IDENTIFYING PRIORITY CONSERVATION AREAS FROM BAJA CALIFORNIA TO THE BERING SEA

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SUMMARY

Conservation in the sea is similar to conservation on land; protecting places and species requires identification of appropriate targets for conservation. Many species range across international boundaries suggesting that effective conservation needs to be implemented at both the international level as well as the local level. Here we summarize a tri-national effort between Canada, Mexico and the United States, facilitated by the Commission for Environmental Cooperation of North America (CEC) and Marine Conservation Biology Institute (MCBI), to identify priority conservation areas for the Baja California to Bering Sea region. Criteria for selecting ecological significant regions were based on protecting biodiversity at the North American scale. Priority conservation areas were identified based on current human threats and opportunities for international collaboration.

The method of assessing priorities was designed to achieve three major goals: 1) to identify regions at the continental scale of high ecological significance (ESR); 2) within the ESR's to identify areas that because of current human threats and opportunities for international collaboration were priorities for conservation action (PCAs); and 3) to provide thorough documentation of each PCA.

INTRODUCTION

From the Gulf of California with its deep canyons, nutrient-rich upwellings and high levels of endemism, to the 20,000 km of bays and inlets, upwelling zones and inland drainage systems of the Pacific Northwest, to the high productivity of the Bering Sea; the west coast of North America is home to unique and important shared marine environments. It is also home to a great number of shared marine species – such as the Leatherback Turtle, Bluefin Tuna and Pacific Gray Whale that migrate thousands of kilometers, moving through country and state/provincial/territorial borders without hesitation. Hence, be it through shared species or ecosystems, the marine environments of Canada, Mexico and the United States are intricately linked. Accordingly, action or inaction on one side of a border will have consequences to the shared living organisms and the boundless ecosystems.

In recent years, conservation strategies, noting past failings to stem the tide of extinctions, have focused to a greater degree on large-scale ecosystem approaches (e.g., Wildlands Strategy, World Wildlife Fund's Global 200). Efforts such as these recognize four critical aspects necessary to conserve species and processes, 1) conserving species and processes that require the greatest area to persist, 2) conserving widespread species and continental phenomenon, 3) quantifying patterns of beta diversity and endemism, and, 4) predicting the location and intensity of threats to biodiversity (8). Large scale efforts also require mapping important areas for conservation such as biodiversity hotspots and other conservation priorities in order to set priorities for action (6, 9)

Although many conservation efforts and sustainable development initiatives exist at different scales along the Pacific Coast of North America, they generally work independently of each other. Unless these efforts are coordinated, species numbers will continue to dwindle and ecosystem integrity will continue to be at risk. The successful conservation of the North American seascapes, therefore, requires collaborative action from all three countries and from a wide array of sectors of society.

The North American MPA Network of the CEC represents one initiative to facilitate a tri-national initiative between Canada, Mexico and the United States of America. Here we detail efforts to set a course for conservation in the B2B region by identifying areas of highest conservation priority in the marine realm of the west coast of North America.

1. BACKGROUND

1.1 International Cooperation

In the North American MPA Network, a tri-national initiative, the countries collaborate to safeguard ecological linkages and conserve marine biodiversity and productivity throughout the exclusive economic zones (EEZ) of the three nations. Many organizations and agencies contribute to this initiative, including the CEC and MCBI. The CEC is an international organization created by the governments of Canada, Mexico and the United States to implement the North American Agreement for Environmental Cooperation, a side agreement to the North American Free Trade Agreement (NAFTA) to address common environmental concerns at the tri-national level. Similarly at the World Summit for Sustainable Development in September 2002, participating governments including Canada, Mexico and the US – committed to implementing networks of representative MPAs by 2012.

1.2 Baja California to the Bering Sea (B2B)

In 2000, the CEC identified the Baja California to Bering Sea region as one of its Priority Regions for Biodiversity Conservation Regions of North America[1]. The B2B region was also advanced as the first test case for the CEC to implement its strategic plan in the marine environment[2]. In May 2001, MCBI and CEC convened a workshop in Monterey, California, where tri-national scientific experts and marine conservationists identified the types of baseline data that are required for conservation in the B2B region. They agreed on the need for identification of priority conservation areas as a step in a larger continental-scale network of protected areas. They also reached consensus that biodiversity protection at the genetic, species and ecosystem levels was the goal of these sites. To the extent possible, the underlying basis for identifying these areas was to be data driven. This led to an exploration of consistent resolution data sets available across the entire B2B region. The consensus of this workshop was that only 5 data sets – bathymetry, shoreline, and satellite derived measures of productivity (chlorophyll-A), sea surface temperature and altimetry (sea surface height used to derive surface currents) – offered reasonable potential for a B2B scale analysis. Among other issues that were significant to this identification process were the role of spatial scale in the analysis, regional data gaps (e.g., higher resolution bathymetry), incorporation of previous priority setting efforts, and dealing with anthropogenic threats (7).

In June 2002, MCBI in collaboration with the CEC, Ecotrust and Surfrider Foundation organized a “Data Potluck” workshop in Portland, Oregon. In this workshop, nearly 80 representatives from 30 organizations offered and exchanged 12 data sets which appeared relevant to the spatial scale of the B2B region, and stressed the need to obtain high resolution bathymetry (Appendix 1; none actually cover the entire B2B geographic region). The participants

[1] http://cec.org/trio/stories/index.cfm?ed=2&ID=18&varlan=english
[2] http://cec.org/pubs_docs/documents/index.cfm?varlan=english&ID=1088

agreed that the concept of a conservation priority must include not only the biodiversity value, but also the threats and opportunities to the area.

MCBI gathered the data contributed to the potluck and compiled it into a CD-ROM in GIS format (4, Canny and Morgan 2002). This compilation of information was used as a guide to conservation decisions at the continental scale in the B2B region.

3. IDENTIFYING PRIORITY CONSERVATION AREAS

3.1 The Workshop

In April 2003, MCBI and the CEC led a three-day workshop at Simon Fraser University, British Columbia, Canada, where a tri-national group of marine experts from government agencies, NGO's, academia, and regional conservation initiatives in Canada, Mexico and the U.S. met to identify Priority Conservation Areas (PCAs) in the B2B region. These experts represented interests from government agencies, academia, and regional conservation initiatives. A team of GIS experts from MCBI and the Geography Departments of Simon Fraser University and McGill University were also present to provide technical support for the mapping work.

The participants were briefed as to the history of the B2B initiative process, goals of the workshop, definitions of key terms such as 'priority conservation areas,' and data available to them in spatial format. Workshop organizers presented data from the B2B 1.0 CDROM to the participants, and individual experts made presentations to brief others on a range of species and areas of concern. These presentations included topics such as bathymetry, sea surface temperature, altimetry, species hotspots, threats from human activities, and on-going conservation activities in each of the three nations. In addition, analyses of seamount density, benthic complexity (1) frontal density (sea surface temperature fronts) (11), primary productivity and altimetry (sea surface currents and mesoscale oceanographic eddies derived from sea surface height) phenomenon were presented. These analyses synthesized selected large scale data sets to highlight regions of unique benthic and pelagic features (Figures 1a, b & cmorgan figure.doc).

Next, participants participated in a 2 day consensus mapper roundtable workshop. Consensus mapper is a procedure that allows exploration of spatial data, discussion of decision priorities and mapping of ecologically significant regions. The roundtable permits experts from different fields of expertise with shared interests to clarify their common understandings while those with divergent interests can clarify their points of disagreement and work towards compromise. This system was developed by Community-Based Environmental Decision Support at McGill University (5,2). The advantages of this collaborative mapping methodology include the following:

- Facilitates collaboration and consensus building within a dynamic social setting
- Structures and documents the stakeholder participation process
- Incorporates inputs and policies at various levels of spatial aggregation
- Encourages spatial thinking and exploration of environmental issues
- Provides feedback into the decision-making process
- Integrates data from expert sources
- Manages the technical and social network of the participation process
- Facilitates collaborative monitoring of decision actions.

Following an overview of the data available and instructions from the workshop facilitators, experts learned how to use consensus mapper, a simplified version of the ArcView software. Finally participants were assembled into expert working groups. The workshop was conducted as

a series of break-out sessions for mapping, and plenary discussions to review progress. The organizers also informed the participants that the end product of this workshop would guide the three nations' governments in their joint conservation initiatives as well as provide a framework for regional conservation efforts and programs.

During the workshop experts engaged in several exercises to identify PCAs. In order to identify priority conservation areas, the experts first identified ecologically significant regions (ESRs) in the B2B extent. The experts were asked to base ecological significance on the data available and their personal knowledge of species, habitats and other oceanographic features in the B2B region. This was determined by several factors, including continental endemism, high beta-diversity, significance to migratory species, and productivity, and was consistent with other approaches (3, 10) that suggest capturing areas that contain examples of major habitats, diverse types of habitats, regional representation, rare and threatened species and habitats, and endemic species. At the same time it is important to capture processes and linkages that interconnect these habitats.

Consensus was reached as maps were overlaid to show areas of agreement among expert working groups. In subsequent exercises, experts were asked to review the specific criteria for each ESR and rate it according to their knowledge of threats to it (e.g., resource extraction, pollution, coastal development) and opportunities for collaboration (e.g., existing protected status, sustainable practices, local support) relative to the other ecologically significant sites. Thus the resulting map of ESRs served to not only highlight places of high ecological significance, but also reflect relative levels of threats and opportunities.

3.2 Mapping Exercises

3.2.1 Exercise One: Thematically Identify Ecologically Significant Regions (ESRs)

The participants were divided into six groups by their expertise: benthic environment (1 group), pelagic environment (2 groups), and planning and management (3 groups). Within each group, there were 6 to 10 participants and at least one representative from each of the four B2B regions: Mexico, the lower U.S., Canada and Alaska. Each group identified areas that they knew to be ecologically significant, and discussed and debated these regions with others in their group. These areas were drawn on a digital map using the consensus mapper program. For each place identified, they noted the rationales in a spreadsheet, stating the physiographic, oceanographic and biological features or other criteria they believed important to the site's ecologically significant role. Pelagic groups were also asked to focus on migratory species (including the CEC's list of marine species of common conservation concern, Appendix 2). In this exercise, each group was allowed to select up to 40% of each nation's economic exclusive zone (EEZ) within the B2B extent as ecologically significant. They were also asked to refrain from selecting areas smaller than 1 degree square. At the end of this exercise, all the groups' selections were superimposed into one consensus map with areas shaded in accordance with the degree of overlap. In a plenary session workshop participants were able to review and comment on the overlaid image of ESRs.

3.2.2 Exercise Two: Review and Refine Ecologically Significant Regions (ESRs)

The participants were divided into four groups by region: Mexico, the lower U.S., Canada and Alaska. Within each group, members had differing expertise from the same geographic region. They reviewed the results of the previous exercise, looking to refine the coarser scale analysis. Based on this review each regional team delineated a new digital map. They either modified the boundaries of those high-consensus regions from Exercise One or adopted them as ESRs or added new selections. In this exercise, the groups also documented the rationales for each ESR that they identified. Each group was allowed to identify up to 40% of its respective EEZ as ecologically

significant. At the end of this exercise, all the groups' selections were combined and shown on a map in a plenary session. The participants saw the finalized ESRs from Alaska to Mexico. Each group had an opportunity to explain their selections to other groups.

3.2.3 Exercise Three: Identify Threats and Opportunities

In addition to the ecological significance, threats and opportunities are also crucial factors in the identification of PCAs. In this exercise, the participants were again divided into regional groups to rate the relative level of threats and opportunities in each of the ESRs previously identified. The workshop organizers categorized threats into the following types: non-renewable resource extraction, exploitation of renewable resources, coastal land use change, pollution, damaging recreational use, and physical alteration of coastline. Opportunities were categorized into: existing legal protection, available management, local/ regional support, funding, available information for management/ conservation, and sustainable business practices. Each group of participants received a list of these categories. Group members discussed the relative significance of these types of threats and opportunities that exist in their ESRs. Where applicable, they described them in more detail and determined their intensity (high, medium or low) and trend (getting better, same, or getting worse). The description, intensity and trend were all recorded in a spreadsheet.

3.2.4 Exercise Four: Identify Priority Conservation Areas

The final step in the workshop was to identify PCAs. The participants were divided into six tri-national teams with at least one expert from each of the four B2B geographic regions. In this exercise the goal was to select not more than 20% of the area within the ESRs from Baja California to the Bering Sea as PCAs. The group members used consensus mapper to digitally map their selections, and specified their rationales for every PCA in a spreadsheet. At the end of this exercise, six sets of PCAs selected by the six groups were overlaid and shown to all workshop participants in a plenary session. The selected areas were colored according to the degree of overlay. The participants saw the level of consistency across the groups. Every group had an opportunity to explain the reasoning behind their selection to others and to point out unique features that they took into consideration.

3.3 Workshop Results

In total 40 ecologically significant regions and 28 priority conservation areas were identified by the workshop experts (Figure 2). The PCAs capture areas of high continental endemism (e.g., the upper Gulf of California's vaquita and totoaba, the Holocene sponge reefs of British Columbia, the Aleutian Island archipelago) as well as migratory routes and important habitats of marine mammals, seabirds and sea turtles. They also encompass sensitive habitats such as coastal wetlands and sponge and coral communities, which are key habitats for a variety of species. Also chosen as ESRs and PCAs are places that afford physiographic complexity, such as seamounts and submarine canyons. In addition, three important oceanographic features, the Haida eddy, the Ensenada Front and the Los Cabos Front were identified as ESRs. Other rationales for ESRs include habitats for one or more life stages of endangered or rare marine species, coastal geography (tidal flats, lagoons, headlands, etc.) and estuaries (fjords, river deltas, etc.). ESRs and PCAs were also identified at each of the transboundary regions (i.e., Alaska/Canada, Canada/U.S., and U.S./Mexico).

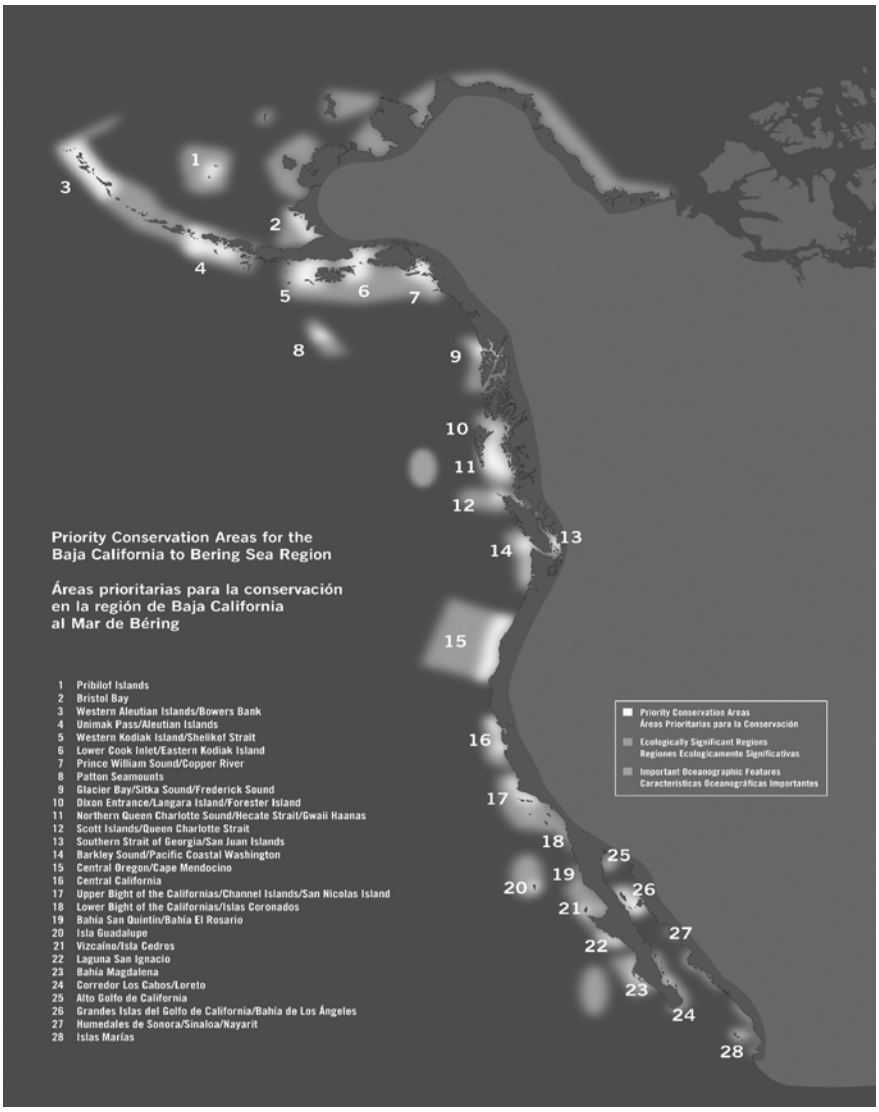

Figure 2. Priority Conservation Areas for Baja California to the Bering Sea Region, based on expert workshop.

4. DISCUSSION

This workshop combined available physical, social and biological data at the North American continental scale with experts' knowledge distilled through a series of small-group exercises and plenary discussions. The use of Consensus Mapper allowed small groups of individuals to work independently, but at the same time integrate the perspectives of experts from different fields and regions. This iterative process and the methodology allowed for a consensus map of priority conservation areas. Not all desired data are available throughout the B2B extent but with the experts' input, the foundation for marine conservation - identifying where to start the conservation work - is laid.

Workshop participants were asked to focus on both the continental uniqueness of areas, the linkages that maintain continental biodiversity, and areas that had a high overlap of many different physical and biological features and processes. It is important to note that this mapping and identification exercise, while consistent with attempts to implement marine protected areas to achieve conservation goals, is not a MPA siting process. The institutional responses to these priorities will vary according to each country's unique socio-economic landscape, as well as its own laws, policies and management practices to address

conservation priorities. Options range from the designation of marine protected areas to the use of incentives and disincentives. This process can assist regional conservation initiatives by providing a unifying view of the continental perspective that is required to protect species with large ranges and migratory behaviors that link the countries ecologically. At the same time, this map highlights regions that are unique to the North American seascape and serves as a supporting document for regional activities.

This communication represents a preliminary report of the expert workshop. A more detailed annotated report is forth coming from the CEC and MCBI. The workshop recommendations will be submitted to the CEC Council and will be the cornerstone for international cooperation between the NAFTA governments. It also serves as an important vision tool for the broader communities interested in marine conservation. While this workshop represents the fulfillment of a tri-national work plan, and will be the basis for future collaborative efforts, it will be up to a diverse network of local and regional governments and NGOs to implement CEC strategy for conservation, using these areas as ecological keystones.

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Appendix 1. Data Sets Available for Workshop from the B2B 1.0 CDROM

Physical

- Altimetry- CCAR biweekly 9km, NLOM avg. 7km
- AVHRR- SST monthly at 9km resolution 1996-1999
- Bathymetry- ETOPO2 4km resolution
- GTOPO30 Topography - ~1km resolution
- Seamounts- point file
- World Vector Shoreline 1:250,000

Biological

- SEAWIFS 9km monthly chl_a 1997-1999
- Blue Whale tracks
- Turtle tracks and “areas of concern”
- Deep Sea Coral (US and Canada)

Social

- Economic Exclusive Zones
- Federal Government Marine Protected Areas
- Ports and Harbors
- Population
- Previous Regional Priority Setting Exercises

Appendix 2. CEC List of Marine Species of Common Conservation Concern

Humpback Whale
Blue Whale
Killer Whale
Gray Whale
Right Whale
Guadalupe Fur Seal
Sea Otter
East Pacific Green Turtle or Black Turtle
Hawksbill Turtle
Kemp's Ridley Turtle
Leatherback Turtle
Loggerhead Turtle
Pink-footed Shearwater
Short-tailed Albatross
Xantus' Murrelet