

WORK PLAN

A Biogeographic Assessment off North/Central California, In Support of Revisions to Sanctuary Management Plans for NOAA's Office of National Marine Sanctuaries

A Cooperative Investigation by the NOS' Biogeography Program and the Office of National Marine Sanctuaries

GOAL

NOAA's Biogeography Program will conduct a biogeographic assessment of the marine region off north/central California to identify important biological areas and time periods. This assessment is being conducted to support NOAA's Office of National Marine Sanctuaries (ONMS) in the revisions to management plans for the Monterey Bay, Gulf of the Farallones, and Cordell Bank National Marine Sanctuaries. Products from this assessment will include: 1) the development and biogeographic analysis of a marine geographic information system (GIS) for the area; 2) production of a report on the ecological components, links, and processes of the study area; and 3) support in the development of a GIS tool to support management in their analyses of biological resources.

OBJECTIVES

1. Identify and collect relevant biological and physical data sets in the study area in order to conduct biogeographic analyses. Organize the data sets into a Geographic Information System (GIS).
2. Conduct a marine biogeographic analysis of available data to identify important biological areas ("hot spots") and time periods, based on species distributions, abundance, habitats, and their ecological function. Produce a summary assessment report of the GIS analyses and results.
3. Produce a report on the ecological components, links, and processes of the estuarine and marine regions off north/central California.
4. Support development of a GIS capability/tool to assist sanctuary staff in developing and evaluating resource analysis scenarios.
5. Support ONMS staff in the integration of biogeographic assessment products into the revisions of the sanctuary management plans.

BACKGROUND

NOAA's Office of National Marine Sanctuaries (ONMS) is currently updating sanctuary management plans for the three north/central California sanctuaries: Cordell Bank (CBNMS), Gulf of the Farallones (GFNMS), and Monterey Bay (MBNMS). The management plans for these sanctuaries have not been updated for several years and the status of the natural resources and their management issues within the sanctuaries may have changed. In addition, significant accomplishments in research and resource assessments have occurred over that period. It is important to incorporate this new and expanding knowledge base into the management plan revisions.

As part of the joint management plan revisions, the ONMS would like to include a biogeographic analysis of the spatial and temporal distributions of marine resources off north/central California. The ONMS has requested the National Ocean Service's (NOS) Biogeography Program (BP) staff to join with ONMS headquarters and sanctuary field personnel to conduct these biogeographic assessments. This assessment includes the identification and characterization of important ecological areas and time periods off the north/central California coast, and also addresses existing and emerging issues concerning living marine resource management.

The purpose of this document is to present a work plan for the BP to conduct the biogeographic assessment. This work plan is designed to be a "Living Document" and will be modified periodically as the project evolves.

This work represents the third analysis the BP has conducted describing biogeographic patterns along the west coast. The first was in the late 1980s and resulted along the “West Coast of North America, Coastal and Ocean Zones, Strategic Assessment: Data Atlas” (NOAA 1988-1990). This Atlas contains maps of key biological, physical, and economic characteristics of the marine environment of the West Coast. The Atlas was complemented by the BP’s studies to define the biological and physical characteristics of adjacent estuarine systems. This latter work formed the basis for the Estuarine Living Marine Resource reports which defined estuarine assemblages and inshore-offshore linkages between ecosystems (Pattillo et. al 1997, Emmett et al. 1991, Monaco et al. 1992).

Using existing and available biogeographic information from NOS and other institutions the BP staff is conducting analyses on the spatial and temporal distribution of important species and their habitats to meet ONMS management requirements. The results of this work will be used to identify important ecological areas and time periods relevant to management issues across the three sanctuaries.

Questions to be addressed by this study include:

- 1) Within the study area, are particular biological “hotspots” evident in space or time?
- 2) Are there latitudinal trends in the distribution of species within the study area?
- 3) Where are suitable habitats for species of particular importance?
- 4) What and where are the important ecological linkages among species and habitats in this area?
- 5) What are the data gaps that might/should be filled in the future in order to improve our understanding of this region?

PROJECT TASKS

Below are brief descriptions of the major tasks planned for the biogeographic assessment. Please see Figure 1 for a diagram of the proposed process and schedule for developing a biogeographic assessment of the three North/Central California Marine Sanctuaries.

Task 1. Project Planning and Implementation

There have been several meetings with BP and ONMS staff refining the objectives and tasks outlined here. This work plan describes the overall project and serves as a blueprint for implementation. While specific products are identified in this document, the final products are dependent on the quality, quantity, and availability of data for analysis; hence, close collaboration with ONMS staff will be required to ensure the BP is well-informed on the resource management priorities for ONMS, and that the BP staff has selected the most important species, habitat types, and data sets for analysis.

Tasks/Products:

- A preliminary list of deliverables (completed 5/2001)
- A preliminary list of important species, habitats and areas for consideration (completed 5/2001)

Task 2. Data Collection

The primary path for identifying relevant data sets for biogeographic analysis was via telephone and email surveys with sanctuary staff and other regional biological experts. To a lesser extent, data was collected through searches of peer reviewed literature, over the Internet, and by review of unpublished data (e.g. gray literature). In addition, the Biogeography Program assessed the utility of NOS data holdings to determine which data sets are useful for this analysis.

In September 2001, informal meetings were held with local experts in California to: 1) obtain key data sets and identify data gaps and other limitations to the analysis; 2) discuss overall project objectives and techniques; 3) further identify priority species, habitats, and datasets to be used for the biogeographic analysis; and 4) demonstrate some example biogeographic results. These meetings aided in defining the scope, temporal, and spatial scales of biological and physical data needed to conduct the biogeographic analyses. The results of these meetings aided in formulating data synthesis strategies and determining the best approach to conduct the biogeographic analyses and meet the needs of the management plan revision process.

Tasks/Products:

- Identify and contact regional experts (throughout)
- Meet with regional experts to discuss approach (completed 9/2001)
- Assess and collect comprehensive and meaningful datasets (throughout)

Task 3. Data Assessment and Selection of Analytical Techniques

A major effort of this work includes the evaluation and selection of analytical techniques that are most appropriate to use for the data collected and the desired products. The West Coast of North America Data Atlas for example, was decided to be too coarse in resolution for most analyses yet still provides a good overview and background on species and species distributions in the area. Certain data sets may be synthesized in order to create complete data layers that span the study area. An effort must be undertaken to determine if and where independent biological and physical databases can be integrated or synthesized into new databases that support the biogeographic analyses. Figure 2 shows the general biogeographic process that will be implemented. The variety and limitations of the various data sets are expected to have a major influence on the character of the biogeographic analyses. All data will be transformed into the appropriate DBMS and GIS format to conduct the biogeographic assessment.

Tasks/Products

- A preliminary approach to analysis will be presented to selected ONMS staff for comment and approval (completed 9/2001)
- Data will be assessed and a final decision on which datasets to be used will be made (completed 9/2002)

Task 4. Data Analysis

The analyses range from relatively simple habitat suitability modeling of selected species to community assemblage analyses. The BP staff will conduct a set of biogeographic analyses to identify key biological areas and time periods based on: species distributions; species life history requirements and habitat affinities; the distribution of habitats; and measures of community structure (e.g., species diversity). A useful outcome of this data collection and analysis may also be the identification of data gaps in space, time, and function (e.g. ecological linkages). The complexity of these analyses will depend on the content and quality of the data sets. An Interim Product will be developed as a means of assessing whether the BP is meeting the needs of ONMS and field staff. This will be reviewed by ONMS and field staff as well as other experts.

Tasks/Products:

- Produce Interim Product (completed 6/2002)
- Hold review of Interim Product (completed 8/2002)

Task 5. Developing GIS Products for Final Reviews

Draft habitat, species level and assemblage analysis maps (e.g. species richness, diversity), and statistical results will be made available to ONMS staff and other experts for review. A list of specific questions and comments will be provided to reviewers to obtain feedback on specific areas of the analysis.

Tasks/Products:

- Hold reviews of analyses and approach conducted with fish and invertebrate data
- Hold reviews of analyses and approach conducted with bird and mammal data

Task 6. Incorporate Review Comments and Present/Deliver Final Results

Once products have been reviewed by selected ONMS staff and other experts, the BP staff will incorporate review comments and prepare final products in an appropriate format for inclusion into the sanctuary management plans. In addition, a report will be developed that provides interpretation of the results of the biogeographic GIS analyses in non-scientific terms that can be easily integrated into the sanctuary management plans.

Tasks/Products:

- A final summary report describing the analysis, results, and interpretation of the results
- A GIS on species, habitats, and important biological areas in the north/central CA study area

- A DBMS with data and information on species and habitats
- Results from GIS analyses, e.g., distributions and time periods of key species, habitats, and ecological areas

Task 7. Produce a Report on the Ecological Linkages and Processes of the Central/Northern CA Estuarine and Marine Environment

The objective of this task is to create a report that will complement the biogeographic GIS assessment. This report will provide background information on important ecological species, processes, and linkages in and around the central and northern California National Marine Sanctuaries. This report will provide a larger ecological context for the biogeographic assessment and will integrate information for many important species and processes for which sufficient data does not exist to be included in the GIS assessment. This report will address both estuarine and marine components of the ecosystem. The report will include a general description of ecosystems within the study region and a discussion of important biotic and abiotic habitats of the ecosystem. It will also include published biological and physical information on important biota including identification of key species, species life histories, connectivity of populations, dispersal, and the species' roles in the ecosystem (trophic interactions, competition, predation). The report will outline how the region is affected by large- and small-scale atmospheric/oceanographic phenomena (e.g., El Nino, upwelling). The report will also identify significant information gaps.

Tasks/Products:

- Develop a statement of work (completed 9/2001)
- Principal investigators develop the preliminary ecological linkage report to be reviewed by NOAA staff (completed 7/2002)
- Presentations of report material made to field sites (completed 7/2002)
- Final ecological linkage report delivered

Task 8. Enhancing ONMS Analytical GIS Capabilities – Support in Developing a GIS Tool

A GIS that displays the results of the biogeographic assessments and enables additional analyses based on a series of species and habitat management alternatives will be provided. This system would be similar to previous GIS projects that BP staff built in cooperation with ESRI (Gill et al., 2001), and will likely build on recent GIS tools (i.e., MaRIS) developed by CSC. At a minimum, this system will house the data used to conduct the biogeographic analysis and allow simple manipulation of those data layers. Development of a GIS tool is contingent on joint discussions between Coastal Services Center, ONMS, the BP staff, and possibly ESRI Inc. The BP can provide a suite of capabilities using ESRI's standard ArcView software, however, a more robust capability could be provided if ESRI is funded to work with CSC, ONMS, and BP staff to develop a GIS tool to conduct resource analyses and develop a variety of output scenarios.

Tasks/Products:

- Draft concept and design of GIS tool
- Develop scope of work to modify existing tools developed by CSC

Task 9. A Web Site for the Biogeographic Assessment

This web site provides background information, updates, and interim products on the CA Biogeographic Assessment. It will also be used for analytical and product review. Visit the web site at: http://biogeo.nos.noaa.gov/projects/assess/ca_nms/

SCHEDULE

See Figure 1 below for proposed project process and schedule.

RESOURCES

Biogeography Program Staff

Dr. Mark Monaco – Marine Biologist and Biogeography Program Manager: project co-coordinator and liaison between BP and ONMS staff and other parties as needed. Supervise data synthesis strategies and biogeographic assessments.

Tracy Gill – Physical Scientist: Will serve as project co-coordinator and serve as liaison between BP and ONMS staff and other parties as needed. Responsible for data evaluation and utilization of information and acquisition of bird and mammal data sets.

Ken Buja – Computer Specialist: Will serve as senior GIS manager and will be responsible for all aspects of data base management and integration into a GIS.

Chris Caldwell – Marine Biologist: Coordinate analyses for fish and invertebrate data and support development of the ecological linkage report.

Wendy Morrison – Marine Biologist: Data collection, analysis, and GIS mapping for fisheries and other resources.

Dr. Lawrence Claflin – Data analyst: Will serve as lead statistician in the biogeographic analysis.

Randy Clark – Marine Biologist: Data collection, analysis, and GIS mapping for fisheries and other resources.

David Moe Nelson – Marine Biologist: Data collection, analysis, and GIS mapping for fisheries and other resources.

Jenny Waddell – Marine Coordinate integration of datasets, pull together final product.

John Christensen – Marine Biologist: Analyses across datasets.

Jamie Higgins – Marine Biologist: Report development.

Other Project Participants

At a minimum, ONMS will provide staff support for project planning, meetings, data identification, collection, and synthesis. Collaboration with sanctuary research staff is essential; interim products will be offered for review at several points during the project in addition to those noted in this task list to ensure that deliverables will meet ONMS expectations. Staff from the National Marine Fisheries Service will participate in data collection and product review.

Equipment

Computer hardware and software including GIS software and a large format color map printer.

Project Period

The current project plan runs from March 2001 through November 2002

SUMMARY OF POTENTIAL OUT-YEAR ACTIVITIES

A great potential exists for many out-year activities as the proposed work is only a component of a greater NOS effort to develop a West Coast of North America Strategic Assessment capability to support coastal management issues. A primary issue of this work is to determine how best to design, define, locate, and manage an integrated suite of marine protected areas along the West Coast of North America. The proposed data synthesis, biogeographic GIS and analyses for the Central California sanctuaries project will provide a working prototype for a larger geographic investigation. A potential major out-year effort could be focused on a more complex and robust GIS project to support both the North/Central California work and the developing West Coast of North America program. It is anticipated that a partnership with ESRI, Inc. may be useful in developing such a GIS.

CONTACTS

Dr. Mark Monaco
Project Coordinator
CCMA Biogeography Program Manager

301-713-3028 x 160
mark.monaco@noaa.gov

Ms. Tracy Gill
Mammals and Birds
CCMA Biogeography Program
301-713-3028 x 150
tracy.gill@noaa.gov

Mr. Chris Caldwell
Fish and Invertebrates
CCMA Biogeography Program
301-713-3028 x 164
chris.caldow@noaa.gov

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FIGURES

Figure 1. Proposed Process and Schedule for Conducting a Biogeographic Assessment off North/Central California

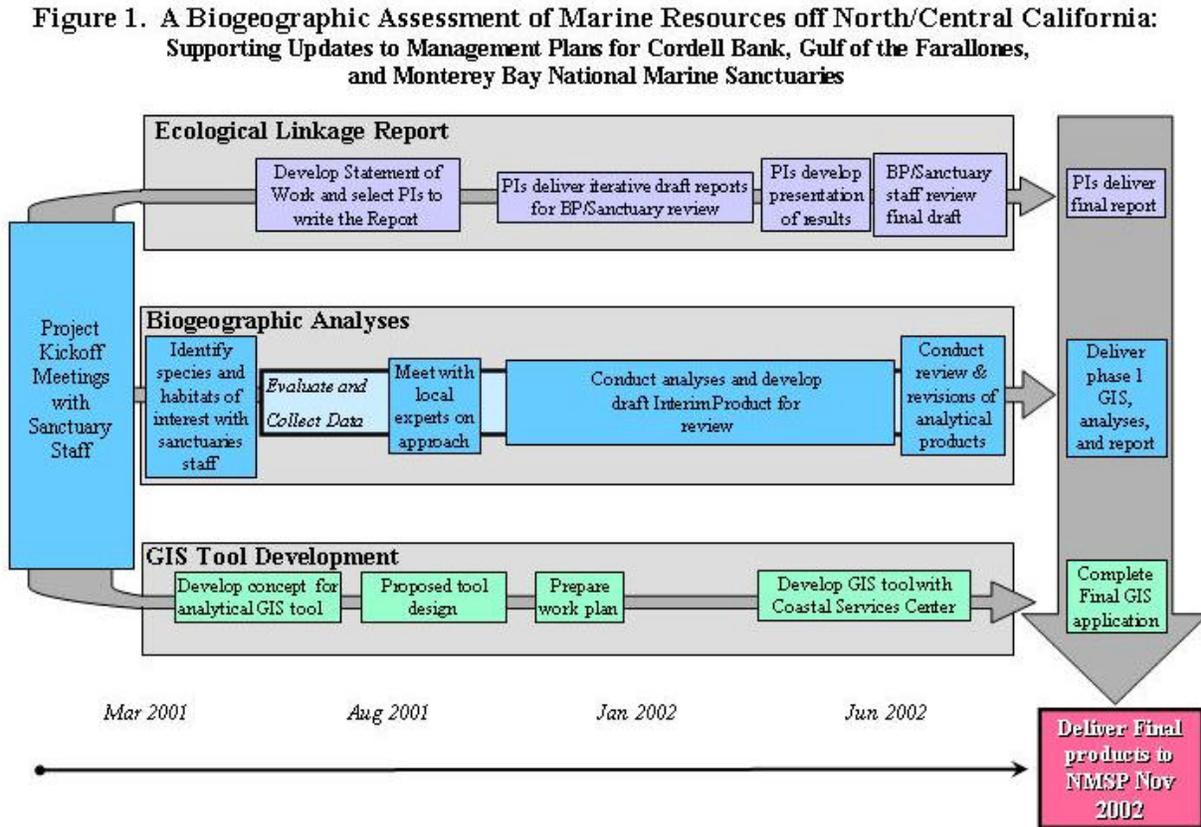


Figure 2. The General Approach to NOAA's Biogeographic Assessment and Modeling

