of protected areas or protected area networks and other, more conventional approaches to marine mammal conservation. The term "conventional," as used here, refers to tools other than protected areas, such as enforced protection from deliberate hunting or harassment, restrictions on fishing or transport activities to prevent accidental harm, and regulatory measures to reduce chemical or noise emissions.

Among the specific questions to be addressed were the following:

- How does one determine whether a proposed protected area or protected area network would bring added value to pre-existing conservation measures?
- Is there a downside to protected areas and protected area networks? In other words, is it possible that at least in some instances this approach to marine mammal conservation compromises or undermines conventional approaches?
- How can a protected area approach and other approaches to conservation be integrated or made to function in a complementary manner?
- In cases where conflicts exist between fisheries and marine mammals inside or alongside marine protected areas, are there generic management approaches that can be applied to address or resolve them?
- How can "adaptive management," a mantra of protected area discourse, be put into practice? Put another way, how can protected areas, once established and functioning, be made to accommodate (or adapt to) changes in the environment, in human activities, or in scientific understanding?
- Should (can) marine mammal concerns be subsumed under broader "ecosystem" concerns in the design and management of protected areas or protected area networks? Would such a model be a preferred alternative, or instead a supplement, to marine mammal-oriented protected areas?
- How can protected area managers address so-called downstream disturbances or threats, i.e., those that emanate from sources "upstream" of the protected area boundaries (meaning either on land or elsewhere in the marine environment)?
- What existing organizations or agencies have the potential to serve as conduits of information or as coordinating bodies among marine mammal-oriented protected areas?

Summary of Findings:

Protected area designations should bring added conservation value beyond that derived from other tools. Like any form of governmental intervention that impinges on human activities, a clear welfare benefit should be attached to any proposal for a protected area designation that involves management. If, on one hand, a marine mammal population is already adequately protected by one or several conventional tools or mechanisms, there may be little or no *management* justification for also establishing a protected area on its behalf (although there may be other types of justification related, for example, to public education and research). If, on the other hand, conventional tools alone are not achieving the conservation objectives, there may be good justification for establishing a protected area or network of protected areas, either as an alternative to other approaches or as part of an integrated mix of approaches.

Summaries of Presentations:

Identification of conventional tools and the "added value" problem
Michael Simpkins

Conventional tools for managing or mitigating the impacts of human activities on marine mammals are generally regulatory in nature. For example, direct harvest or other direct taking of marine mammals can be regulated by imposing quotas as well as by regulating the trade in products from such direct harvest or take. Incidental take (bycatch) of marine mammals in fishing gear can be controlled by regulating fishing practices, e.g., through time-area closures and/or restrictions on fishing gear or fishing operations. Disturbance or injury of marine mammals by noise from human activities can be addressed through requirements placed on permits given to commercial operators that produce noise (e.g., maximum source levels, ramp-up or shutdown protocols). Vessel strikes can be reduced by regulating speed limits or changing the configuration of shipping lanes so that they avoid areas of high marine mammal density. Finally, impacts from pollution and marine debris can be addressed internationally through MARPOL regulations and domestically through waste-management and pollution regulations.

MPAs essentially apply one or more conventional tools within an area that has been specially designated. This spatially focused approach to the application of conventional tools provides additional conservation value (i.e., "value added") when threats are geographically concentrated. Further, when multiple species or threats must be addressed, MPAs can enhance coordination and regulatory coherence among the conventional tools applied. Also, in many instances, stricter controls on human activities can be applied within an MPA than would be possible through more general application of conventional tools. Finally, the mere act of designating an area as needing special protection – i.e., creating an MPA – can attract attention and funding to support necessary conservation actions.

The downside issue: Can protected areas be not only ineffective but even counterproductive?
Giuseppe Notarbartolo di Sciara

There are two main ways in which a protected area approach can be ineffective or even counterproductive. One is if the protected area is created with inappropriate scientific justification; the other is if it is created through an inappropriate process. An example of the former would be when an MPA is created to protect a population that is threatened only by pressures that a protected area cannot possibly address (e.g., airborne pollution). Another example would be when the design of the MPA fails to offer meaningful protection to the population (e.g., the designated area does not encompass sufficient critical habitat). Finally, there can be a problem of regulatory overkill, such as if protected area management entails superfluous measures that are hard to justify to stakeholders and it is clear that the identified threat(s) could be addressed in some other way. It must also be said that there are times when politics completely overrides science and the term MPA is misapplied, such as when a nation's entire EEZ is declared a marine mammal "sanctuary." The process of MPA designation can fail when there is insufficient stakeholder involvement, local animosity toward the species or habitat to be protected, insufficient institutional commitment (e.g., management, enforcement, funding), a lack of results, or a loss of credibility with the general public or with local people. Effectiveness also can be undermined if management has the wrong focus, e.g., when energies and resources are invested in addressing pressures that are mildly threatening (e.g., tourism) while more serious threats that are more difficult to deal with (e.g., bycatch, noise) get little or no attention.

Managing fishery conflicts in, alongside, and near protected areas
Liz Slooten and Karin Forney

Slooten: MMPAs and fishery regulations can both be used to mitigate marine mammal bycatch. Protection of Hector's dolphins in New Zealand started with a Marine Mammal Sanctuary created under the Marine Mammal Protection Act, followed by a protected area created under the Fisheries Act. In 2008, 20 years after the creation of the first protected area, a comprehensive package of fishery regulations was put in place to reduce dolphin bycatch. Management varies from no protection in some areas to bans on gillnetting and trawling in others. The protection measures are currently being challenged by the fishing industry in a court case against the Minister of Fisheries. Assuming they stand, the new protection measures are expected to result in stable or slowly recovering populations in some areas and continued decline in others, with the potential for further population fragmentation. This would represent a major improvement over past management, which allowed numbers to decline from an estimated total population of 29,316 (CV=0.16) in 1970 to a current total of 7,873 (CV=0.16). The new protection measures are expected to slow the decline (7,169, CV=0.19 by 2050), while without fishery mortality the population would be expected to reach 15,411 (CV=0.16) by 2050. A similar analysis by the National Institute of Water and Atmosphere resulted in similar predictions. The estimated dolphin mortality in commercial gillnets was 110-150 per year during 2000-2006, which is many times the overall PBR of 4.3-9.5 (0.01-2.38 for individual populations). Dolphins are also caught in trawl nets and recreational gillnets, but no estimates of bycatch in these fisheries are available.

This case study follows a familiar pattern, starting with a relatively small protected area and with protection measures expanding progressively over a period of more than 20 years. The 13-year gap between the first and second protected areas likely was due in part to a perception that the first sanctuary had "solved the problem." The latest package of measures is much more nearly comprehensive, affording at least some protection in most of the range of Hector's dolphins. One approach for integrating MMPAs and conventional tools would be to manage the serious, direct threats for all or most of the species' range (e.g., with effective fishery regulations) while relying on MMPAs to manage the less direct or more localized threats (e.g., point-source pollution, marine mining) and to address cumulative impacts, which is difficult when focusing on one threat or species at a time. Clearly defined management goals and plans need to guide both the larger-scale (e.g., fishery regulation) and smaller-scale management measures (e.g., MMPAs). Management plans must consider areas (including high-density and high-risk areas), species (e.g., protecting endangered species throughout their range), and threats (assigning priorities to human activities according to the level of risk to species or populations).

Forney: MMPAs are in some ways similar to conventional management frameworks, such as the U.S. Marine Mammal Protection Act. Both approaches strive to maintain stable populations of marine mammals that are functioning elements of their ecosystems. Information needs are similar and include distribution, abundance, trends, and threats. A conventional fishery-specific or threat-specific approach generally involves the identification of problems and implementation of targeted management actions. MMPAs take an area-specific approach, identifying an area or species of interest and then mitigating or eliminating threats in that area or to that species. In both cases, threats must be monitored, and the framework must adapt when changes occur or management is found to be inadequately effective (as with the Hector's dolphin example above). One difference is that conventional processes often have limited public awareness and few stakeholders involved at each step, whereas the public tends to be aware of MMPAs and many stakeholders may be involved. A concern about conventional management is that it can result in a mosaic of local, state, and federal regulations applying to different fisheries or gear types, areas, or target species. Similarly, a network of MPAs can become a patchwork of areas with differing levels of protection, for different species, and with varying restrictions on activities such as fishing or other extractive uses. In both cases, this can lead to confusion, although the conventional management tends to be more easily understood by the fishing community, while MPAs are more readily understood and embraced by biologists and the public. An example of an MPA mosaic is the network of parks, reserves, sanctuaries, and refuges along the California coast. Each has its own array of regulations and restrictions, and it can be difficult for non-managers to determine what activities are allowed where. Furthermore, the public is given the impression that all marine species and habitats are well protected throughout the region, but in reality none of the existing MPAs offers any direct protection ("added value") for marine mammals (which are still managed according to conventional methods).

In many cases, the optimal management regime is one that combines both conventional and MMPA approaches. The choice of tools should take into account biological considerations, such as type of threats, animal range and movements, and ecosystem

context, and non-biological considerations, such as local laws, culture, resources, and knowledge as well as the availability of technology (e.g., gear modifications to mitigate bycatch). One might start with a conventional approach, such as the U.S. Marine Mammal Protection Act, but then identify problem areas or hotspots and provide an additional layer of protection within protected areas or networks. For example, a location that represents an important foraging refuge during years of poor ocean productivity might be protected in order minimize the risk of animals (or species) and threats becoming spatially and temporally concentrated.

In conclusion, conventional management and MMPAs are complementary tools, with similar information needs, problems, and pitfalls. It is important to share ideas, experiences, and approaches whenever possible to help ensure that the most appropriate set of management tools is identified based on the specific circumstances, including species, regulatory structures, social context, and other factors. In some cases, MMPAs can focus attention on certain species or problem areas when conventional management approaches are not adequate. However, the use of protected areas for marine mammals should be coordinated within broader multi-species MPA processes in order to avoid a confusing mosaic of regulations. For all MPAs, it is important to be explicit about what species are being protected from what threats, and to continue monitoring effectiveness.

Adaptive management
Tundi Agardy

When considering the topic of adaptive management, a central question becomes "How do MPAs and MPA Networks allow us to practice adaptive management to make conservation more effective?" In attempting to answer this question, I'll begin by stating my own perspective, that Adaptive Management is not at all the same thing as amended management. That is, marine management that fails and thus must be amended or revised does not adaptive management make: it makes failed management, from which management agencies must try and recover, without strategy and without the benefit of proactive adaptive management mechanisms. Rather, I consider Adaptive Management in the sense envisioned by Carl Walters: experimental design to test management is built into the management planning for the MPA or marine protected area network, right from the start.

In order to conduct adaptive management in this sense of the term, one must have:

- Clear, measurable objectives.
- Adequate resources for monitoring, research, and analysis.
- Formal or informal decision rules about what to do if benchmarks are not met.
- A management body that is capable of, and amenable to, changing the management regime.

The scale of adaptive management will vary according to the goals of the marine protected area or MPA network. These might include:

- Conserve or restore population or species.
- Protect whole communities of organisms/habitats.

- Manage Ecosystems (EBM).
- Manage Large Marine Ecosystems (LMEs).
- Whether MPA or MPAN design was right.
- Whether management is effective at addressing threats.
- Whether, in light of global change, MPA locations need to be changed.
- Whether wider effects of MPAs or MPANs are positive.

Without adaptive management built into the design of the protected area, answering such questions becomes difficult if not impossible, and adaptive management for effective conservation remains elusive.

Nesting marine mammals within broader ecosystem concerns: Are cuddly blubberies a proxy for the arcane anxieties of academics? And does it matter?
Mike Donoghue and Sue Miller-Taei

The establishment of MPAs in New Zealand is a complex process. Multiple, sophisticated ecological principles are generally considered during the process, which can become heavily academic. It is often implicitly assumed that MPAs established largely to benefit marine mammals contribute to the protection of marine biodiversity more generally. In other words, because of their charismatic appeal, marine mammals can function as flagship or umbrella species.

The marine mammal sanctuaries established over the past 25 years through section 22 of New Zealand's Marine Mammals Protection Act (1978) have had mixed results. In the Auckland Islands, the number of southern right whales over-wintering in the marine mammal sanctuary has increased spectacularly, but New Zealand sea lions, which forage mainly outside the sanctuary boundaries, have remained vulnerable to bycatch in the trawl fishery. Recently, four new marine mammal sanctuaries were established to protect the endemic Hector's and Maui's dolphins, and the existing sanctuary for Hector's dolphins at Banks Peninsula was greatly enlarged. Because entanglement is the major known threat to these dolphins, the Ministry of Fisheries has banned the use of inshore gillnets throughout much of their range. It is essential for government agencies (in New Zealand particularly the Ministries of Conservation and Fisheries) to work cooperatively to address this and other marine biodiversity issues.

It must be acknowledged that marine mammal sanctuaries, by themselves, often have no positive effect on threats to the health of the marine environment, such as urban and agricultural runoff, point-source pollution, and noise from ship traffic and industrial activity. The only piece of New Zealand legislation that articulates a holistic approach to marine conservation is the Hauraki Gulf Marine Park Act, which provides for integrated management of the Hauraki Gulf across 21 statutes, including the Resource Management Act, the Conservation Act, and the Fisheries Act. However, thus far the Hauraki Gulf Marine Park Act has scarcely been invoked or implemented.

Workshop 1: Mapping Cetacean Critical Habitat Areas and Turning Them into MMPA Networks: Toward Practical Solutions

Convener: Erich Hoyt
Co-chairs: Erich Hoyt and Cara Miller
Rapporteur: Mike Bossley

Workshop Participants:
Robin Baird, Naysa Balcazar, Lars Bejder, Ana Cañadas, Sal Cerchio, Colleen Corrigan, Cheryl Cross, Mike Donoghue, Karin Forney, Catalina Gomez, Sascha Hooker, Erich Hoyt, Miguel Iñíguez, Elaine Leung, Elizabeth Fahrni Mansur, Nadia Menard, Cara Miller, Camille Montiglio, Rubaiyat Mansur Mowgli, Cdr Johnny Nilson, Giuseppe Notarbartolo di Sciara, Simone Panigada, Milena Rafic, Vincent Ridoux, Kim Shelden, Lien Siang-Chou, Juney Ward, Sarah Wilkin, Rob Williams

Overview:

More than 30 MPA managers, marine mammal researchers, and NGO representatives met to discuss and identify (1) fast, effective, and efficient ways of identifying critical habitat for cetaceans in order to facilitate the establishment of MPA networks, and (2) ways of mapping and making the data accessible to relevant stakeholders, government and international agencies, and the public at large. Presentations on critical habitat/ MPA approaches and progress in the Mediterranean and Black Seas, Argentina, the Pacific Islands Region, Bangladesh, the Amazon River, Alaska, British Columbia, the Antarctic Peninsula, and Hawai'i provided participants with an indication of the broad scope and variability inherent in these different settings.

Following presentation of the case studies, the group exchanged ideas about global oceanographic and marine species databases, mapping apex species' distribution patterns, and adapting survey techniques for identifying and defining cetacean habitat. It was recommended that researchers employ a variety of techniques during surveys to achieve a more rigorous understanding of cetacean critical habitat. In addition, the group stressed the need for good survey design and for understanding population (stock) structure and animal behavior as well as sighting locations. A small working group was convened to draft a "toolkit" of research techniques that could be used to map and investigate questions related to cetacean critical habitat. The workshop also placed emphasis on developing low-cost survey techniques and on contributing to skills, resources, and capacity-building opportunities for researchers and MPA staff in less developed countries to help them obtain the data necessary to create MMPA networks.

The workshop was pleased to learn about a healthy population of some 6,000 Irrawaddy dolphins in Bangladesh – the largest known population of this species in the world. Also, it was encouraging that a protected area network is being proposed to protect this population and its habitat. Participants agreed that the Bangladesh network, which would give added protection to at least seven species of whales and dolphins, could be a model network for all of South Asia.

Summary Points from Presentations:

Cetacean critical habitat designations in the Mediterranean and Black Seas through ACCOBAMS
Erich Hoyt

- Much has been learned during the process of determining critical habitat features in order to develop MPAs under the ACCOBAMS agreement.
- The existence of an expert advisory group was very important in terms of identifying relevant areas and populations in need of conservation. Working within the ACCOBAMS Scientific Committee meant that the MPA process could draw upon species conservation plans (e.g., for common dolphins in the region) to identify potential sites and develop strategies for creating networks, while recognizing additional measures that would need to be undertaken to ensure successful conservation.
- Although the ACCOBAMS Scientific Committee and State parties (countries) to the agreement have endorsed the principle of establishing a network of 17 MPAs, implementation has been slow.

Cetacean critical habitats in Patagonia, Argentina
Miguel Iñíguez (presenting work by Cecilia Gasparrou, Marta Hevia, Vanesa Tossenberger, Mauricio Failla and Miguel Iñíguez)

- A summary of 7 MPAs (and two areas important to cetaceans) in Argentina was presented including details of the well known southern right whale spots around Península Valdés.
- The main threats to cetaceans in Argentina include ship strikes, offshore oil and gas development, and bycatch in fisheries.
- A matrix analysis of whale watching indicated only moderately satisfactory management within MPAs.
- At this stage in Argentina, it may be more important to improve the management of current MPAs than to create more of them.

What do we know about cetacean habitat in the Pacific Islands Region?
Cara Miller

- The Pacific Islands Region includes a large ocean with 22 different countries and territories. Little data is available, yet a recent review indicates up to 42 different species of cetaceans occur in this region.
- An excellent framework is in place (CMS Memorandum of Understanding for the Conservation of Cetaceans and their Habitats in the Pacific Islands Region), yet there has been difficulty discussing and progressing cetacean habitat protection given the limited data.
- Ways forward for MMPAs in the Pacific Islands Region may include predictive habitat modeling, concentration on specific species and/or countries or territories, and description of ocean systems or processes that are important for cetaceans.

Cetacean critical habitats in Bangladesh: the Protected Area Network for Cetacean Diversity (PANCD) – the first proposed protected area network for cetaceans in Asia
Rubaiyat Mansur Mowgli

- The Sundarbans area contains the world's largest mangrove forest and is home to an abundance of cetaceans, including the world's largest known population of Irrawaddy dolphins. Of particular importance is the deep-water canyon offshore ("Swatch of No Ground"), an upwelling area that appears to be a "hotspot" for cetaceans, seabirds, and fish.
- The proposed network includes habitat – inshore mangrove creeks, coastal shallows, and a deep offshore area – for at least seven cetacean species. A potential transboundary protected area will require considerable work to forge political agreements with India.
- The goals of PANCD are to conserve cetaceans but also to integrate the needs of local communities into planning. This is being attempted by building local capacity, conducting educational outreach, providing assistance to fishermen, and using adaptive management concepts.
- There was strong agreement in the workshop that the approach taken in Bangladesh could serve as a model for cetacean conservation in other parts of South Asia.

Assessing habitat use of Hawaiian odontocetes using sighting surveys and satellite tracking
Robin Baird

- Multi-species cetacean surveys are carried out using small boats for photo-identification, genetic sampling, and satellite tagging. Two species that are among those most at risk in Hawai'i but which are encountered only infrequently were highlighted: Blainville's beaked whale and the false killer whale. The threats that the populations of these species face differ. Small, resident, island-associated populations of both species exist around the main Hawaiian Islands, and distinct offshore populations are also found in the region.
- Because both island-associated and offshore populations overlap in range, designating critical habitat for the small, island-associated populations requires more than just density information: photo-identification or genetics need to be incorporated in order to determine which population is being studied.
- Comparisons of habitat use as assessed from small-boat surveys and from satellite tagging revealed substantial differences for both species. Satellite tagging reduces the spatial biases associated with survey effort due to sea conditions or distance from ports, and provides unbiased information on movement patterns, which is critical for assessing extent of overlap with areas of potentially harmful activities such as fishing and naval sonar use.
- In follow-up discussion on methodological issues, it was noted that a variety of techniques is sometimes needed to answer questions concerning cetacean habitat use.

Critical habitat designations under the U.S. Endangered Species Act: eastern North Pacific right whales
Kim Shelden

- Because information on North Pacific right whales is so limited, it is particularly difficult to characterize and locate their critical habitat.
- However, designation of critical habitat has proceeded through the use of sighting data from the Bering Sea and the Gulf of Alaska, where these rare animals have been observed most often.
- Direct threats to the whales include entanglement in fishing gear and ship strikes, but threats to their prey from offshore oil and gas development could be much more significant. The U.S. government has recently proposed to open the region declared as critical habitat for this species to oil and gas exploration.

Defining and linking river dolphin critical habitats in the Amazon and Orinoco
Catalina Gomez Salazar

- The Amazon and Orinoco basins have incredibly high biodiversity, but threats are increasing. The fact that so many different countries are involved complicates decision-making processes and this can be an obstacle to achieving protection.
- Numerous Fresh Water Protected Areas (FWPAs) have been designated within this region. However, these were not proposed based on river dolphin distribution or habitat needs, so it is unclear whether they adequately protect important cetacean habitat. Such protection is particularly difficult due to the extreme seasonal changes in water levels.
- Many issues need to be resolved concerning where and how to focus conservation efforts. For example, it is unclear whether an emphasis should be on areas with the highest densities of animals or areas where threats appear to be most serious. One thing that is clear is that it is critical to protect the headwaters of these river complexes; any effects on the headwaters are bound to cascade through the entire systems.

Participants listen in during a session at the ICMMPA.

Apex species critical habitat approach in the Mediterranean: strengthening cetacean MPA proposals
Erich Hoyt (presenting work by Erich Hoyt and Giuseppe Notarbartolo di Sciara)

- Experts on various apex species groups (seabirds, turtles, monk seals, sharks, tuna) prepared distribution maps, which were then overlain to show the substantial overlap with cetacean distribution (particularly with seabirds). The overlapping areas coincide with known nutrient-rich feeding areas.
- This approach demonstrates that whales and dolphins can function as good umbrella species, and that there is potential for significant engagement with NGOs, advocacy groups, and stakeholders who have priorities other than, or in addition to, cetaceans. MPAs intended for multispecies protection might be easier to achieve than MPAs that focus only on marine mammals. This work also has clear implications for networking MPAs.
- It was recommended that this approach be repeated in a more detailed way covering at least four separate areas of the Mediterranean, and that it should be a priority to fill information gaps in the eastern and southern Mediterranean Sea where less cetacean work has been carried out.

Further steps toward building a network of MPAs in the Mediterranean: a route for establishing effective MPA proposals.
Giuseppe Notarbartolo di Sciara

- National MPAs in the Mediterranean region have been progressed by national governments to protect particular parts of their territorial waters. Also, a number of Special Protected Areas of Mediterranean Importance (SPAMIs) have been designated to protect waters on the high seas. To date, the SPAMIs, with the exception of the Pelagos Sanctuary for Mediterranean Marine Mammals, are small and confined to the western Mediterranean basin.
- Differential effort and support across the region have made establishing high-seas MPAs difficult.
- The ACCOBAMS Scientific Committee can highlight and propose areas of known significance for cetacean protection, but the Regional Activity Centre for Specially Protected Areas **(**RAC SPA), part of UNEP's Mediterranean Action Plan, has the authority to designate these areas on the high seas. It is currently a high priority to develop ways of identifying the most important locations for MMPAs on the high seas.

Mapping MMPAs, managing data, and building knowledge for decision.
Colleen Corrigan

- The accessible UNEP-WCMC world database of protected areas is a valuable source of information on MPAs and could also serve as an excellent model for the development and monitoring of global MMPAs. In addition, the WCMC has data sets with biogeographic information such as locations of sea grasses, coral reefs, and mangroves.
- Important issues for possible MMPA database design and management issues are: the requirement for minimum core fields; determining who will manage and

update the database; making it simple for people to contribute to; and keeping up with technological advances.
- Globally, cetacean "hotspots" do not often overlap with existing MPAs, particularly on the high seas but also in national waters. The workshop concluded that only a tiny percentage of the world's critical habitat for cetaceans is effectively protected in MPAs.

Strategies for identifying critical habitat for cetaceans: from GAM-based spatial modeling to mapping areas of overlap between wildlife and anthropogenic activities
Rob Williams

- A number of options are available for researchers aiming to identify high-density or preferred habitats for cetaceans, ranging from opportunistic sightings databases to density surface modeling from systematically collected line transect survey data. Each method has its strengths and weaknesses. Generally (but not always), there is a tradeoff between cost of data acquisition and the ability to make sound inferences from the sample. Studies that aim to estimate distribution can benefit from being designed in the context of estimating abundance, because one aspect of the habitat's "criticalness" demands an estimate of population size – i.e., one metric of habitat importance is a measure of the proportion of the population that uses it.
- Low-cost, small-boat surveys can be used to collect data on distribution and abundance, but close attention needs to be paid to survey design and protocols. It is always preferable to follow a systematic rather than haphazard design, especially when the area is new to science. Time invested at the design stage saves time at the analysis stage and usually results in gains in precision and statistical power. For example, the results of one low-cost, small-boat survey in British Columbia (BC) (for which 10% of the overall budget was allocated to survey design) produced line transect and mark-recapture estimates of abundance that compared well with the estimates derived from annual censuses by the Department of Fisheries and Oceans.
- Recording behavior as well as sighting locations makes it possible to identify not only the area used preferentially by the animals, but also the subset of habitat they use for different behavior and the type of behavior in which they are most vulnerable to human activities.
- Social, cultural, political, and economic factors should be taken into account when designing MMPAs. In the case of Robson Bight (a killer whale sanctuary in BC), the process of identifying and protecting the habitat was driven by the local whalewatching and research communities.
- Combining data on habitat use by cetaceans with data on human activities and threats can help elucidate critical habitat (e.g., overlap between GAM-based density surface models and data on shipping intensity was used to identify areas where cetaceans are most susceptible to ship strikes and oil spills).
- An array of autonomous hydrophones and recording devices was deployed along the BC coast to measure ambient sound and evaluate whether anthropogenic noise levels can be used in models to describe preferred cetacean habitat and to identify relatively quiet areas for use in marine planning (including MPA designation). Although the long travel distances of low-frequency sound may

limit our ability to design "quiet" MMPAs in pelagic regions, it may be possible to do so in geographically complex regions such as the fjord areas of BC, Chile, and New Zealand.

General Recommendations (adopted in plenary on 3 April 2009):

- A worldwide effort must be made urgently to identify and define marine mammal critical habitats and hotspots. This information then needs to be mapped with other species and ecogeographic data to assist in the design and creation of MPA networks in national waters and on the high seas, working through national governments as well as various regional and international bodies. Critical habitat is not defined simply as high-density areas. Less densely occupied areas may be more critical to survival, depending on behavior and population/stock structure and on whether threats are present in these areas that have impacts on the population. Therefore, it is necessary to map not only critical habitat, but also threats and human activity.
- As part of networking, a strong effort should be made to transfer essential skills and resources to researchers and management staff in less developed countries (i.e., build capacity) so that they are better able to obtain the data necessary to develop MMPAs. (A website with extensive resources and mentoring contacts should be part of this.)

Recommendations Specific to this Workshop:

- It is important to assemble an expert advisory group in MPA development to ensure full stakeholder engagement and appropriate scientific expertise in design.
- Good planning (investing 10% of funding for survey design) and employing a variety of survey techniques can help achieve a more nearly comprehensive understanding of cetacean (marine mammal) critical habitat. There is a need for excellent survey design and for understanding population structure, behavior, and threats as well as sighting locations. (A working group was convened to draft a "toolkit" for collaborative research techniques that could be used to investigate questions related to cetacean (or marine mammal) habitat.)
- Global databases covering environmental, oceanographic, and species characteristics may assist in the identification of critical habitat and design of MPAs, but such databases need to be "ground-truthed" against local data, or by an expert group using a Delphic process.
- It is necessary to clarify (i.e., specify) the population or populations that are under study and therefore what is to be protected within a given MPA.
- It is important that social, cultural, political, and economic factors be taken into account when designing MMPAs, but the primary role must remain to conserve species and ecosystems.

Workshop 2: Criteria for Marine Mammal Critical Habitat to make MPA Networks more Effective

Convener and Chair: Ana Cañadas

Presenters: Ana Cañadas, Colleen Corrigan, Sascha Hooker, David Hyrenbach, Jeffrey Polovina, Randall Reeves

Participants (in addition to the above)**:** Brad Barr, Liz Slooten, Elaine Leung, Viviana Jiménez, Robin Baird, Karin Forney, Cherryta Yunnia, Idelisa Bonnelly, Cara Miller, Juney Ward, Lui Bell, Tatiana Lee, Kirstin Dobbs, Rubayat Mansur, Sue Miller Taei, Tiare Holm, Sal Cerchio, Cheryl Cross, Johny Nilsen, Lien Chou, Shelley Rowley, Mike Simphins, Thea Johanos, Doug DeMaster, Lloyd Lowry, Thierry Houard, Donna Petrachenko, Stephen Jameson, Paul Wong, Craig Macdonald, Erich Hoyt, Simone Panigada, Giuseppe Notarbartolo di Sciara

Summary:

A brief introduction highlighted the point that for ocean travelers, like wide-ranging marine mammals, sea turtles, and seabirds, it is important for management to be pursued at scales consistent with the spatial and nutritional requirements of the species. More specifically, ecologically designed MPA networks have to accommodate the life history of the species of concern and the dynamics of their oceanic habitats if such tools are going to contribute meaningfully to conservation.

The presentations focused on: (a) what can be considered critical habitat for marine mammals, (b) the importance of incorporating large, dynamic features and high-seas elements in MPA design, (c) representativeness and connectivity in networks of MPAs, (d) data required to design science-based MPA networks, and (e) scientific tools available for MPA design. Additionally, three case studies were presented: the NPTZCF Highway (Turtle Watch Program), the Gully in Nova Scotia, and the Mediterranean Sea (ACCOBAMS *Ziphius* initiative and Alborán Sea).

One objective of the workshop was to learn from other taxa (besides cetaceans). In this regard, useful input was received from seabird and sea turtle experts. Much of the discussion centered on the importance of considering corridors that connect protected areas and on the large-scale, dynamic features that must be taken into account in the conservation of many oceanic, wide-ranging species of marine mammals.

Summaries of Presentations:

Critical or important habitats for cetaceans: what to protect
Randall Reeves

Critical habitat, as defined in the U.S. Endangered Species Act, does not explicitly refer to migration routes or connecting corridors. Corridors have been largely neglected in the design of MMPAs, which instead have focused mainly on boxes drawn around

"hotspots" of animal occurrence, taking account of political, economic, and social feasibility. However, movement corridors are often critical to long-term population viability, and they may be amenable to management as dynamic protected areas or otherwise protected through temporally and spatially explicit measures. A clear and instructive example, albeit from the terrestrial realm, is provided by the jaguar (*Panthera onca*), a species that, like some cetaceans, has a vast but highly fragmented range. Initially, conservationists regarded the protection of hotspots – basically large areas harboring at least 50 of the big cats – along with buffer zones around them as the optimal approach for conserving jaguars. However, genetic evidence of panmixis in the overall population pointed to the importance of "connecting the dots." Thus, the currently preferred conservation strategy for jaguars is to protect a large network of interconnected corridors and refuges from the US-Mexico border to the southern tip of South America. Corridors, even though they may contain low densities of animals at any one time, are seen as critical in allowing these large cats to wander and maintain their genetic mixing on a continental scale. In this case, as in many others, innovative science (both genetic analyses and satellite tracking) provided vital information on which to base protected area planning. Protected area planners must not allow themselves to become boxed-in by a triage mentality that, before careful study and weighing of evidence, concedes the loss of small areas of low density in favor of large areas with high density.

Among other key questions that should be addressed in protected area planning are: Should currently unoccupied habitat that would be needed to allow population recovery be encompassed within the meaning of critical habitat? And, is it sensible to assume that hotspots of occurrence automatically fall within the definition of critical habitat?

MPA designs: large dynamic features and oceanic species
David Hyrenbach

Protection of organisms and populations in the open ocean requires consideration of dynamic features, often on large spatial and temporal scales. Such consideration, which implies seasonal or annual shifts in MPA boundaries, is a major analytical and logistical challenge. Some useful guidance can be gained from work with other taxa, in this instance sea birds in particular.

The main conceptual challenges are that (a) MPAs are better suited for taxa that concentrate in high densities but with long-distance migrators it is necessary to deal with "corridors," and (b) for highly mobile species, the total range of a population will in most cases exceed the spatial extent of a single protected area, so we need to link MPAs through regional monitoring and management. In terms of methodological challenges, the main ones are the need to accommodate (a) dynamic features and (b) dynamic distributions. This requires an ability to characterize the dynamics and predictability of habitat features and to track and predict the shifting distributions of mobile predators across seasons, years, and decades.

Building networks of MPAs
Colleen Corrigan

Two standard definitions of an MPA network are available. One, from the IUCN World Commission on Protected Areas (2008), defines a network as a collection of individual MPAs or reserves "operating co-operatively and synergistically, at various spatial scales and with a range of protection levels, … designed to meet objectives that a single reserve [or MPA] cannot achieve." The other, from Canada's Federal Marine Protected Areas Strategy (2005), defines a network as "a set of complementary and ecologically linked MPAs, consisting of a broad spectrum of MPAs, established and managed within a sustainable ocean management planning framework and linked to transboundary, global and terrestrial protected area networks."

The main design criteria for an MPA network are: (a) representativeness – whether it covers the full range of biodiversity, including rare and threatened species; (b) adequacy – whether it has the appropriate size, spacing, and shape to ensure viability of populations and systems under varying conditions; (c) connectivity – whether it ensures linkages between sites, e.g., through currents, migrations, or larval dispersal; and (d) resilience – whether it is able to withstand shocks and catastrophes. The main challenges are: (a) determining the size and shape of MPAs within a network; (b) establishing no-take areas; (c) achieving connectivity; (d) minimizing distances between MPAs; and (e) achieving resilience.

The following recommendations are adapted from the resolution on MPAs for 2009-2012, as agreed at the World Conservation Congress in Barcelona in October 2008:

- Clarify terminology, harmonize approaches.
- Clarify objectives, using IUCN categories to the extent possible.
- Strengthen capacity for MPA network establishment, including planning.
- Expand regional, national, and local initiatives.
- Improve reporting.
- Monitor and evaluate progress in the development of MPA networks.
- Evaluate impacts.
- Improve management of MPAs and MPA networks.
- Ensure MPA networks are established with a broader spatial planning and ecosystem-based management framework.

Data required to design science-based MPA networks
Sascha Hooker

Marine mammals are often considered priority species in conservation planning, and offshore "pelagic" MPAs are recommended for them. Although several metrics have been suggested for use in designating such MMPAs, these are often conflicting and unclear. For example, should density hotspots or usage hotspots be used? Will assessment of high trophic-level "umbrella" species provide ecosystem protection? Should multiple species be incorporated using simple biodiversity hotspots or should a form of species weighting based on population viability concerns be used instead?

A doctoral program is currently underway at the Sea Mammal Research Unit (St. Andrews University, Scotland) that aims to develop ecologically rigorous design principles for MPAs based on marine mammal distribution and abundance around the UK. This will involve investigation of the effects of a range of different objectives and constraints on the resulting MPA selections. Ultimately, it is hoped that this work will contribute to the development of objective criteria and thus inform national and international policies on MPAs for wide-ranging marine mammals.

In discussion of this presentation, participants stressed the importance of incorporating population models into such algorithms for MPA design. Also, it was suggested that a principal role of science is to present a range of alternatives to managers, varying from no protection to full protection, and describing the likely impacts of the various alternatives on the species concerned.

Tools available for scientific design of MPAs
Ana Cañadas

There is a hierarchy in the way animals can be represented in analytical space, from a single observation of one animal at a point defined by a set of coordinates, to a much more sophisticated and challenging method of relating density to habitat preferences. As a result, there is a variety of analytical methods available to assist in the design of MPAs. These can range from simple descriptions of where and when animals are and are not observed, to sophisticated modeling with regression models, such as general linear models (GLMs) and general additive models (GAMs), each of which has its own strengths and limitations.

Case study: TurtleWatch - a dynamic closed area advisory for loggerhead turtle bycatch reduction
Jeffrey Polovina

Movement data from satellite tracking of over 200 juvenile loggerhead sea turtles, together with remotely sensed (via satellite) oceanographic information, have been used to describe these turtles' pan-Pacific migration and ocean habitats. The turtles travel and forage along a dynamic chlorophyll and temperature frontal feature that moves 1,000 km north and south seasonally and exhibits interannual dynamics as well. The information was used to develop a weekly map called TurtleWatch that forecasts a zone within the longline fishing ground for swordfish with the highest probability of interaction between swordfish gear and turtles. The map is distributed weekly to fishermen as an advisory product to help them avoid interactions with sea turtles.

Case study: the Gully, eastern Canada
Sascha Hooker

The Canadian Oceans Act (31 Jan 1997) called for MPAs to incorporate one or more of the following: (1) fishery resources, including marine mammals and their habitats, (2) endangered or threatened species, (3) unique habitats, and (4) areas of high biodiversity or biological productivity. A greater diversity and abundance of cetaceans is found in the Gully area than in other shelf-edge or shelf areas off Nova Scotia. Analysis of spatial and

temporal distribution suggested that depth is of most value in describing species distributions and that an MPA should be based on bathymetry.

Productivity of the Gully area was investigated using a simple bio-energetic model for the northern bottlenose whale population found there. The area encompassing whale distribution, the number of whales found there at any time, their estimated energetic requirements, and trophic level, were used to estimate the amount of primary productivity required to sustain the bottlenose whale population. This was found to be much greater than expected, and greater than what has been documented for even the most productive ocean areas. Our findings were interpreted as suggesting that there must be a substantial spatial subsidy into the area and therefore that additional protection is needed at the head and mouth of the Gully and in its feeder canyons.

Case study: two examples from the Mediterranean
Ana Cañadas

- Example 1: ACCOBAMS collaborative effort to map critical areas for beaked whales in the Mediterranean.

Recalling that the aim of ACCOBAMS is to reduce threats to cetaceans in the region and to improve knowledge of these animals, and given the lack of information on beaked whales, the ACCOBAMS Scientific Committee agreed that a modeling exercise should be attempted to characterize habitat use by beaked whales in the Mediterranean. This is a strongly collaborative effort, with many researchers from the region contributing data that are being analyzed using General Additive Models. It is hoped that this initiative will serve as an example and lead to broader, similarly collaborative efforts to identify important habitat for marine mammals, and that this in turn will lead to well-informed conservation measures, including the establishment of more MMPA networks.

- Example 2: MPA proposals for odontocete cetaceans in the Alborán Sea.

Habitat preference modeling, using General Additive Models and 12 years of data, was carried out to identify areas that are used intensively by seven species of odontocetes in the Alborán Sea (SW Mediterranean). This work resulted in a proposal for three SACs (Special Areas of Conservation) for bottlenose dolphins, one Oceanic Area for oceanic species, especially beaked whales, and a large SPAMI (Special Protected Area of Mediterranean Importance) for all species together. It achieved its goal of demonstrating the value of this method for helping define the boundaries of potential MMPAs.

Main Workshop Findings:

- Threats should be considered both in the design and monitoring program of an MPA.
- In order to design MPAs with ecologically meaningful boundaries, it is desirable to consider multiple species with various characteristics in common, particularly with respect to distribution, movements, and threats. Behavior and social systems should also be taken into account in attempting to identify "critical habitat" for the species of greatest interest and concern. Results of spatial (and other) modeling should be integrated into survey design as much as possible.
- A classification system is needed to help assess the effectiveness of MPAs and to avoid giving the public and policymakers a "false sense of security," i.e., an impression that more protection has been achieved than really has been. This will require clear management plans that set measurable objectives for assessing effectiveness. Demographic modeling as well as spatial risk modeling that links protection measures and risk factors with population trends for the species of interest and concern may be useful in efforts to assess MPA effectiveness.
- Much more attention should be given to dynamic physical and biological features of the marine environment when designing MPAs or other spatially explicit management measures (Turtle Watch provides a good example of this).
- Corridors have been largely neglected in the design of MPAs for marine mammals. Instead, the focus has tended to be on boxes drawn around "hotspots" of animal occurrence, often taking into account the feasibility of designation in terms of political, economic, and social considerations. However, corridors used by marine mammals as they migrate or move between "hotspots" can be critically important to long-term population viability. Corridors may be amenable to management as dynamic protected areas or protected through other temporally and spatially explicit management measures.
- When providing advice to policymakers, scientists should offer several options and their likely associated consequences. The options may range from *no* special protection to *complete* protection. In this way, the burden of decision-making is shifted to managers who are accountable via legal, administrative, and political processes.
- It is important to remember that MPA designation is not an end in itself and that management needs to be adaptive. This means that research, monitoring, and evaluation must be ongoing and set within a regional context. Concerns about climate change have made such needs more apparent than ever.

Workshop 3: Getting Stakeholders to Talk to Each Other: Improving the Process

Convener: Ricardo Sagarminaga
Co-chairs: Ricardo Sagarminaga and Ana Tejedor

Participants: Lisa Andon, Olive Andrews, Alain Barcelo, Deborah Benham, Mike Bossley, Elsa Cabrera, Gonzalo Cid, Mike Donoghue, Emily Gaskin, Miguel Iñíguez, Haryadi Itimawan, Jamal, Otto Lee, Christophe Lefebvre, Mick McIntyre, Vincent Ridoux, Philippe Robert, Ricardo Sagarminaga, Ana Tejedor, Jen Vandenur, Trevor Ward, Michael Williams

Overview:

The efficacy of MPAs for the conservation of highly mobile species (which most marine mammals are) has been the subject to much debate over the last decades. Stakeholder involvement is among the key factors highlighted as critical for ensuring that MPAs are effective tools for conservation. Scientists and resource managers often have experience and knowledge appropriate for addressing problems of study design, fishery management, and monitoring. Unfortunately, however, they often lack the skills and experience needed to effectively engage the public and stakeholders in both short- and long-term projects. This makes it difficult for such individuals to ensure that conservation initiatives have broad community support.

Some of the themes of successful consensus-based management are stakeholder identification, communication strategies and tools, building trust, maintaining interest and positive momentum, avoiding conflicts, giving a sense of responsibility and ownership, good structures for management, consultation, and coordination, and finding "win-win" solutions. Considering the economic and logistical challenges of enforcing regulations in the open ocean, such themes are essential to create and implement successful MPAs.

Workshop Goal:

The goal of this workshop was to initiate a discussion among people who deal with the issues of stakeholder communication and involvement in MMPAs. In the process of exchanging perspectives and experiences, participants were asked to focus on the question: How can networking be applied to stakeholder involvement to improve the process?

Summaries of Presentations:

Working with stakeholders in Niue
Olive Andrews

Niue is a small seamount (12 nmi across) with a human population of approximately 2,000. Coastal activities concentrate on the leeward (western) side of the island, where boats are lowered into the swells by crane from the cliffs. Very little is known about cetaceans in the area, but sightings of approximately 50 humpback whales during a 1-week initial survey in 2008 are of great interest. Sperm whales and spinner dolphins also appear to be abundant in these waters, meaning there is good potential for whale watching tourism, limited mainly by travel issues (one flight per week from Auckland). Whale watching licenses are issued only to Niueans, with priority given to Tapu (traditional fishers). No code of conduct is required as there is an "agreement between people and whales." Vessels are allowed to interact with whales for up to one hour.

In 2003, Niue declared its EEZ to be a whale sanctuary and began developing a management plan. At about the same time, however, the island experienced the ravages of a force-5 cyclone. Over-exploitation of fish resources is a major concern to islanders, as the removal of more than 3,500 t/yr from EEZ waters leaves little benefit for them. This is despite the existence of a controversial fish plant on the island. Depredation by cetaceans on longlines is a major concern of fisheries in the region.

A consultation process concerning the Niue cetacean sanctuary began in 2004 and a first draft was completed in 2005. This is the only cetacean sanctuary in the Pacific Ocean belt that currently has a management plan. Major stakeholders involved in planning are the Departments of Agriculture and Fisheries, Tourism, and Culture, the fish processing plant, Nui Dive (currently the only tourism company), Vaka fishing canoe, the SPREP coordinator, and the sport fishing association. Using the SPREP and the New Zealand Cetacean Action Plans as reference documents, the main issues addressed in the plan are fishing, tourism, strandings, pollution, captivity, and boats.

New Zealand
Mike Donoghue

Protocols for dealing with cetacean strandings in New Zealand were presented as a case study to analyze the processes and tools for effective stakeholder communication. Stakeholders involved include government agencies, the national research institution (NIWA), researchers, environmental NGOs, the fishing and aquaculture industries, community groups, and maritime industries such as shipping and oil and gas development. The main subjects of stakeholder interest are bycatch (entanglement), whale watching, strandings, bone retrieval, sanctuaries, and seismic surveys.

With regard to strandings, a key historical event is Queen Victoria's promise to the Maori to respect their ownership of marine riches. Strandings in New Zealand are common events. One of the earliest strandings reported involved 300 pilot whales in 1840. Although the Maori have no tradition of actively hunting whales, they considered stranded animals as gifts from the sea and made use of the products from carcasses. The

promise by Queen Victoria surfaced in the early 1990s, when there was growing tension between the desire on the part of non-Maori New Zealanders to "save" stranded whales and the Maori claim to the rights to use the animals. The "hands off they're ours" claim resulted in a protocol coordinated by the Department for the Environment. Animals stranded alive will be rescued only if feasible. Otherwise, controlled euthanasia will be considered and carcasses handed over to Maori for utilization (bones).

This case study highlights some of the basics of effective stakeholder management, as follows (also see www.doc.govt.nz):

- The "people side" of issues is often overlooked but it has to be addressed (in Pacific islands, people and communities own the land, sea, reefs, etc.).
- Due consideration needs to be given to deciding where the most benefits lie in setting up managed relationships.
- Know and seek to understand stakeholders and their concerns;
- Social science research is often highly relevant.
- Seek to understand the social and economic context, particularly in poor communities.
- Consider both the barriers to and the incentives for developing relationships;
- Figure out what can be bargained.
- Try to follow the "gifts and gains" principle and focus on what people stand to gain rather than lose.
- Document the purposes of relationships.
- Develop and maintain systems to support relationships, always based on clarity and honesty.
- Ensure that everyone understands the state of play, i.e., find a common language.

In summary, it is important to (a) find the most effective approaches and avoid letting the loudest voices stand out or prevail, (b) always remember to support those who support you, (c) share information and stick to the truth, (d) provide feedback openly, promptly, and consistently, and (e) assess the state of your relationships regularly.

Santa Cruz province, Argentina
Miguel Iñíguez

Bycatch of Commerson's dolphins in fisheries is a longstanding conservation concern in Argentina. At present, the gears most often involved are coastal gillnets, trammel nets, and midwater trawls. Between 1999 and 2000, 66 Commerson's dolphins were found dead on La Angelina beach and along the shores of Ría Gallegos in the Argentine province of Santa Cruz. Strandings are most frequent between August and February, when there is a high degree of overlap between gillnetting and the occurrence of these dolphins. The following process was followed in order to address the situation:

- An assessment concluded that the estimated average annual catch of 179 dolphins was high in relation to the small population of dolphins in the region. The assessment also noted the lack of a legal framework at the provincial level to address the bycatch issue, and the fact that illegal fishing operations were involved.

- After a year of negotiations with relevant authorities for emergency measures, a provincial law (No. 2582) was passed in July 2001 declaring Commerson's dolphin to be a Provincial Natural Monument (the highest possible protection status). This gave the local resident dolphin populations protection from deliberate capture, but the province does not have regulatory authority over gillnet fisheries.
- In September 2001, based on the incidental catch levels of Commerson's dolphins and seabirds in previous years, the Subsecretariat of Fishing and Port Activities issued regulations (Disposition No. 195) that prohibit fishing with passive nets in certain areas between 1 October and 7 December. A few years later, the problem at La Angelina beach was "solved" when a farmer decided to close the passage needed by fishermen to reach and operate in the area where Commerson's dolphin bycatches were concentrated.
- The search has continued for solutions that would allow fishing to proceed without resulting in the deaths of Commerson's dolphins. This search for lower-risk or alternative fishing methods promises to benefit other species besides the Commerson dolphin (e.g., Magellanic penguin and great grebe). Genetic analyses indicate that a precautionary approach to management of the Commerson's dolphin bycatch would be to recognize three relatively isolated management units: Ría Gallegos–La Angelina, Bahía San Julián, and Ría Deseado.

During the process outlined above, a major crisis erupted when a television station used the dolphin bycatch issue to "attack" the affected fishing sector. Therefore, this case study indicates the need to manage the mass media as well as the stakeholders and, equally important, the importance of working to accommodate the legitimate needs and interests of fishermen and their families.

Blue whale conservation, gaps, and challenges of MPA policies in Chile
Else Cabrera

Waters off northwestern Isla de Chiloé, southern Chile, host a major feeding aggregation of blue whales during the austral summer. Human activities in the area include intensive salmon farming, industrial fishing, and maritime ship traffic. An initial effort by Chilean authorities to establish an MPA for the conservation of blue whales in the region was unsuccessful due to the lack of an appropriate national legal framework and, perhaps more importantly, because of a flawed process of public participation. The proposal failed to consider blue whale distribution, habitat use, and threats, and it exempted from future regulations all fishing operations (both artisanal and industrial) and aquaculture facilities already established in the area. Complaints from stakeholders regarding technical, environmental, and socio-economic aspects of the proposal led the government to postpone adoption until "all sectors are adequately involved." This was viewed as a positive outcome because adoption under the terms proposed, creating a paper MPA with no management plan and with regulatory exemptions for potentially harmful activities, would have set an unfortunate precedent.

Postponement of MPA adoption has created an opportunity for researchers and managers to identify gaps and challenges that need to be addressed before a truly effective MPA network can be established in Chile. Hopefully, this will lead to a national

policy on MPAs, including MMPAs. The current crisis centered on the salmon farming industry and its environmental impacts in southern Chile is mainly a result of accelerated and unregulated development. It, too, is best seen as an opportunity to promote adoption of conservation measures that include strict regulation of Chile's massive salmon aquaculture industry.

In summary, (a) a stalled MPA initiative and an aquaculture crisis are both best viewed as opportunities for making progress in the development of better MPA policies, (b) a joint effort by NGOs and artisanal fishing communities has proven to be a catalyst for positive change, (c) it is preferable to view the 2012 MPA goals as an opportunity for improved MPA policy development rather than a pressure factor for creation of more paper MPAs, and (d) more support is needed from international groups and individuals.

Pelagos
Philippe Robert

One of the main challenges facing the Pelagos Sanctuary in the Mediterranean has been to change deeply entrenched attitudes and human behavior toward cetaceans. Fishing, maritime traffic, boat races, and tourism are major concerns because of their effects on cetaceans, but these activities are also extremely important socio-economically. Major objectives currently identified for the sanctuary are to (1) change human behavior, (2) develop and carry out projects or actions that will galvanize public support, (3) raise awareness among decision-makers, (4) harmonize the management plan, and (5) conduct socio-economic analyses.

Whale watching in the sanctuary is promoted as nature tourism more broadly in order to prevent customer dissatisfaction when cetaceans are not sighted. A voluntary "quality labeling" trial is currently underway for whale watching operations in the sanctuary. A training workshop is organized annually to give whale watch operators a chance to exchange ideas and improve their industry. To address the threat of ship strikes, ferry companies and local research and conservation groups have begun trials of a system in which vessel captains are informed, in "real time," of the presence of whales on their track. This REPCET system involves observers and a communication system to which three ferry companies are currently subscribed.

Improved stakeholder relationships and involvement are clearly needed for this sanctuary to function effectively. The current vision is to develop a charter in direct collaboration with stakeholders. This means meeting around the same table and discussing working documents prepared in advance by managers. Guidelines for the conduct of various human activities should be developed from this process, followed by training courses, annual assessments of progress, and adaptive changes to the guidelines and other agreed measures. The sanctuary should provide tangible support to stakeholder activities (e.g., informational brochures, advice on legal, scientific, or technical matters). Strategic use should be made of the media, with due regard for the need to give appropriate credit to all parties, not just stakeholders and not just sanctuary management. Specific projects or events in which scientists or technical specialists work directly with managers (e.g., a diving event with a specified objective) could be used to draw public attention and strengthen the capacity of the sanctuary staff. Finally, it is

important that stakeholders be able to communicate and interact with a responsible individual who represents the sanctuary's interests and positions and who is able to make things happen.

Moray Firth, Scotland
Deborah Benham

The Dolphin Space Program (DSP) (see www.dolphinspace.org) is a voluntary code of conduct and accreditation scheme for dolphin-watching boats in the Moray Firth. Development of this program has benefited from Benham's experience in Monterey Bay National Marine Sanctuary, where she worked with local stakeholders to investigate the disturbance of sea otters by recreational activities and develop guidelines for responsible viewing. When she joined the DSP in 2005, the program had been running for ten years but was not effective for several reasons, including discontent with the code of conduct, a perceived lack of benefits from the DSP scheme to tour operators, poor communication, and the persistence of old grievances between some stakeholders.

Many of the entrenched conflicts and issues have been resolved by using techniques such as "storytelling," "story listening," increased face-to-face meetings, collaborative workshops, and "walking in each other's shoes." These techniques have led to increased compliance with the DSP code of conduct, improved support for the DSP from its tour operator members and steering group, and more effective ongoing collaborations. The lesson is that sometimes at least, simple techniques such as serious, respectful listening to stakeholders, trying to understand their point of view and the challenges they face, and taking their "stories" into account, can go a long way toward improved MPA effectiveness.

One of the challenges of employing this "method" is that it requires a budget to support a person who can coordinate the ongoing, in-depth communication and interaction with stakeholders. Also, some stakeholders may not wish to engage in such communication and interaction, preferring instead to simply continue their activities as they always have. In such a situation, managers may find it helpful to try to spend social time with these types of stakeholders in hopes of breaking down barriers and allowing people to relate as individuals. This can increase the willingness of people to work together.

Alborán case study
Ana Tejedor

A multi-faceted stakeholder involvement process was developed in the Alborán Sea for the transport, defense, fishing, and tourism sectors. Also, a "stakeholder involvement task" was carried out in 2007 within the framework of the OSPAR Convention. Some of the main lessons learned from these processes were as follows:

- Involving stakeholders from the beginning is fundamental, as it may –
  - Provide or otherwise make available relevant data and information.
  - Clarify errors and misunderstandings in data and information.
  - Make management measures operational.

- Identify solutions to conflicts or apparent conflicts between stakeholder interests and nature conservation objectives.

- It is impossible (or at least hazardous) to generalize (local circumstances exist for all MPAs), but –
  - There are basic common-sense rules.
  - Transparency and shared goals are crucial.
  - Ongoing dialogue is important, as is respect for and adherence to commitments.
  - Never underestimate the power of public opinion.
  - Build on trust.
  - Search for "win-win" situations.
  - Relationships can change and reputations can improve;
  - It is always a good idea to build social capital (i.e., public support) so that it is available when the next challenge comes along (most social capital comes from shared decision-making, but government agencies often do not have clear policies about sharing control and responsibility).
  - Simple techniques can be helpful at the regional level.
  - When it comes to high-seas governance, the same principles apply even though the "puzzle" may be different.

Workshop Conclusions:

It was recognized that public participation is an important aspect of environmental decision-making in much of the world. For example, in Europe all the federal agencies are required to encourage public participation and to provide access to all relevant information, in keeping with the provisions of the Århus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters. Socio-economic factors are among the primary determinants of the success of MPAs, and therefore stakeholder involvement in the development and implementation of MPAs is essential. In spite of this, most agencies dealing with MPAs are just beginning to learn how to design and conduct effective participatory processes.

The following items were highlighted by the workshop:

- Stakeholder involvement and communication cannot be considered an appendix to management, but rather must be overseen and conducted professionally, with the costs of consultation included in budgets from the outset.
- Social, economic, and cultural assessments must be regarded as equally important to other areas of research. They may serve as first steps toward a sound relationship with stakeholders.
- An inadequate stakeholder involvement process, including leaving out a key stakeholder group, can have lasting effects and undermine even the most scientifically robust management plan or MPA strategy. A plan and strategy for identifying and engaging stakeholders are necessary to (a) ensure feedback, (b) maintain positive momentum, (c) avoid overloading stakeholders, and (d) close gaps in communication.

- In negotiations with stakeholders, it is important to develop a common understanding of real resource needs; set clear, shared objectives; and not allow predetermined negotiating positions or the most vocal individuals to dominate discussions. With regard to the latter, effort should be made to control and take advantage of their energy in order to drive discussions and outcomes in a positive and not divisive direction.
- Coordination is vital. Communities vary in their willingness and ability to "consult." Particularly in small rural communities, stakeholders are often involved in multiple consultations regarding access to their resources and the use of those resources by non-governmental organizations and government agencies. Thus, community consultations must be coordinated to avoid overloading and duplication, which can lead to "consultation burn-out." There is also a risk that, especially when stakeholders depend on the consultation process for income, that process itself will become a kind of "new economy."
- Monitoring of the stakeholder plan and strategy is necessary to identify issues that need to be addressed and to maintain positive momentum. Assessing and managing stakeholder expectations is essential in order to avoid problems. Providing the feedback necessary to stakeholders, not too little but also not too much, is essential.
- Scientists and conservationists must translate their products in order to establish good communication with stakeholders. Furthermore, they should always be modest and demonstrate genuine respect and appreciation for the perspectives, cultures, and knowledge of key stakeholders, such as fishermen and local communities.
- Honesty, transparency, and trust are too often neglected in stakeholder communication and interactions. Listening to stakeholders' concerns, acknowledging their contributions and their understanding of marine resource issues, and trying to put oneself in their shoes are essential for maintaining long-term stakeholder support.

Stakeholder participation processes can be categorized at four levels, which can progress from (1) information gathering, to (2) consultation (where the views of stakeholders are actively requested and used to shape decision-making, to (3) shared decision-making (where solutions to specific issues or problems are sought cooperatively and collaboratively), to (4) identifying and involving key personalities who are able to build bridges and trust among participants (gatekeepers).

Networking – Key Messages Emerging from the Workshop:

Sharing experience and technology: Important issues such as the development of bycatch mitigation methods and the use of special communication tools (e.g., storytelling, websites, "dialogue matters") would benefit from better networking among MMPAs.

Common populations – common threats: Fishing fleets (e.g., European Community fleets operating in Pacific Ocean) and other industries (e.g., salmon farming in Chile, oil industry, maritime shipping) are often major subjects addressed in MMPA management plans and strategies. Therefore, in a global context, networking could be useful for engaging such stakeholders at an international level.

Workshop 4: Exploring the Role of Culture (Indigenous, Historical, Modern) in Managing MPAs

Convener: ʻAulani Wilhelm

Participants: Lisa Andon, Lui Bell, Francis Hickey, Vicky Holt-Takamine, Viliamu Iese, Takiora Ingram, Sol Kahoʻohalahala, Tatiana Lee, Theresa Mundita S. Lim, Kepa Maly, Kauahi Ngapora, Kalei Nuʻuhiwa, Sue Taei, Moani Pai, Athline Clark, Nik Pavlov, Tiare Holm, Naomi McIntosh, Juney Ward

Presentation: *Culture and Protection of Humpback Whales: a Maui Perspective*
Kalei Nuʻuhiwa, Papaku Makawalu (Hawaiʻi)

Panel Discussion: *Hawaiian Perspectives and Reflections*
Sol Kahoʻohalahala, Maui County Councilman (Hawaiʻi)
Vicky Holt-Takamine, Kumu Hula, Pua Aliʻi Ilima (Hawaiʻi)
Kepa Maly, Executive Director, Lanaʻi Culture & History Center (Hawaiʻi)

Presentation: *The Whale Watch Story*
Kauahi Ngapora, Chief Operating Officer, Whale Watch Kaikoura Ltd. (Aotearoa/New Zealand)

Summary and Purpose:

Traditional Ecological Knowledge (TEK), historical ecology, and local knowledge are quickly becoming trends in academia and resource management as "tools" to improve the status of species, habitats, and ecosystems, either through policy or direct management. What is the role of culture (indigenous, historical, modern) in marine management? Can the differences between scientific and traditional or local perspectives be overcome and these two knowledge systems integrated on a practical basis to yield more nearly comprehensive approaches to marine management? How can managers incorporate indigenous or local knowledge and practices into marine mammal species and habitat management to be more successful? How can we build upon traditional networks and linkages among indigenous people (e.g. across the Pacific, North America, or the Aleutian chain) and ways of relating to help foster communication, collaboration, and linkages among MPAs to set forth and strengthen management strategies specific to marine mammals? How can strengthened indigenous networks result in strengthened marine mammal protection (particularly where resident species are the same, migratory species and populations are shared geographically, or the same animals breed in one area and forage in another)? While the scientific perspective often differs from the traditional perspective, both have an important role to play in contemporary resource management.

The goal of this workshop was to capture shared understandings, conclusions, and recommendations that would help managers incorporate indigenous, historical, and local knowledge and resource management practices into the management of marine mammals and their habitat. An emphasis was placed on the engagement of indigenous and local communities in marine mammal "management" and how traditional ways of

networking, often still used among indigenous communities, can foster communication, collaboration, and linkages among MMPAs.

Participants agreed on the following key messages and recommendations.

Key Messages:

- Recognizing indigenous knowledge – in all of its diversity – is just as important as science in the design and implementation of MPAs. There is a huge diversity and wealth of traditional knowledge (including practical, management-relevant knowledge) about marine mammals that could be drawn upon to inform scientific enquiry. We consider our cultural practices to be as scientific as western/modern methods and practices.
- Across the Pacific Ocean, whales and indigenous peoples have a shared culture of connection**,** a shared culture of migration, and a shared culture of loss. Further, the interactions of Pacific peoples with marine mammals were often governed by clear rules and protocols (e.g., in regard to stranded animals), extensive knowledge of these animals, and respect for them as treasured, ancestral creatures. Today, these connections remain and transcend modern partitioning of the ocean and the way it is governed. Incorporating the diversity of cultural knowledge and perspectives is a potential way to unite efforts, including the development of MMPAs and particularly strengthening MMPA networks.
- The design and development of MPAs should be based on local needs and knowledge, not only on the need to protect biodiversity. Local and cultural stakeholders should be directly involved and consulted in the development and ongoing management of MPAs.
- Recognizing and including traditional knowledge in planning processes and implementation of MPAs is also conservation of culture.
- Traditional marine tenure systems should be used to enhance the management of marine mammals, including where government capacity to fulfill this role is lacking.
- We collectively claim our traditional/indigenous knowledge for ourselves and will not wait for others to recognize that knowledge. We will integrate the use of our knowledge to enhance marine mammal management at any appropriate opportunity.

Key Recommendations:

- Cultural values and knowledge of marine mammals and the need to protect them – sometimes through MPAs – transcend modern political boundaries (e.g. EEZs) that have led to artificial divisions among us. Cultural links throughout the Pacific may be the key to overcoming these divisions and may help us unify management efforts regionally and internationally.
- A united Pacific voice is needed to recognize what has been lost and what has been taken through the harvest and exploitation of our ancestral treasures, including marine mammals, and to foster guardianship across the ocean to promote species recovery.

- There is a need to establish an international network to share, perpetuate, and support traditional knowledge and marine mammals. Networks and linkages among indigenous people need to be strengthened and supported to enhance marine mammal protection (particularly where resident species are the same, migratory species and populations are shared geographically, or the same animals breed in one area and forage in another). Capacities among indigenous communities differ and need to be supported. Such networks can add value to the more established scientific networks for the improved design and management of MMPAs. Such networks may also assist in further advocating for the protection of intellectual property rights over our knowledge.
- Partnerships among governments, communities, and NGOs regarding the management of MPAs should be strengthened to assist in the integration of traditional and local knowledge into management planning and implementation.
- Indigenous people need to be represented on national delegations to international bodies (such as the International Whaling Commission) and integrated into the international debate on marine resource management.

Specific Recommendations to the Conference:

- Sessions (plenary sessions, panels, and workshops) should be integrated to provide both scientific and cultural perspectives alongside each other in addressing issues related to MMPAs.
- A half-day workshop focused on culture and traditional knowledge was insufficient. Whole day sessions or a series of sessions should be planned in the future.
- More indigenous managers and researchers should be represented on the conference organizing committee and involved in the planning of future conferences. These managers and researchers should be more prominently featured alongside scientific presenters in future conferences and meetings.
- The conference was overly focused on the role of science in MMPA development and management. More attention should be paid to the role and value of traditional and local knowledge as well as cultural values of cetaceans in the interest of providing and fostering a more holistic perspective.
- The term MPA/MMPA may be modified to MMA/MMMA (Marine Managed Area – triple "M"A). The term MPA is often perceived as promulgating a more western approach while undermining the more holistic traditional approaches to management. The term MPA also does not easily give value to indigenous views that include humans as integral parts of the ecosystem, with sustainable use as one management option.

Workshop 5: MMPAs and MMPA Networks for Monk Seal Conservation: Hawai'i vs. Mediterranean

Convener: Lisa Van Atta

Participants: Bud Antonelis, Bob Braun, David Cottingham, Doug DeMaster, Krista Graham, Harun Guclusoy, Thea Johanos-Kam, Alexandros Karamanlidis, Spyros Kotomatas, David Laist, Charles Littnan, Giuseppe Notarbartolo di Sciara, Rosa Pires, Randall Reeves, Teri Rowles, Jeff Walters, Michelle Yuen.

Workshop Goal:

To identify topics for which capacity building and collaboration among managers and researchers will aid the recovery of monk seal populations.

Summary of Findings:

This workshop provided a unique opportunity for monk seal researchers and managers from Hawai'i and from several Mediterranean monk seal range states (specifically Greece, Turkey, and Portugal [Madeira]) to present and share current information. In-depth discussions revealed successes and failures, shared challenges, and great potential for further interaction among individuals involved in the conservation of these two critically endangered species (the Hawaiian monk seal and the Mediterranean monk seal).

Short-term Recommendations:

- Protocols and documents currently used to guide Hawaiian and Mediterranean monk seal recovery activities should be shared. Recovery efforts will be enhanced and ongoing issues and challenges will be better addressed by maintaining regular communication and by conducting biennial *Monachus* workshops in conjunction with conferences of the Society for Marine Mammalogy.
- Specific items of information exchange should include –
  - Methods for characterization of habitat and resources essential for reproduction and foraging success of monk seals, e.g., telemetry devices, animal-borne camera systems, capture and chemical immobilization techniques.
  - Protocols for enforcement and protection of MMPAs (e.g., VMS within MMPAs).
  - Procedures for stock assessment and population monitoring, e.g., sampling design for data collection and analysis, techniques of collection and storage of genetic samples.
  - Techniques for health evaluation, rehabilitation, and release, e.g., protocols for neonates, juveniles, sub-adults, and adults; plans for response to unusual mortality events.
  - Strategic plans for building public support for conservation and recovery of monk seals and for assessing success, e.g., outreach and education

materials, organizational structure of participating agencies and organizations.

Long-term Recommendations:

- Secure greater representation for *Monachus* recovery efforts in IUCN and its networks.
- Build capacity and expertise through exchange programs designed to train managers and scientists (e.g., in the care and husbandry of abandoned neonatal monk seals).
- Design strategic plans to build stakeholder support and enhance funding for support of MMPAs and *Monachus* recovery (e.g., fisheries, tourism);
- Develop a classification system for types and levels of protection provided by MMPAs.

Workshop 6: Creating Regulations that Actually Work: Enforcement vs. Education

Conveners: Lisa Van Atta and Anne Walton

Participants: Harun Guclusoy, Spyros Kotomatas, Jayne LeFors, Ed Lindelof, Jason Philibotte, Jeff Pollack, Eric Roberts, Jeff Walters, others.

Overall Workshop Approach and Content:

The first part of the workshop consisted of a structured discussion of marine mammal protection rules and regulations in MMPAs, with examples from different countries. The goal was to identify measures that are working and are not working, and to find ways of improving those measures that could work but are not working at present. The emphasis of this part of the workshop was on rules, regulations, and enforcement.

The second part of the workshop approached the issue of effectiveness from a different angle: "interpretive enforcement." The emphasis here was on building awareness and understanding in order to change human behavior in MPAs. This was seen as complementary to the more legalistic or enforcement approach.

Rather than producing a series of formal presentations, with summaries, conclusions, and recommendations, this workshop simply provided an opportunity for practitioners to examine and consider case studies, including successful long-term models where human behavior in MPAs had been changed through on-the-water outreach efforts.

Titles of Presentations:

- Guarding a Greek MPA: Experience from an 11-year "Pilot" System. Spyros Kotomatas, MOm, the Hellenic Society for the Study and Protection of the Monk Seal, Greece.
- Optimizing Enforcement Across Multiple Jurisdictions. Jeff Walters, Co-Manager Hawaiian Islands Humpback Whale National Marine Sanctuary, State of Hawai'i Department of Land and Natural Resources.
- Enforcement Experiences in a U.S. Marine Mammal Protected Area. Jeff Pollack, Special Agent and Liaison to the Humpback Whale Sanctuary and NWHI Monument, NOAA Office of Law Enforcement; and Eric Roberts, Marine Protected Species Program Manager, and Marine Mammal Response Coordinator U.S. Coast Guard, D14, Enforcement Branch.
- Interpretive Enforcement as an Approach to Voluntary Compliance. Anne Walton, NOAA/National Marine Sanctuary Program, International MPA Capacity Building Coordinator; and Jason Philobotte, Coral Reef Resource Management Specialist.

Interactive Exercises (led by Anne Walton and Jason Philobotte)**:** Identification of Target Resources; Inventory of User Groups, Threats Analysis; and Identifying Approaches to Interpretive Enforcement.

Recommendations/Key Points (from enforcement portion of workshop):

- Given the lack of resources, we need to look beyond what we may consider "traditional enforcement" for innovative solutions to enforcement issues.
- Sometimes the best deterrence is simply "presence on the water" or within the protected area. A general recommendation is to build capacity for enforcement and thus increase such presence.
- At the next ICMMPA, a symposium should be convened that brings together more case studies, new technologies, and additional participants who work on enforcement issues.
- Enforcement of existing laws and regulations is critical to the proper functioning of MPAs.

Appendix 1. List of Training Sessions

Training 1 & 2: Stranding, Entanglement and Health Assessment (Teri Rowles, David Mattila, Ed Lyman)

Training 3 & 4: A Management Planning Framework for MPAs (Anne Walton)

There was no Training 5, 6 & 7.

Training 8: Monitoring MPAs to Achieve Success – MPA Check-up and Review (Gonzalo Cid)

Training 9: Marine Guides and Interpreters (Deborah Benham)

Training 10: The Role of Education in the Community and on the Water (Deborah Benham and Patty Miller)

Appendix 2. List of Species Names

CETACEANS
Amazon River dolphin or boto, *Inia geoffrensis*
Antarctic minke whale, *Balaenoptera bonaerensis*
Blainville's beaked whale, *Mesoplodon densirostris*
Blue whale, *Balaenoptera musculus*
Bryde's whale, *Balaenoptera edeni/brydei*
Commerson's dolphin, *Cephalorhynchus commersonnii*
Common bottlenose dolphin, *Tursiops truncatus*
Common minke whale, *Balaenoptera acutorostrata*
Dusky dolphin, *Lagenorhynchus obscurus*
Dwarf minke whale, *Balaenoptera acutorostrata* (subspecies)
False killer whale, *Pseudorca crassidens*
Fin whale, *Balaenoptera physalus*
Finless porpoise, *Neophocaena phocaenoides*
Ganges River dolphin, *Platanista gangetica*
Gray whale, *Eschrichtius robustus*
Harbor porpoise, *Phocoena phocoena*
Hector's dolphin, *Cephalorhynchus hectori*
Humpback whale, *Megaptera novaeangliae*
Indo-Pacific bottlenose dolphin, *Tursiops aduncus*
Irrawaddy dolphin, *Orcaella brevirostris*
Killer whale or orca, *Orcinus orca*
La Plata dolphin or franciscana, *Pontoporia blainvillei*
Marine tucuxi or Guiana dolphin**,** *Sotalia guianensis*
Maui's dolphin, *Cephalorhynchus hectori maui*
North Atlantic right whale, *Eubalaena glacialis*
Northern bottlenose whale, *Hyperoodon ampullatus*
North Pacific right whale, *Eubalaena japonica*
Sei whale, *Balaenoptera borealis*
Southern right whale, *Eubalaena australis*
Sperm whale, *Physeter macrocephalus*
Spinner dolphin, *Stenella longirostris*
Vaquita, *Phocoena sinus*
Yangtze River dolphin or baiji, *Lipotes vexillifer*

PINNIPEDS
Hawaiian monk seal, *Monachus schaunislandi*
Mediterranean monk seal, *Monachus monachus*
New Zealand fur seal, *Arctocephalus forsteri*
New Zealand sea lion, *Phocarctos hookeri*

SIRENIANS
Dugong, *Dugong dugon*

Appendix 3. List of Marine Mammal Protected Areas

A directory of all proposed and existing marine mammal protected areas up to 2005 is currently available on the website www.cetaceanhabitat.org, based on the tables in Hoyt, E. 2005. *Marine Protected Areas for Whales, Dolphins and Porpoises*. Earthscan, London, 516pp. This volume is being updated for a new 2011 edition and after the publication of the book, the website will be updated as well.

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