

Mapping Human Activity in the Marine Environment: GIS Tools and Participatory Methods

**November 30 – December 1, 2005
Pacific Grove, CA**

National Marine Protected Areas Center

WORKSHOP SUMMARY



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I. Executive Summary

This report summarizes the results of the workshop “Mapping Human Activity in the Marine Environment: GIS Tools and Participatory Methods,” convened by the National Marine Protected Areas (MPA) Center Science Institute on November 30 – December 1, 2005 in Pacific Grove, California. The workshop brought together 20 social scientists, geographers, and GIS specialists from government agencies, universities, and non-governmental organizations with expertise in characterizing human use patterns in the marine environment with the aid of GIS tools. The goal of the workshop was to develop general design criteria for a practical participatory method or a suite of methods to collect spatial data on human use patterns to inform local and regional MPA planning processes.

Workshop participants were asked to discuss and identify the relational data associated with human activities in the marine environment that are needed to inform MPA planning processes at the regional and local levels, and to assess the applicability of GIS for the storage, analysis, and representation of these data. Participants also generated a set of recommendations for designing a methodological approach for collecting the data types necessary at the regional and local levels.

Results of the workshop will further the goal of the MPA Center’s Human Use Patterns and Impacts project, which is to develop a broadly applicable method for identifying the patterns, intensities, and socioeconomic significance of human uses of the marine environment. This method, and the data captured through its application, will aid the planning and design of effective and equitable MPA sites and networks, and compliment efforts to conduct ecosystem-based management.

II. Workshop Background

A. Rationale

Understanding human activities in the marine environment is a critical need in coastal and ocean management and conservation. Regardless of the management model being employed, (e.g. single-species management, ecosystem-based management, integrated coastal zone management, adaptive management, community-based management), it is necessary to understand patterns of human activities as they relate to marine resources and ecosystem services. The recent Pew Oceans Commission and the U.S. Commission on Ocean Policy reports highlight the potentially deleterious effects that human activities in and adjacent to marine environments can have on marine ecosystems. Hence, documenting use patterns is important for determining areas and resource characteristics that may be at risk and in need of further protection. Knowledge about human uses of the

marine environment is not only critical for assessing threats to marine resources, but also for understanding the social, economic, and cultural values associated with uses and the potential impacts of management measures on human communities. Documenting human uses of the marine environment is especially important for the planning, management, and evaluation of marine protected areas (MPAs). Siting MPAs requires a careful consideration of the sources and intensities of human and non-human threats to resources, as well as the concerns among user groups for continued access and sustained participation in consumptive and non-consumptive use patterns. Marine protected area management often necessitates balancing access needs among multiple and at times competing user groups. This need, coupled with a concern for the effects of displacement, and consideration of the ecological and socioeconomic connectivity among and between places at sea, watersheds, and shore-side communities, highlights the importance of employing sound data on use patterns in the planning, management, and evaluation of MPAs.

B. Human Use Patterns and Impacts Project

The National MPA Center designed the Human Use Patterns and Impacts project in order to address the need for documenting human activities in the marine environment. The goal of the project is to develop a broadly applicable method for identifying the patterns, intensities, and socioeconomic significance of human uses of the marine environment. The application of the method will yield data on human activities that may be used to assess the potential impact of uses on key resource variables, analyze the compatibility among uses, and to determine the socioeconomic value and significance of the activities. The results of the project will aid future efforts to identify gaps in management and high priority sites for area-based coastal and ocean management where use patterns pose a potential threat to resources; the categories of user groups that need to be engaged through participatory management processes; user conflicts and equity issues that may need to be addressed; and, potential socioeconomic impacts of management alternatives. Products will include a methodological process and guidelines for documenting human use patterns in marine ecosystems; a synthesis of secondary data on spatial patterns of human activities in a pilot region (west coast); tools for storing, analyzing, and presenting use data; and, tools for assessing the compatibilities among and potential impacts of human uses.

C. Project Review Summary

The MPA Center conducted a review of projects related to the characterization of human activities in the marine environment in the process of scoping the Human Use Patterns and Impacts project. The review was conducted to provide guidance and a set of lessons learned for determining the scope and function of the project and focused on efforts that represent a range of potential approaches to characterizing human use patterns in marine environments. The review generated the following key findings related to mapping human activities in the marine environment.

Collecting available secondary datasets across a large geographical area can provide a coarse snap-shot of use patterns at the regional level. Time and effort should be devoted in the early stages of development to locate and assess the quality of existing secondary datasets in order to identify gaps. Metadata should be meticulously kept for all datasets gathered and analyzed. This approach is usually employed when the specific management needs are not known and a rough baseline is considered to be generically useful for a range of future planning and management concerns. Data must be available or collected across the entire study area in order to provide consistent coverage and to make valid generalizations. At the regional level, documenting and mapping fine-grained distinctions between use areas and use categories is not feasible due to the expansive geographical scope and the lack of quality data on many use patterns, most notably nonconsumptive uses. This option typically produces a static atlas with the primary goal of yielding a starting point for further investigations. Building a regional picture of use patterns in this manner does not typically allow for the collection of important relational data such as user demographics, socioeconomic values, intensity of use, and temporal dimensions of activities. Ideally, these findings are subsequently reviewed through expert-panel/key informant methodologies that provide more contextual information on spatial patterns of use. The benefits of this approach include providing large geographic coverage of human uses and resource zones that may indicate ‘hotspots’ of potential threats and areas of use incompatibilities. It provides a baseline for identifying data gaps that need to be filled and potential areas of resource and use incompatibilities for further investigation. This approach represents a first step that requires more in-depth, primary data-gathering for informing specific planning and management objectives.

The collection of both primary and secondary data at a finer level of detail across smaller geographic areas, coupled with the creation of a dynamic database to house the data, allows the layering of data and the use of query tools to generate findings required to meet the specific needs of an evolving management planning process. Prioritization of project needs, including the geographic coverage of the study, the scale at which data are collected, and use types documented, should be conducted within the framework of the management process the findings are intended to inform in order to maximize buy-in and

support. This approach is predicated upon integration with a formal management process with known objectives and identifiable needs, thereby requiring a much greater degree of coordination with decision makers and stakeholders in the specific geographic area or region in which it is employed. This model also requires larger-scale data (greater detail) on uses and resources that would likely necessitate more in-depth fieldwork and higher costs.

In any study of use patterns, significant efforts are needed to integrate the effort with current and ongoing research in the region of interest in order to build partnerships and prevent ‘burnout’ among stakeholders. Access to secondary datasets is often hindered by confidentiality concerns, proprietary data protocols, lack of trust, and costliness of cooperation. Further, access to primary data depends on building trust and rapport among user groups. The review emphasized the need for coupling archival and secondary data gathering with a participatory approach to the collection of primary data.

The findings of the review highlight the challenge of developing an accurate, regional, or ecosystem-based portrait of use patterns and their significance. The difficulty of developing a regional picture is related to the lack of extant data and the disjuncture between regional planning needs and local management concerns. The review underscores the importance of designing a methodology that moves between regional and local levels in documenting use patterns in order to inform regional site planning, engage local communities, and build support for more in-depth research that can inform various phases of MPA planning, management, and evaluation.

III. Workshop Design

A. Workshop Goal and Objectives

The workshop was intended to inform the design of a methodology for documenting human use patterns at both the regional level (for identifying gaps in protection, user groups and stakeholders, compatibility and equity issues) and the local level (for more in-depth understanding of use values and significance, and for meeting local management needs). The workshop brought together researchers with expertise in the design and application of GIS-based mapping tools and methodological approaches to participatory mapping. The specific goal of the workshop was to develop general design criteria for a practical participatory method or a suite of methods to collect spatial data on human use patterns to inform local and regional MPA planning processes. There were two objectives associated with this goal. The first objective was to identify the relational data associated with human activities in the marine environment that are needed to inform MPA planning processes at the regional and local levels, and to assess the applicability of

GIS for the storage, analysis, and representation of these data. The second objective was to generate a set of recommendations for designing a methodological approach for collecting the data types necessary at the regional and local levels.

The workshop focused on GIS-based mapping in combination with an emphasis on participatory research. Geographic Information Systems are considered to be an ideal tool for decision makers and conservation planning due to functionalities that allow the integration of physical, biological, and socioeconomic data into a single spatial frame of reference. The GIS platform also allows for the integration of data with different spatial and temporal scales, the application of a broad suite of software tools including statistical packages, and the visual representation and manipulation of data through user interfaces. Developing a participatory approach to mapping human activities in support of MPA planning and management is important for a number of reasons. Human dimensions of MPAs are the keys to the success of MPA design and management. Participatory methods can empower people and provide a platform for voicing diverse needs, concerns, and perspectives. Participatory research can increase the legitimacy of the planning process in which the data collection efforts are embedded, foster greater cooperation and consensus building, and increase the long-term viability of the management decisions. Methods that encourage participation can also facilitate future commitment to monitoring and evaluation, and may yield valuable local and experience-based knowledge that would otherwise remain untapped.

B. Workshop Process

The workshop was convened over the course of one and a half days. The morning of the first day was devoted to an overview of the Human Use Patterns and Impacts project, workshop goals, and formal presentations on mapping human uses in the marine environment. The presentations covered a range of methodological, theoretical, and ethical issues pertaining to the use of GIS and participatory methods, the collection of primary and secondary data on human uses at both local and regional scales, and the integration of findings into MPA management processes.

In the afternoon on the first day, participants engaged in a dialogue session that was intended to identify priority data needs associated with documenting spatial patterns of human activity at the regional and local levels. Participants were asked to consider the full range of uses, both consumptive and non-consumptive, in identifying the relational data that would be needed to inform MPA planning. They were also asked to identify how data needs might differ between regional planning efforts and local management needs.

The distinctions that emerged between data needs for regional and local planning were further investigated on day two, when breakout sessions were held to address methodological approaches to data needs. Participants split into two groups, one focused on developing a methodological process for collecting data needs at the regional level, and the other focused on the local level.

IV. Workshop Results

A. Data Priorities

Workshop participants generated a comprehensive list of research questions and data needs pertaining to the mapping of use patterns in the marine environment. This list represents a wide range of potential areas of inquiry that shed light on the socioeconomic and cultural dimensions of spatial patterns.

- *Who are they and what are they doing?* This research question is both one of the most basic and complex. It is basic in that it requires, at a minimum, the identification and categorization of the activity types. It is complex in that membership in use groups can be characterized by myriad demographic variables including residence, ethnicity, gender, age, income, employment, and a host of additional behavioral and cultural variables.
- *Where do they go in space and time?* The spatial patterns of the user groups are the obvious subject of mapping efforts. Spatial patterns are inextricably tied to temporal dimensions that can be understood in reference to various time frames. Long-term trends in spatial patterns can be discerned through a historical time frame, while short-term patterns may vary in relation to a seasonal frame of reference.
- *How much do they go?* Determining the intensity of use activities is a core dimension of mapping spatial patterns that is necessary for conducting numerous analyses such as threat and impact assessments. Intensity of use may be measured in different ways depending on the activity type and the intended use of the data. For example, intensity may be measured by frequency of use, duration of visitation, number of different uses per unit area, or number of man hours or ‘fisherman days’ per area.
- *Where do they come from?* This question explores the complex linkages between marine areas where activities take place, and the wider spatial, socioeconomic, and

cultural worlds of the users. This area of inquiry not only includes geospatial linkages, such as residence, points of access, distance traveled, and other marine areas used, but the socioeconomic and cultural connections among and between places. These connections include, for example, the link between activities at sea and local communities (both geopolitical and identity-based), support infrastructure, market and exchange networks, and kinship ties.

- *Why do they go there?* The underlying motivations behind the use activities and their association with particular places are an additional dimension of spatial patterns. While difficult to measure, the motivation for using particular areas is important for modeling behavior and predicting outcomes of management alternatives. This area of inquiry may include research on site selection criteria, site preference and ranking, and the identification of the sources of attachment to places. Motivations are complex and may be based on a combination of material/economic considerations; cultural identity and lifestyle choices; historical/personal connections; regulatory constraints, opportunities, and cumulative effects; perceptions of resource abundance/quality; and, particular event drivers.
- *What are the costs/values/significance of the activities?* This question pertains to the need for understanding the value of the spatial activities to both the user groups engaged in them, and to non-users. Methodologically, the question is extremely complex and admits a wide range of theoretical models and practical tools for establishing the importance of places. For example, significance and value can be assessed according to economic principles (e.g. gross revenues, market values, cost of entry, costs per trip, non-market valuation and willingness to pay), sociocultural variables (substitutability of the activities, quality of experience, aesthetics, resilience of user groups), or a combination of approaches.
- *What do they know?* The users of marine places have local and experience-based knowledge as a result of their interactions with the environment. This knowledge is often applied to their use of the marine environment and can shed light on a number of other research questions. For example, perceptions of resource abundance, quality, and biophysical trends can help answer the question concerning motivation and can also yield important knowledge for identifying areas in need of protection. Knowledge of regulations, boundaries, and governance structures can help assess the functioning of current management processes. Finally, bringing place-based knowledge to the planning process can increase the support for the process, build rapport, and encourage participation.

The applicability of these data types to MPA planning, management, and evaluation and the methods employed in their capture will vary in accordance with the goals and objectives of the management process as well as the scale of the effort. The following sections will summarize the differences between regional and local MPA mapping efforts that were identified during the workshop.

B. Regional Data Needs and Research Process

Use patterns can be documented across large geographic areas for the purpose of establishing a baseline for regional MPA planning through a variety of research methods. Data that are needed for creating a regional picture are essentially limited to the categorization of use activities (who is doing what?) and identification of where these activities are taking place (where are they doing it?). The lack of secondary data and the difficulty of generating data that provide adequate coverage across a large study area constrain the ability to capture data on other dimensions of use such as intensity, spatial linkages, motivation, value, and knowledge.

The research process for documenting uses at the regional level requires the following key steps:

- Define the boundaries of the study area: The region of interest must be spatially delimited. In addition, the ecosystems within the region (if the region is not, itself, defined by ecosystem boundaries) should be identified, as well as the vertical and horizontal political and regulatory boundaries that pertain to the region.
- Identify and prioritize the use types within the study area: The use types need to be identified and then selected and categorized according to their relevance to the regional planning need. The categorization should meaningfully reflect reality and/or meet the planning needs of the documentation effort. For example, certain use types, or fine-grained distinctions among use types, may not be important for management or planning purposes.
- Collect secondary data on priority use types: Archival research is needed to locate sources of information on use types, assess their quality and value, and collect available spatial data. Secondary data may be available from state governments, federal agencies, and the private sector. Accessibility of the data will vary, as will its quality and usefulness. There may be no extant data for certain use types.
- Design sampling strategy: Representatives and key informants of user groups in the region and/or individuals knowledgeable about the region's use types need to be

identified and brought into the research process. Due to the dearth of extant data on uses and the variable quality of what is available, information from key informants is necessary for filling gaps in the regional picture and ground-truthing existing data. It is important to provide informants with the data that are already known as a starting point. In certain cases, however, the regional picture will have to be built by aggregating local knowledge of use patterns (see below). The spatial extent of informant knowledge will vary according to use type and particular qualities of the informants, including their level of experience.

- Determine data collection methods: Data can be elicited from key informants through individual interviews and/or through the formation of panels and focus group interviews that feature a mapping component. Focus groups designed explicitly to be heterogeneous (different use group representatives) may be important for cross-checking validity, but numerous approaches can be employed.

The goal of this process is to produce a spatially-explicit representation of uses across a large region with some reference to intensity and timing. While key informants can provide insight on other relational aspects of use patterns such as values, meanings, motivations, and knowledge, the regional picture will have limited power to describe these socioeconomic and cultural nuances of spatial patterns. This general process and the methods of data collection may differ between regions and within regions, between different use types. It is important to consider the need to maintain the rapport developed with key informants and their communities through the process of building a regional picture because it is likely that more in-depth, local data gathering will be needed to address these information needs.

C. Local Data Needs and Research Process

The planning, siting, and management of MPA sites at the local level demand a much more detailed understanding of the contextual dimensions of uses. The obvious need for understanding the use types, the user groups, and the spatial patterns of use is joined by the importance of measuring intensity of use across time and understanding the spatial connections beyond the marine sites, the values of use, and the motivations/causes behind use preferences and patterns. Establishing the proper indicators for these variables and the appropriate measures is challenging, but essential for creating a baseline for understanding change. Local knowledge may also be captured through the mapping process in order to build rapport and inform understandings of a range of phenomena such as the state of natural resources, the motivation behind site selection, and perceptions of management authorities and regulations.

The process of documenting human uses at the local level is relatively similar to the methodological steps required at the regional level. One significant difference, however, is the importance of combining traditional scientific data-gathering methods with a greater emphasis on participatory methods, and the complexities that this entails. The following steps outline the process and methodological considerations that are pertinent at the local level.

- Define the boundaries of the study area.
- Identify and prioritize use types within the study area: Much greater attention needs to be given to engaging the user groups that are identified. The local level is where participatory methods of data collection are most successful and so great care is needed in identifying the relevant user groups. The categorization of uses needs to consider the socioeconomic interests, political fault-lines, and cultural similarities and differences among and between the various user types. This analysis will have ramifications for the level of trust, cooperation, and interest that is generated by the research effort. In addition, it is important during this stage to identify those use groups that may be less visible as a result of their social and political marginalization.
- Collect secondary data on priority use types: An examination of secondary data for its usefulness in describing spatial patterns is extremely important at the local level. The use of participatory methods must account for past efforts in order to avoid redundancy and ‘burnout’ among community members that may derail the project.
- Design sampling strategy: Collecting data at the local level may require a suite of methods and approaches, each with their own sampling strategy that depends on the level and nature of participation. Participatory research ranges from cooperation to collaboration and many models may be of use in determining the proper methodological approach. Regardless of the sampling design, selecting representatives of user groups is very challenging due to the social and cultural complexities of power, identity, and representation.
- Determine data collection methods: At the local level, different use types may demand different approaches to mapping spatial patterns and associated data. Researchers need to determine in consultation with use group representatives the most appropriate methods including the geographic interface (paper maps and charts, digital tablets, etc.) and scale, and the style, timing, and location of interviews. This also pertains to methods for capturing values associated with

spatial activities, which may differ according to the marine environment and the use types associated with it.

D. Overarching Principles and Lessons Learned

The following points that emerged from the workshop describe general opportunities and challenges associated with mapping human activities in the marine environment. They provide valuable guidance on how to design and conduct research in support of MPA planning and management.

1. Data Issues

- It is important to generate a baseline that includes key socioeconomic dimensions of use before the MPA planning process is fully engaged.
- Secondary data on uses can be used to begin building the baseline but they have significant limitations and gaps.
- Primary data collection, including the use of key informants, is necessary to fill gaps in our understanding of use patterns at all scales.
- Ecosystem management necessitates balancing a regional perspective with an understanding of local needs and issues. Establishing a baseline at a wider regional scale can be an effective method of catalyzing interest in further research at the local level.
- Socioeconomic data need to be better integrated with biogeographic and physical data for a variety of analyses that include assessing the values of users and the motivations for site selection.

2. GIS Uses and Limitations

- GIS is limited in terms of its ability to capture the full complexity of socioeconomic and cultural dimensions of use patterns and should not be the only tool for decision making.
- Not all data need to have defined spatial coordinates. GIS is flexible enough to permit the use of qualitative data to inform mapped spatial patterns.

- Representation of spatial data (especially their scale and level of aggregation) influences the response to data.
- Drawing lines is inherently political (social, cultural, economic), which influences the incentive structure as the planning and designation process unfolds. Once lines are drawn, the assignment of socioeconomic value becomes political. However, depending on how the process is designed, drawing lines can facilitate a meaningful discourse.

3. Opportunities and Challenges of Participatory Research

- Timelines associated with MPA planning determine what can be collected, analyzed, and represented, and how people respond to the call for information and cooperation. It is, therefore, necessary to develop a transparent research process that fully describes the timeline, research objectives, data collection efforts, and analysis tools.
- Interest and participation in the research process can be catalyzed as the MPA timeframe moves further into site designation and implementation phases, as long as opportunities for meaningful participation are provided at the outset.
- The process of engaging people (as members of communities and user groups) is as important as the data that emerge.
- Knowledge of local users is often devalued in management and planning. The use of local knowledge and participatory data collection methods can establish rapport, build commitments, and bolster understanding of social and natural conditions.

V. Next Steps

The results of the workshop and the principles outlined in this summary provide a starting point for the development of a methodology for documenting spatial patterns of use in the marine environment for MPA planning. The National MPA Center will combine these results with the findings from subsequent research in publishing draft methodological guidelines. These guidelines will be tested as part of the West Coast Pilot, a project that will be conducted in coordination with federal, state, and tribal MPA agencies to provide information and tools for examining ecosystem-based conservation and management needs.

Appendix A: Abstracts

Marine Protected Area Decision Support Tool

Kelly Chapin, Spatial Projects Coordinator, National Marine Protected Areas Center Science Institute, Monterey, CA

In 2005-2006, the MPA Center collaborated with the Monterey Bay National Marine Sanctuary and the California Marine Life Protection Act Team to produce a web-based, spatial decision support tool which supports central California MPA processes. Currently available spatial data from many sources were imported into the decision support tool. The goals of the tool are: 1) to allow equal access to the tool by multiple users in various settings, 2) to provide spatial datasets relevant to MPA processes, 3) to encourage users to evaluate the datasets using a simple web interface, and 4) to capture and present MPA ideas generated by stakeholders and working groups. Even though the decision support tool is still under development, it has already been tested in MPA processes. Due to the comprehensive nature of this decision support tool, the development and data preparations have been time consuming and costly. Even though the tool functions too slowly to be used in large interactive group settings, the stakeholders have reacted positively to the use of the tool. They especially praise the equitable nature of presenting all the data in one product and the versatility of drawing and proposing individual MPA candidates.

Analysis of Spatial and Socioeconomic Baseline Information and Fishing Profiles in Support of the Joint Management Plan Review (JMPR) Process: An Application of the Ocean Communities 3E Analysis (OCEAN) Tools

Charles Steinback, Astrid J. Scholz, and Mike Mertens, Ecotrust, Portland, OR

Ecotrust was contracted by the three central California National Marine Sanctuaries - Cordell Bank National Marine Sanctuary, Gulf of the Farallones National Marine Sanctuary, and Monterey Bay National Marine Sanctuaries - to collect, compile, and analyze spatially explicit socioeconomic information pertaining to commercial and recreational fisheries in and around sanctuary waters. We present methods and results based upon analytical and informational needs identified by two stakeholder-working groups, which was conducted in support of the Joint Management Plan Review process. Analysis was conducted using Ecotrust's Ocean Communities "3E" (economy, ecology, and equity) Analytical (OCEAN) suite of tools. The OCEAN framework utilizes a GIS database for spatial analysis and interpretation of a wide range of ecological and

socioeconomic data, coupled with an interface that allows scientists, managers, and communities to take an integrated and systemic look at ecosystems, fishery policy and marine conservation issues, as well as the effects of policy changes on central California coastal communities. The data sources used for this project were both quantitative, including fishery dependent and independent data, and qualitative, relying on fishermen's knowledge and direction. Most significantly, the project relied on a participatory process for eliciting local fishermen's knowledge of critical economic areas for each fishery. This information was captured spatially and then used to constrain agency data sources. Specifically, we used the local characterizations of the fishing grounds to interpolate the fishery dependent data sets, and to derive use patterns and fishing effort on the grounds. Summarizing this information to the port level, we constructed detailed socioeconomic profiles of communities adjacent to the sanctuaries and of fleet sectors whose livelihoods rely upon the sanctuaries areas. Future applications of the products from this project likely include decision-support for the consideration of marine protected area siting and other management issues in central California and beyond.

EcoGIS – GIS Tools for Ecosystem Approaches to Fisheries Management

David Moe Nelson, NOAA / NOS Center for Coastal Monitoring and Assessment, Silver Spring, MD

Tim Haverland, NOAA / NMFS Science and Technology, Silver Spring, MD

The EcoGIS project is developing a set of GIS tools to better enable both fisheries scientists and managers to adopt ecosystem approaches to fisheries management. EcoGIS is a collaborative effort between NOS, NMFS, and four regional Fishery Management Councils. The need for these types of tools was highlighted in a September 2004 workshop in Charleston, SC, with fishery scientists and managers from NOAA, Fishery Management Councils, academia, and NGOs. Based on the issues identified by the Workshop, four topic areas were identified to guide the development of prototype GIS tools: Area Characterization – Within a selected area, what are the physical parameters (e.g. sediment type), and biological parameters (e.g. species abundance), and regulatory framework? Fishing Effort Analysis – Where, when, and how do fisheries operate within a given area? How have fisheries been impacted as a result of regulatory changes? Habitat Interactions – What types and amount of habitats have been fished using bottom-tending gear? Bycatch Analysis – What are the trends in bycatch among different fisheries, geographic areas, time periods, depth ranges, and habitat types? GIS needs of the end users range from simple map-based queries to complex ecosystem modeling. The end product will enable a simplified means to query data and create

models of complex multi-dimensional datasets and a visualization of results that will help communicate information to support decision makers.

Implementation of the Mapping Initiative Sec. 388 of the Energy Policy Act of 2005 (P.L.109-58)

Leland F. Thormahlen, Chief, Mapping and Boundary Branch, Department of the Interior, Minerals Management Service

This paper will look at the Mapping Initiative described in the Energy Policy Act of 2005 (P.L.109-58) Sec. 388 – Alternative Energy-Related Uses on the Outer Continental Shelf. The discussion will include the Implementation Plan MMS proposes to use to meet the requirements of the Act. On August 8, 2005, President George Bush signed the Energy Policy Act of 2005 (P.L. 109-58). Sec. 388 – Alternative Energy-Related Uses on the Outer Continental Shelf, of the Act grants the Minerals Management Service (MMS) new authority to regulate energy uses on the Outer Continental Shelf (OCS). Moreover, it directs the Secretary of the Interior, in cooperation with the Secretary of Commerce, the Commandant of the Coast Guard, and the Secretary of Defense, to establish an OCS Mapping Initiative to assist in decision making related to alternative energy uses on the OCS. The goal of the initiative is the identification of OCS locations of federally-permitted activities; obstructions to navigation; submerged cultural resources; undersea cables; offshore aquaculture projects; and any area designated for the purpose of safety, national security, environmental protection, or conservation and management of living marine resources.

Spatial Assessment and Analysis of Non-Consumptive Uses in California's National Marine Sanctuaries

Chris LeFranchi, Coordinator, Social Science Program for the Channel Islands National Marine Sanctuary and Spatial Assessment and Analysis of Non-Consumptive Uses in California's Marine Sanctuaries

This study will address a critical gap in information needed to inform National Marine Sanctuary management and the greater Marine Life Protection Act process – an assessment of the economic magnitude of private non-consumptive activities within marine sanctuaries and the ways in which marine protection affects these values. Non-consumptive recreation includes any recreation activity that does not involve removing Sanctuary resources (e.g. scuba diving, snorkeling, whale watching, bird watching, viewing other wildlife, viewing/photographing scenery, surfing, kayaking, and sailing).

Outcomes of the proposed research will include the first geographically organized inventory of private non-consumptive users and values, insight into how biological and physical attributes influence user behavior and values, and the economic impacts associated with these users, in terms of local expenditures and social welfare. All stages of the study will involve a formal peer review process. Three core tasks will be completed for Channel Islands and Monterey Bay National Marine Sanctuaries: Establish baseline data: i) Total amount and spatial distribution of non-consumptive use, ii) Socioeconomic and expenditure profiles of non-consumptive users, and iii) Knowledge, attitudes, and perceptions of sanctuary management strategies and regulations; Analyze the market and non-market economic impact of non-consumptive use; and, Analyze how non-market use varies with respect to attributes of marine and coastal environments.

Atlas Project

Kevin St. Martin, Assistant Professor, Department of Geography, Rutgers, The State University of New Jersey

Madeleine Hall-Arber, Anthropologist, Center for Marine Social Sciences, MIT Sea Grant College Program

The Atlas project is an action oriented participatory research project where fishermen are interviewing other fishermen concerning the resource areas upon which fishing communities depend. Using GIS tools, we have developed maps using federal VTR data that show community areas at sea. These maps, then, are the focus of interviews where the maps are corrected and amended by fishermen. While the maps themselves are corrected/amended in this process, they also serve to facilitate discussions about how the spaces indicated on the map are inhabited/used by fishing communities. The project is on-going and the presentation will focus on background, methods, and preliminary results.

The Channel Islands Spatial Support and Analysis Tool (CI-SSAT): Public Participation GIS in Marine Reserves Planning

Ben Waltenberger, Channel Islands National Marine Sanctuary

Engaging communities in the government decision-making process is a vital component of national policy implementation. Often, the data presented to communities are of a complex and non-intuitive nature. This was the case in NOAA's Channel Islands National Marine Sanctuary (CINMS) Marine Reserve implementation process. To promote community and stakeholder involvement in the process, CINMS partnered with

NOAA's Coastal Services Center to develop a Geographic Information System (GIS) tool that created an intuitive visualization interface for data access. The tool allowed stakeholders to query and spatially display decision-making data, and to weight those data based on perceived negative or positive effects to individual stakeholders and to stakeholder groups. Maps were created by various stakeholder groups based on these perceived effects, then overlaid with one another to look for areas of spatial commonality that would lead to the least negative, and most positive, impacts resulting from marine reserve implementation.

Mapping Human Uses in the Marine Environment: Selected Florida Examples

Rob Hudson, Senior Project Manager, Photo Science Geospatial Solutions

Florida's coastal environment is becoming increasingly threatened by a wide variety of human uses that generate impacts to the marine ecology or conflict with other dissimilar human activities. The state's coastal zone is quite diverse. The west coast is generally composed of sandy white beaches and estuaries along the panhandle, low-lying marshes and seagrass beds in the "big bend," a mixture of sandy barrier islands and mangrove shorelines along the west coast that eventually give way to mangrove islands bordering Florida Bay. The Everglades, the "River of Grass," also interfaces with Florida Bay and is considered one of the nation's top ecological assets. The east coast includes long stretches of beaches with various inlets that lead to estuarine waters, lagoons, and river systems. Of course, there are the Florida Keys and its associated coral reef ecosystem in South Florida. Because of this ecological diversity, people use the coastal resources differently. For example, Apalachicola Bay is well known for its commercial oyster fishery while the Florida Keys are known for its recreational lobster fishery. In addition, the coastal waters off of Jacksonville are considered to be calving grounds for right whales but are also highly traversed by commercial and military ships. Several initiatives have aimed at mapping and characterizing human uses in the coastal zone. The Florida Fish & Wildlife Conservation Commission's Florida Wildlife Research Institute (FWRI) has been mapping human uses through its Florida Blueways project. Initially started in Charlotte Harbor characterizing boating patterns and usage, FWRI is now investigating boating usage in the Tampa Bay area. This analysis has also been expanded to investigate the spatial footprint of boating regulations in the area. In addition to FWRI's efforts, Dr. Ashley Johnson, from the University of Florida, mapped human uses in the Guana Tolomato Matanzas National Estuarine Research Reserve. Dr. Johnson employed a participatory approach in mapping human uses that resulted in an estuarine plan. Additional examples of human use mapping related projects include the Florida Keys Carrying Capacity Study that sought to determine the effects of additional coastal development on several key ecological and social factors, including the marine

environment. Approaches, lessons learned, and recommendations will be discussed as part of this presentation.

Participatory Action Research

Patrick Christie, Assistant Professor, School of Marine Affairs and Jackson School of International Studies, University of Washington

Participatory action research is a well established framework to engage diverse constituencies into a process of information collection, analysis and action. It has been used extensively to foster environmental management, especially as a complement to traditional science-based policy making. The use of participatory action research (PAR) with GIS spatial data management tools would be a novel and potential rewarding marine protected area research and planning framework.

Appendix B: Agenda



Mapping Human Activity in the Marine Environment: GIS Tools and Participatory Methods

Asilomar Conference Center, Pacific Grove, California
November 30 – December 1, 2005

National Marine Protected Areas Center
Science Institute
Monterey, California

WORKSHOP GOAL

The goal of the workshop is to develop general design criteria for a practical participatory method or a suite of methods to collect spatial data on human use patterns to inform local and regional MPA planning processes.

WORKSHOP AGENDA

Wednesday Morning, November 30, 2005

- 7:30** **Breakfast**
- 8:00** **Welcome and Orientation**
- *Charles Wahle, MPA Center Science Institute*
- 8:15** **Workshop Goals**

- *Bryan Oles, MPA Center Science Institute*

8:30 Workshop Participant Introductions

8:45 – 12:00 GIS and the Human Dimension of Place-Based Conservation: Examples and Case Studies

8:45 Marine Protected Area Decision Support Tool

- *Kelly Palacios, MPA Center Science Institute*

9:05 OCEAN Framework

- *Astrid Scholz, Ecotrust*
- *Mike Mertens, Ecotrust*

9:25 EcoGIS – GIS Tools for Ecosystem Approaches to Fisheries Management

- *David Moe Nelson, NCCOS Center for Coastal Monitoring and Assessment*

9:45 Minerals Management Service Mapping Initiative

- *Leland Thormahlen, Minerals Management Service*

10:05 Break

10:20 Spatial Patterns of Non-consumptive Use on the California Central Coast

- *Chris LeFranchi, Channel Islands National Marine Sanctuary*

10:40 ATLAS Project

- *Kevin St. Martin, Rutgers University*
- *Madeleine Hall-Arber, MIT Sea Grant*

11:00 Channel Islands Spatial Support and Analysis Tool (CI-SSAT)

- *Ben Waltenberger, Channel Islands National Marine Sanctuary*

11:20 Mapping Human Uses in the Marine Environment: Selected Florida Examples

- *Rob Hudson, Photo Science Geospatial Solutions*

11:40 Participatory Action Research

- *Patrick Christie, University of Washington*

12:00 Lunch

Wednesday Afternoon, November 30, 2005

1:00 Priority Data Needs and GIS Capabilities

Objective: The objective of this working session is to identify the relational data associated with human activities in the marine environment that are needed to inform MPA planning processes, and assess the applicability of GIS for the storage, analysis, and representation of these data.

Guiding Questions:

- What information do we need to know about patterns of human uses for MPA planning at the regional and local scales?
- What are the potentials for and limitations to using GIS to store, analyze, and represent each of these data needs?

Topical Discussion Points:

- Intensity of use
- Temporal dimensions; seasonal patterns and historical trends
- Extra-local spatial connections and networks
- Economic values of the activities and places
- Sociocultural values and meanings of the activities and places
- Knowledge of the conditions and attributes of the places

3:00 Break

3:15 Priority Data Needs and GIS Capabilities (continued)

5:00 Adjourn

6:00 Dinner

Thursday Morning, December 1, 2005

7:30 Breakfast

8:00 Review of Previous Day: Identified Data Needs and GIS Capabilities

8:15 Best Practices for Documenting Human Use Patterns through Participatory Methods

Objective: The objective of this working session is to generate a set of best practices and recommendations for applying a participatory method in the collection of data types identified during Day 1.

Guiding Questions:

- What are the alternative methods (models) of participatory research, and which are most appropriate for the collection of data identified during Day 1?
- How might these approaches differ on regional vs. local scales of MPA planning?

Topical Discussion Points:

- Who to ask (sampling strategies: experts, key informants, random samples, community representatives, etc.)?
- How to engage communities (building rapport and legitimacy, gaining entrée, fostering engagement)?
- How to elicit data (what to ask people and how to ask it)?
- What to do with the data (issues of access, use, and control)?

10:00 Break

10:15 Best Practices for Documenting Human Use Patterns through Participatory Methods (continued)

11:30 Summary and Next Steps

- What we've done
- What needs to be done next
- Outputs and outcomes

12:00 Adjourn

Appendix C: Participants

BJ Atanasio
CA Sea Grant Fellow
MPA Center Science Institute
99 Pacific St., Suite 100F
Monterey, CA 93940
bjatanaz@earthlink.net

Marybeth Bauer
Human Dimensions Program Leader
NOAA National Ocean Service
National Centers for Coastal Ocean Science
1305 East West Highway, SSMC4
Silver Spring, MD 20910 USA
301-593-4724
marybeth.bauer@noaa.gov

Patrick Christie
Assistant Professor
School of Marine Affairs
Jackson School of International Studies
University of Washington
3707 Brooklyn Ave NE
Seattle, WA 98105-6715
206-685-6661
patrickc@u.washington.edu

Monica Diaz
GIS Technician
MPA Center Science Institute
99 Pacific St, Suite 100F
Monterey, CA 93940
831-645-2712
Monica.Diaz@noaa.gov

Sarah Fischer
Pacific Regional Coordinator
MPA Center
99 Pacific ST, Suite 100F
Monterey, CA 93940
831-242-2054
Sarah.Fischer@noaa.gov
Natalie Hargraves
MPA Center Science Institute

99 Pacific ST, Suite 100F
Monterey, CA 93940
831-645-2708
Natalie.Hargraves@noaa.gov

Madeleine Hall-Arber
Anthropologist
Center for Marine Social Sciences
MIT Sea Grant College Program
3 Cambridge Center, NE20-368
Cambridge, MA 02139
Arber@MIT.edu

Rob Hudson
Senior Project Manager Photo Science
Geospatial Solutions
9800 4th St. North; Suite 402
St. Petersburg, FL 33702
727-576-9500
727-896-5913
rhudson@photoscience.com

Chris LaFranchi
Social Science Coordinator
Channel Islands National Marine Sanctuary
114 Oak Knoll Dr.
Santa Cruz, CA 95060
415-602-7302
E-mail: chris@naturalequity.com

Jim Lima
EIS Coordinator
Minerals Management Service
3801 Centerpoint Dr.
Anchorage, AK 99503
907-334-5266
James.Lima@mms.gov

Mike Mertens
Director of Spatial Analysis
Ecotrust
721 NW 9th Avenue

Portland, OR 97209
mikem@ecotrust.org

David Moe-Nelson
NOAA NCCOS
1305 East-West Hwy.
Silver Springs, MD 20910
301-713-3028 x154
David.Moe.Nelson@noaa.gov

Bryan Oles
Senior Social Scientist
MPA Center Science Institute
1305 East West Highway Room 12255
Silver Spring, MD 20910
301- 713-3100 ext. 113
Bryan.Oles@noaa.gov

Kelly Chapin
Spatial Projects Coordinator
MPA Center Science Institute
99 Pacific ST, Suite 100F
Monterey, CA 93940
831-645-2711
Kelly.Chapin@noaa.gov

Carrie Pomeroy
California Sea Grant Marine Advisor
UCCE Santa Cruz County
1432 Freedom Blvd.
Watsonville, CA 95076-2796
(831) 763-8002
cmpomeroy@ucdavis.edu

Kevin St. Martin
Assistant Professor
Rutgers, The State University of New Jersey
Department of Geography

54 Joyce Kilmer Drive
Piscataway, NJ 08854-8045
kstmarti@rci.rutgers.edu

Astrid Scholz
Ecological Economist
Vice President Knowledge Systems
Ecotrust
721 NW 9th Avenue
Portland, OR 97209
503 467 0758
ajscholz@ecotrust.org

Valerie Termini
Intern
MPA Center Science Institute
99 Pacific ST, Suite 100F
Monterey, CA 93940
831-645-2705
Valerie.Termini@noaa.gov

Leland Thormahlen
Chief, Mapping and Boundary Branch
Minerals Management Service
12600 W. Colfax, Suite C-210
Lakewood, CO 80215
303-275-7120
Leland.Thormahlen@mms.gov

Ryan Vaughn
765 Weyburn Terrace #67
Los Angeles, CA, 90024
415-420-5350
rkvaughn@gmail.com

Charles Wahle
Director
MPA Center Science Institute
99 Pacific ST, Suite 100F
Monterey, CA 93940

831-242-2052
Charles.Wahle@noaa.gov

Ben Waltenberger
NOAA / Channel Islands NMS
113 Harbor Way 150
Santa Barbara, CA 93109
Ph (805)966-7107 X461
Fax (805)568-1582
Ben.Waltenberger@noaa.gov

