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Project No: _____
Date Received: _____

GEM PROPOSAL SUMMARY PAGE

(To be filled in by proposer)

Project:Title:	A comprehensive, web-accessible, geo-referenced metadatabase of marine-related physical and biological databases of the northern Gulf of Alaska (Short title: "NGOA Metadatabase")
Project Period:	FY 04-FY 06
Proposer(s):	S. Allen Macklin, NOAA/OAR/PMEL Bernard A. Megrey, NOAA/NMFS/AFSC
Study Location:	Seattle, Washington
Abstract:	This project will adapt for GEM purposes the North Pacific Ecosystem Metadatabase (NPEM, http://www.pmel.noaa.gov/np/mdb/) that has served information via the World-Wide Web since 1998. The adaptation will be a web-accessible metadatabase of marine science databases of the northern Gulf of Alaska. Appropriate records from the NPEM will be transferred to the GEM metadatabase, and additional records pertaining to GEM, PICES, NPRB, UAF/IMS, GLOBEC, FOCI, and similar research efforts will be added. Metadata will be coded to the FGDC standard using the 26 elements specified by MetaLite. As possible, metadata will include thematic, semantic and syntactic descriptors. This utility will include filtering capabilities to extract from existing metadata records those specific to the regions, habitat types, and subject areas defined by the working concepts of the GEM Science Plan. Compound searches of the metadatabase will allow selection of records by time, space, keyword, text string, etc., and results will be ranked according to their agreement with the search criteria. Work will be accomplished over a three-year period in Seattle, Washington.
Funding:	EVOS Funding Requested: FY 04 $152,600 FY 05 $183,000 FY 06 $111,900 TOTAL: $447,600 Non-EVOS Funds to be Used: FY 04 $76,600 FY 05 $82,300 FY 06 $76,000 TOTAL: $234,900
Date:	June 13, 2003 (Date proposal prepared)

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GEM RESEARCH PLAN

A comprehensive, web-accessible, geo-referenced metadatabase of marine-related physical and biological databases of the northern Gulf of Alaska

I. NEED FOR THE PROJECT

A. Statement of Problem

According to the Gulf Ecosystem Monitoring (GEM) Program Document, Chapter 3 (*Exxon Valdez* Oil Spill Trustee Council 2002), data generated by GEM projects need to be converted into useful information that is readily available in a timely fashion to the scientific communities, resource managers, resource dependent people and their communities, policy makers, and other members of the public. In addition, data sets and information regarding other research and monitoring activities in the GEM region must be readily accessible to EVOS staff and contractors, GEM committees and working groups, state and federal resource agencies, and concerned members of the public in order to facilitate gap analysis during project selection and implementation, and maximize the use of all data collected. The North Pacific Ecosystem Metadatabase (NPEM, see Section II for description) is a catalog of information pertaining to the greater North Pacific Ocean and contains some desirable information for GEM.

In its review of the GEM Program Document, the National Research Council (2002) recommended that one of the first tasks of the GEM Data Management Office should be to install the relevant body of existing data for the Gulf of Alaska into the GEM database. The NRC listed some examples, including the NOAA TAO/ENSO data collection, PDO estimates, PICES TCODE data, and other historical, regional oceanographic and climate data. Such data archives are essential to ecosystem modeling and synthesis in the GEM program. As mentioned above, the NPEM already contains some of this information in a format readily adaptable to GEM specifications.

Much of the data collected in the past century exists in undocumented (i.e., metadata-less) files or in flat files that include unformatted, non-relational metadata as header records to the data. Some data don't even exist in digital format. Until they are adequately documented, these datasets essentially are lost to modern-day data harvest and mining techniques. Metadata archival can and should take place before data are quality assured and formatted for distribution. Full and open access to data must be the fundamental principle of all parties involved in scientific research (National Research Council 1997, American Geophysical Union 1997). Also, the responsible stewardship of our natural resources depends on making current, accurate, and complete information available to a wide audience (President's Council on Sustainable Development 1998). The ultimate successes in data exchange and accompanying advancements in knowledge rest with the participation of scientists. Vogel (1997) reported that scientists should recognize that a data set's value reaches beyond its initial collection. The value of documented data increases with time. A data set may have unforeseen future uses, providing

added value to society as additional results are obtained from its use. An American Geophysical Union report (American Geophysical Union 1997) calls for full and open sharing of earth and space science data for research and education. Such statements enhance the awareness of data issues among the scientific community, as well as policy makers. Vogel (1997) further expounds that without action by scientists to document, archive, and exchange data, in addition to publishing results of research, the vision of full and open sharing cannot be fulfilled.

Data set documentation, also known as metadata, is vital to a data set's accessibility and longevity. Without documentation, scientists new to a field of study cannot know what suitable data already exist to help answer particular research questions. Additionally, as undocumented data age, they become unusable as information about them is lost (Michener et al. 1997), often when the collecting scientist leaves the field. Information loss hampers data sharing and is ultimately detrimental to science, as data become unreliable. Documentation of data sets organizes a scientist's, institution's, and research program's data holdings. Data are a form of recognition for the scientist's contribution to scientific advancement, and documenting them promotes the scientist's activity to his peers. Greater visibility among scientists leads to increased contacts and opportunities for collaborative research. Overall, scientific understanding advances through the open sharing of data.

Metadata are especially important in the context of an ecosystem investigation such as GEM. Scientists who undertake inter- and multidisciplinary investigations, such as those required of ecosystem level research, must have access to information and data sets that are more complex than those needed by studies that focus on one or two disciplinary areas. Data sets suitable for ecosystem research must include information on all important biological and physical components of the ecosystem and relate these often disparate pieces of information by linking them to some attribute such as common space and time scales. Such steps allow integrated, holistic research to take place.

B. Relevance to GEM Program Goals and Scientific Priorities

GEM data management will support continuing gap analysis through a continuously updated database of current and historical information-gathering projects in the Gulf of Alaska and adjacent areas (*Exxon Valdez* Oil Spill Trustee Council 2002). If funded, our project will identify and document global, hemispheric, regional and local datasets that are relevant to the GEM mission. Global and hemispheric datasets include those that are indicative of the sorts of large-scale climate characteristics and forcing that affect the region and those gridded data sets having elements within the GEM regions. Examples of the former are the ENSO, PDO, AO, and other indices; examples of the latter are COADS and NCEP Reanalyses. Regional datasets generally are those generated by broad-area, long-term research programs such as OCSEAP, GLOBEC, and ongoing surveys by institutions such as NOAA/NMFS. Local datasets comprise spatially limited, short-term research projects, often process oriented, that are funded by NSF and other granting agencies. In addition, collected information will include information on low- to high-

frequency events that will be especially relevant to GEM's long-term goal of ecosystem monitoring. True ecosystem response to long-term variability can only be ascertained by simultaneously examining seasonal, interseasonal, multi-year, decadal, and multi-decadal trends.

These datasets can be used for retrospective analyses, parameterization of numerical models, establishment of biological rates, and identification of observational gaps that can be addressed by further research. Data harvesting and data mining of these datasets will result in value-added analyses that become the basis for examining a host of new and as-yet-unknown scientific questions.

II. PROJECT DESIGN

A. Objectives

This project has six objectives to be accomplished over three years.

1. Establish a metadatabase schema in accordance with GEM Data System requirements. By developing metadatabase structure in consultation with GEM data managers, we will insure that the utility meets the needs of GEM, and is able to interact with other metadatabases for inclusion of broader-spectrum data.

2. Acquire one development and one production computing and server platform equipped with open-source software. These identical and redundant platforms will house the relational metadatabase, the web server, and ancillary applications (ArcIMS, ISITE) and scripts. Ancillary applications and scripts allow the user to query the metadatabase through the WWW, and receive information from the metadatabase in interactively specified formats. The production server platform will be delivered to GEM at the conclusion of the contract.

3. Develop search and filtering utilities to permit harvest of metadata specific to GEM by compound interactive request to this project's and other metadatabases (using Z39.50 protocol). Establish the site as a Federal Geographic Data Committee (FGDC) National Spatial Data Infrastructure (NSDI) clearinghouse node. Search and filtering procedures of this and federated metadatabases can return information about a dataset's relevance to declared search criteria.

4. Ingest applicable metadata records from the NPEM that, as mentioned in Section II B, already contains more than 200 records pertaining to the Gulf of Alaska.

5. Identify and catalog other relevant northern Gulf of Alaska datasets. There remain undocumented data sets that will enrich the database. We suspect that the body of uncataloged information is far greater than that which is referenced in metadatabases.

6. Deliver a functional, turn-key system, as described by objectives 1-5, to GEM.

B. Procedural and Scientific Methods

We will develop the GEM metadatabase using expertise, experience and methodology from our six years of experience with the North Pacific Ecosystem Metadatabase (NPEM, http://www.pmel.noaa.gov/np/mdb/, Fig. 1, (formerly the Bering Sea Ecosystem Biophysical Metadatabase). The NPEM possesses many of the characteristics that GEM specified in the announcement that this proposal addresses. Since we are proposing to adapt NPEM to the needs of GEM, we feel it is appropriate to provide a brief history of that development.

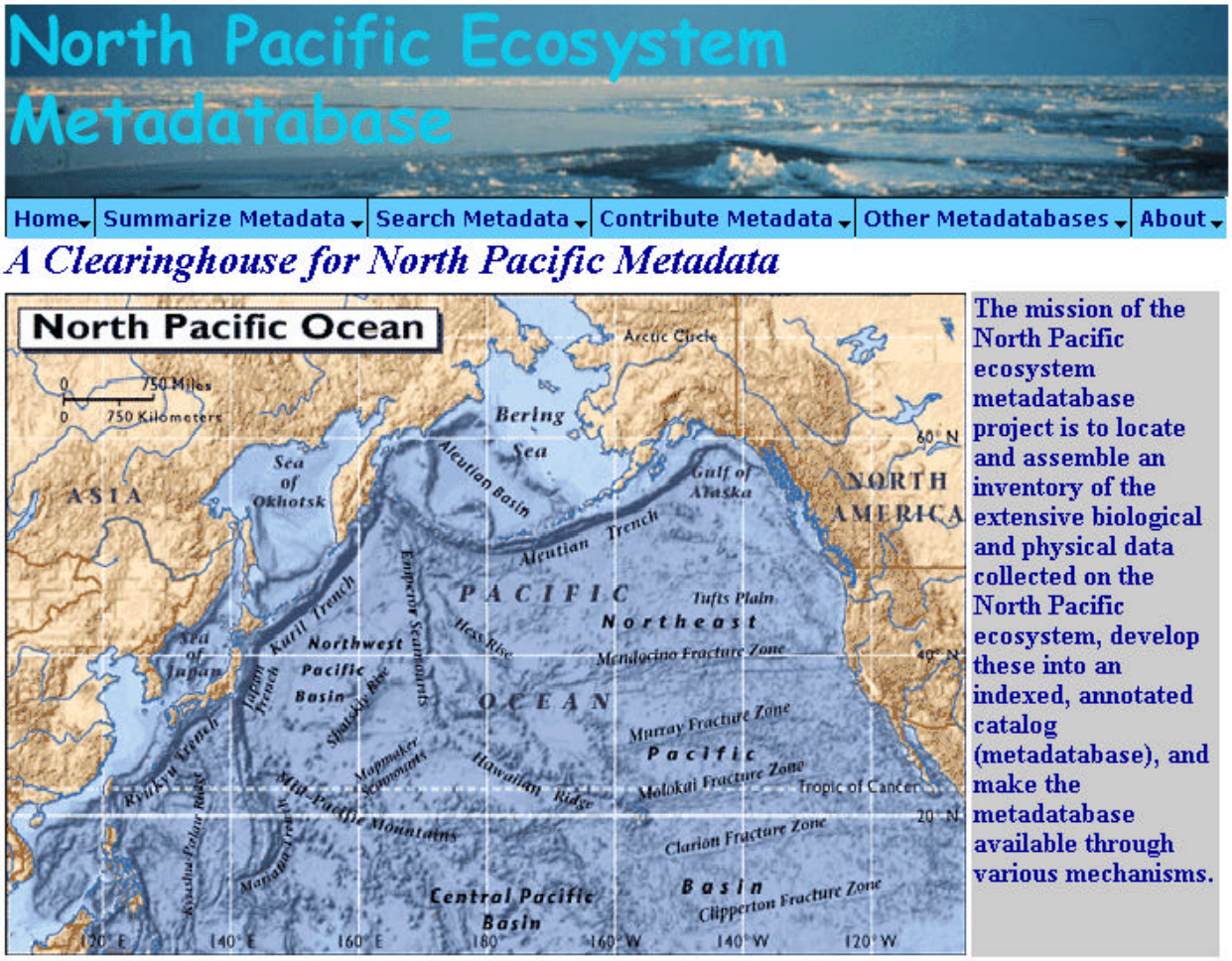

Figure 1. Website of the North Pacific Ecosystem Metadatabase.

North Pacific Ecosystem Metadatabase: A model for a GEM metadatabase – In response to a declaration from the National Research Council (1996) decrying the lack of a Bering Sea data catalog, we applied successfully to the National Oceanic and Atmospheric Administration (NOAA) for funding through its Environmental Services Data Information Management (ESDIM) program. In 1997, we began developing the Bering Sea Ecosystem Biophysical

Metadatabase (BSEBM, Megrey and Macklin 1999), wherein metadata describe the content, quality, condition, and other characteristics of data. Over the three-year life span of the project we 1) designed an FGDC-compliant database that conforms to a national standard (Federal Geographic Data Committee 1995), 2) populated the database with over 1000 records, 3) purchased and configured a web page server, and 4) made the metadatabase searchable from the WWW. In this system, metadata are assigned by keywords to one or more of the following ecosystem categories: atmosphere, benthos, biology, biological effects, birds, chemistry, fish, geology, ice physics, intertidal, mammals, management, meteorology, microbiology, oceanography, plankton, and synthesis. Additional keywords and an unlimited text description can be associated with each metadata entry. Each record is assigned a status code that designates whether data collection is planned, in progress, or completed. Contributors may stipulate constraints on access and use of their data. The name of the person to contact to obtain data is listed. Whenever data are available on-line, the metadatabase includes a direct link to them. For example, Figure 2 shows partial content of a metadata record for Alaska Coastal Current process modeling as displayed using the WWW metadatabase search utility. Note the URL that links to project information.

The BSEBM was selected as the official data-sharing vehicle by the interagency organizing committee of the first Bering Sea Ecosystem Workshop held in December 1997 in Anchorage, Alaska (Bering Sea Ecosystem Workshop 1997). Furthermore, the Bering Sea Task Force, in their March 1999 report to the Governor of Alaska (Bering Sea Task Force 1999), recommended establishing a comprehensive system for gathering, keeping, and communicating information; the BSEBM was cited as an element of such a system (Bering Sea Task Force 1999). Similarly, the Alaskan Oceans Seas Fisheries Research Foundation in their Unified Alaskan Research Plan (Alaskan Oceans Seas Fisheries Research Foundation 1999) recommends that existing data, including old reports and international data, be gathered for easy access via the Internet.

From July 1999 through June 2001, with support from the North Pacific Marine Research (NPMR) Program, we enhanced the utility and holdings of the metadatabase, focusing on cataloging metadata for projects funded by NPMR. In 2002, we began expansion of the Bering Sea metadatabase to the North Pacific Ecosystem Metadatabase. Expansion to the North Pacific Ocean was recommended at a joint workshop on "Impact of Climate Variability on Observation and Prediction of Ecosystem and Biodiversity Changes in the North Pacific", sponsored by PICES, Census of Marine Life, and the International Pacific Research Center (Alexander et. al 2001). Again, we attracted funding support from NOAA/ESDIM. That funding expires in FY 2004. We also added a co-operative partner, the North Pacific Marine Science Organization (PICES), and received endorsements from PICES and the *Exxon Valdez* Oil Spill Trustee Council (Attachments 1 and 2 following Section VII REFERENCES).

Full Metadata Record Description

TITLE AND LOCATION OF ON-LINE DATA

Title: Process modeling of the Alaska Coastal Current

URL: http://www.sfos.uaf.edu/npmr/projects/physchem/53/index.html

ABSTRACT AND PURPOSE

Abstract: Proposal -- We seek understanding of the dynamic response of the Gulf of Alaska shelf to a distributed coastal buoyancy influx and downwelling winds. Simple process-type numerical models will be used to resolve the basic dynamic balances and capture the cross-shelf circulation pattern. Parameter ranges used in modeling will encompass seasonal variations in winds, buoyancy, and stratification of the Alaska Coastal Current (ACC). Results should shed light on a number of issues relevant to the ecosystems of the Gulf of Alaska and the Bering Sea. We seek to provide a physical explanation for the observed high biological productivity of this deep shelf. The basis for this production is enigmatic given that downwelling winds prevail throughout most of the year and that the shelf receives a massive coastal influx of nutrient-poor freshwater. The ACC appears to be a crucial habitat for young-of-the-year salmon migrating to the ocean. Physical processes within the ACC could enhance the aggregation of zooplankton and therefore be critical to salmon recruitment success. Passive tracers will be introduced into the model to mimic zooplankton and/or young-of-the-year salmon. The dispersion of these tracers will show how these organisms are either retained within the ACC or dispersed outside this current. The results should benefit fisheries biologists seeking to understand salmon recruitment processes that depends upon survival during their first year. Finally, the ACC plays a crucial role in the freshwater balance of the Gulf of Alaska and possibly the Bering Sea shelf, which lies downstream of the Gulf of Alaska and ultimately receives the ACC. The major focus of the proposed work is on the processes that control the along- and cross-shore transport of freshwater and, conversely, the onshore transport of nutrient-rich, high salinity water from offshore. This work will be performed by a graduate student (William J. Williams). An NPMR project

Purpose: Proposal "to develop process models of the Alaska Coastal Current" sent to NPMR

CONTRIBUTOR'S NAME AND ADDRESS

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Published Date: Planned

METADATA RECORD TIME ELEMENTS

Single Date: **Single Time:**

Multiple Dates/Times:

Beginning Date: 7/1/1999 **Ending Date:** 7/31/2001

Beginning Time: **Ending Time:**

Figure 2. Part of a metadata record for Alaska Coastal Current process modeling. The URL links to information about the proposal and results obtained from research.

Presently, the NPEM contains more than 2000 records, is geo-referenced, and allows the user to build interactive, compound searches of its metadata records. Of those, more than 200 pertain to the Gulf of Alaska. The NPEM refers to data from such well known research programs as GEM, PROBES, OCSEAP, FOCI, SEBSCC, GLOBEC and NPMR, as well as other rare or less well known data collections. Several years ago, PICES agreed to merge the “PICES Inventory of Long-Term Time Series Relevant to the North Pacific” database into the NPEM.

The NPEM is an element of the award-winning North Pacific Ocean theme page (Fig. 3, Macklin 2001). Besides serving as the portal for the metadatabase, the theme page, which may be accessed at http://www.pmel.noaa.gov/bering/, provides further information for investigating the ecology of the North Pacific Ocean. It is a forum for presenting and discussing new ideas, plans and research results. The theme page, started in 1995, is accessed over 100,000 times a month from nearly 8,000 sites in more than 70 countries. It steers users to the NPEM and is continuously modified to reflect current events.

Figure 3. The North Pacific Ocean Theme Page is the gateway to the North Pacific Ecosystem Metadatabase.

Our experience over the past six years has given us valuable insight into the process of collecting and presenting marine-oriented metadata. The mechanics of creating a database, populating the

data tables, and presenting the metadata are easily managed. Obtaining the metadata is arduous. Although scientists readily acknowledge the value of their metadata, they often find it difficult to make the time to contribute it, even when contractually bound. In our experience, this means that obtaining metadata is a time consuming task that requires frequent individual contact.

We will extend Gulf of Alaska metadatabase holdings by conducting active and passive data searches. Actively, we will contact active investigators through solicitations in program and project newsletters (GEM, NPRB, GLOBEC, etc.), and by notices and presentations at regional, national, and international meetings and conferences. Our passive data search uses facilities provided by conventional library and museum systems, as well as electronic search utilities such as WWW search engines.

One of the most useful features of recent metadatabase technology is the ability to conduct federated searches, i.e., a user of one metadatabase can target additional on-line, cooperating metadatabases or data clearinghouses as part of an interactive data search. A good example of this is CIIMMS (http://info.dec.state.ak.us/ciimms/) that provides basic access to metadata and data relating to Cook Inlet and other areas of Alaska. Using the Z39.50 protocol, we will make this a feature of the proposed GEM metadatabase, and we will establish the GEM metadatabase as a National Spatial Data Infrastructure clearinghouse node. Using support from ESDIM on a parallel project, we are investigating the possibility of conducting federated searches with international ocean data centers, e.g., Russian Oceanographic Data Center, Japan Oceanographic Data Center. These sties undoubtedly contain some data sets that are pertinent to GEM, certainly on global and hemispheric scales, but likely also on regional, and perhaps even local, scales.

We will consult with GEM data managers in developing a schema for the comprehensive, web-accessible, geo-referenced, relational metadatabase of marine-related physical and biological databases of the northern Gulf of Alaska to be developed for GEM. The schema is critical to establishing the power of the metadatabase in terms of search and filtering capability. The metadata must be standardized and structured through the schema to assist in data extraction, data mining, and data formatting functionality. Currently we propose to use the 26 FGDC elements tracked by MetaLite as the basis for the schema. In addition, we will provide metadata descriptors for non-FGDC data characteristics. These are termed collectively *thematic*, *semantic* and *syntactic* descriptors. Thematic metadata describe the context of the study, i.e., the project, funding agency, purpose of the data, hypothesis being studied, principal investigator's details, etc. Semantic metadata describe the context of the observations, i.e., measurement type, sensor characteristics, measurement units, data quality, calibration data, etc. Syntactic metadata describe the form of the dataset, i.e., file size, format, storage mechanism, location, etc. These extra descriptors are crucial to accurate and detailed representation of datasets. In the NPEM, much of this extra information is encapsulated in the FGDC Abstract element and is accessed by a text-string search. We will work with GEM data managers to refine this method, as necessary.

We propose the following architecture (Fig. 4) for the GEM metadatabase. Information will be stored and served from a Linux platform, running the Red Hat Linux OS, mySQL, Apache/Tomcat webserver, Java JSPs and servlets, ArcIMS, ISITE or an equivalent Z39.50 server, and OPeNDAP protocol for data transfer, as possible. This architecture has the benefit of low cost, high reliability applications with proven speed and reliability. Using low- or no-cost, open-source applications also provides the flexibility of sharing, importing and adapting new technology from the many other metadata and data service developers that use the same applications. Using ArcIMS permits map-oriented, geo-referenced data query and data delivery capabilities.

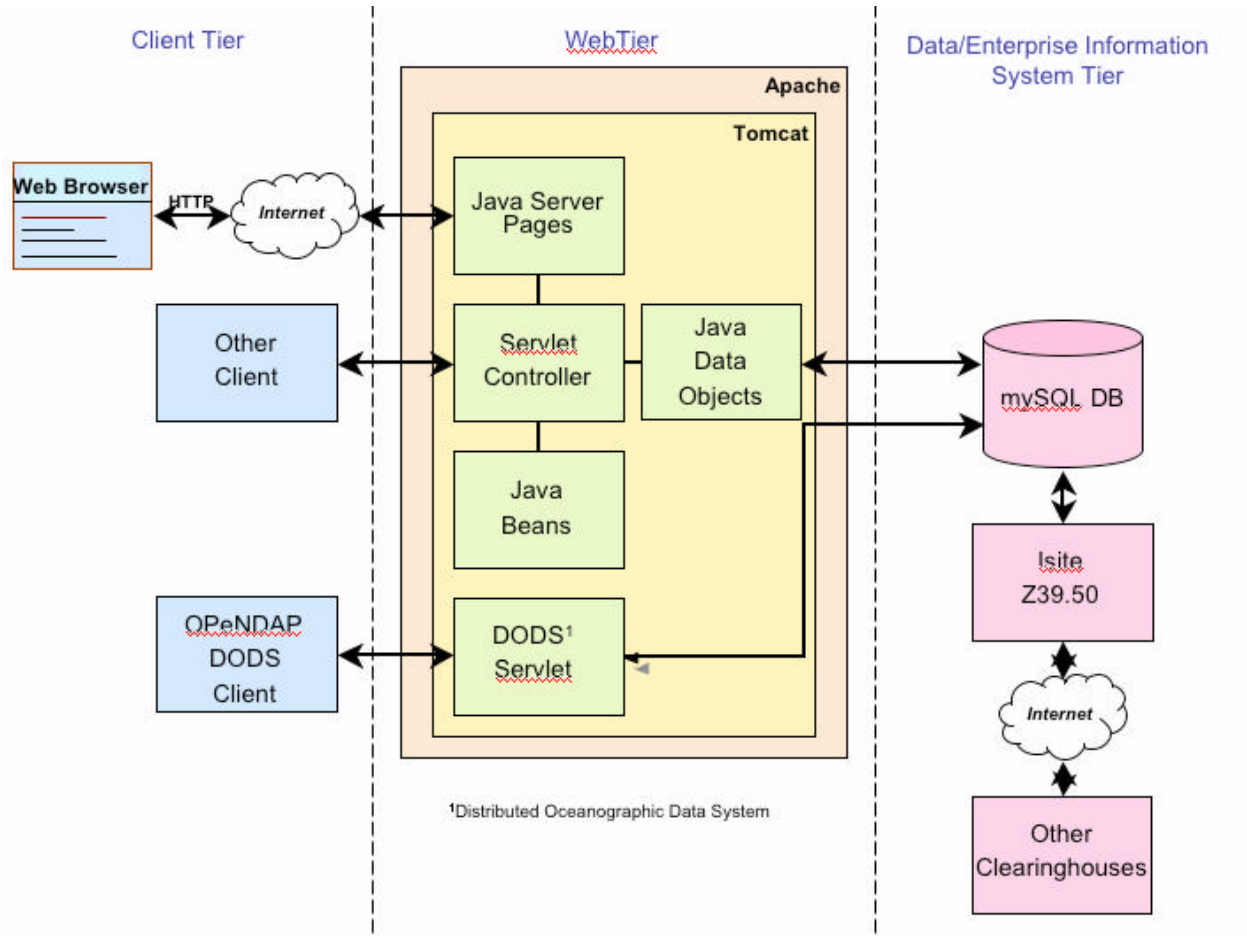

Figure 4. Proposed system architecture.

For the GEM metadatabase, ArcIMS will serve as the application for spatial searching and filtering. Besides user-stipulated latitude-longitude searches, easy spatial searches on pre-defined regions (e.g., “Gulf of Alaska”, “Cook Inlet”, “Prince William Sound”) will be a feature of the delivered product. This property is implemented in NPEM. We also will develop the capability to deliver search results in a map format, with data locations indicated as clickable

"dots". Clicking on a data location "dot" will take the user to the actual full metadata record. Presenting this information in a map format is an easy and effective way of communicating results to the public, educational programs, and non-English speaking users.

C. Data Analysis and Statistical Methods

This proposal falls in the Data Management and Information Transfer category, thus it has neither data analysis nor statistical methods to describe.

D. Description of Study Area

The geographic focus for the metadatabase is the northern Gulf of Alaska. All work towards accomplishing the objectives of this proposal will be accomplished in Seattle, Washington, with occasional trips to national and international conferences, as well as to the *Exxon Valdez* Oil Spill Trustee Council office in Anchorageto confer with GEM staff.

E. Coordination and Collaboration with Other Efforts

This project will support and cooperate with Project No. 030455, GEM Data System, begun in 2003, and with Project No. G-030687, "Monitoring in the Nearshore: A Process for Making Rational Decisions." This second project adopted the use of the NPEM metadata collection form (with slight adaptations) for their particular data collection needs. Additionally, we will borrow methodology, resources, and exchange information with the North Pacific Ecosystem Metadatabase.

This project will relate to any GEM funded project as the GEM metadatabase will facilitate current and future research by serving as a resource for GEM researchers. We will cooperate with existing research programs such as FOCI, GLOBEC, NPRB, and UAF/IMS to obtain adequate descriptions of, and links to, their archived data. We plan to advertise the existence of the project in scientific newsletters in the hope of identifying obscure or undocumented pieces of information by communicating directly with scientists through the reading material they routinely scan.

III. SCHEDULE

A. Project Milestones

The project sets the following milestones to address the six objectives declared in Section II. Milestone numbers refer to declared objectives. Because some objectives have been broken into several milestones, more than six milestones are presented.

Milestones 2004		To be met by
1a..	In cooperation with GEM staff, adapt NPEM schema to GEM	Jan 2004

	requirements according to FGDC standards.	
1b.	Add syntactic, thematic, and semantic descriptors to the metadatabase schema.	Mar 2004
2a.	Specify hardware requirements for development and production computing and server platform; purchase equipment.	Jan 2004
2b.	Obtain "open source" operating system, web information server, database, and associated software (i.e., LINUX Advanced Server, Apache/Tomcat web server, MySQL database software).	Feb 2004
2c.	Install and configure servers for web access and metadatabase capabilities.	Apr 2004
3a.	Design a user-focused, web-based search, identification, retrieval, and data delivery interface to permit harvest of metadata specific to GEM by compound interactive request.	Jun 2004
4.	Ingest applicable metadata records from the North Pacific Ecosystem Metadatabase.	Aug 2004
6a.	Demonstrate operational web-accessible metadatabase.	Sep 2004

Milestones 2005		**To be met by**
5a.	Solicit information on ancillary Gulf of Alaska datasets through newsletter articles, science conference presentations, etc.	Oct 2004
2d.	Obtain, install and configure Z39.50 search engine on server to allow searches of remote databases (e.g., CIIMMS, ARLIS, NOAA Server) and to make GEM information products readily available to partners, user groups and other data clearinghouse programs.	Dec 2004
2e.	Install and configure a map-oriented geo-referenced tool to facilitate data query and delivery functions.	Mar 2005
3b.	In cooperation with GEM staff, evaluate scoring algorithms to permit computation of the relevance of metadata records to GEM's goals.	Jun 2005
5b.	Continue populating metadatabase tables with metadata pertinent to GEM's objectives.	Sep 2005
6b.	Demonstrate functional turn-key system to GEM.	Sep 2005

Milestones 2006		To be met by
5c.	Re-solicit information on ancillary Gulf of Alaska datasets through newsletter articles, science conference presentations, etc.	Oct 2006
2f.	Expand nodes of Z39.50 federated search to other data clearinghouse programs.	Mar 2006
3c.	Implement a metadata record relevance scoring algorithm.	May 2006
5d.	Continue populating metadatabase tables with metadata pertinent to GEM's objectives.	Sep 2006
6c.	Deliver functional turn-key system to GEM.	Sep 2006

B. Measurable Project Tasks

FY04, 1st quarter (October 1, 2003-December 31, 2003)

October: Project funding approved by Trustee Council.

FY04, 2nd quarter (January 1, 2004-March 31, 2004)

January: In cooperation with GEM staff, adapt NPEM schema to GEM requirements according to FGDC standards.

January: Specify hardware requirements for a development and production computing and server platform and purchase equipment.

February: Obtain "open source" operating system, web information server, database, and associated software (i.e., LINUX Advanced Server, Apache/Tomcat web server, mySQL database software).

March: Add syntactic, thematic, and semantic descriptors to the metadatabase.

FY04, 3rd quarter (April 1, 2004-June 30, 2004)

April: Install and configure servers for web access and metadatabase capabilities.

June: Design a user-focused web-based search, identification, retrieval, and data delivery interface to permit harvest of metadata specific to GEM by compound interactive request.

FY04, 4th quarter (July 1, 2004-September 30, 2004)

August: Ingest applicable metadata records from the NPEM.

September: Demonstrate operational web-accessible metadatabase.

September: Submit Annual Report to Trustee Council.

FY05, 1st quarter (October 1, 2004-December 31, 2004)

October: Solicit information on other available historical Gulf of Alaska datasets using announcements in scientific newsletters, presentations at science conferences, etc.

December: Obtain, install and configure Z39.50 search engine on server to allow the capability to search remote databases and clearinghouses and to make GEM information products readily available to partners, user groups and federated clearinghouses.

FY05, 2nd quarter (January 1, 2005-March 31, 2005)

March: Install and configure a map-oriented geo-referenced tool to facilitate data query and delivery functions.

FY05, 3rd quarter (April 1, 2005-June 30, 2005)

June: In cooperation with GEM staff, evaluate scoring algorithms to permit computation of the relevance of metadata records to GEM's goals.

FY05, 4th quarter (July 1, 2005-September 30, 2005)

September: Continue populating metadatabase tables with metadata pertinent to GEM's objectives.

September: Demonstrate functional turn-key system to GEM.

September: Submit Annual Report to Trustee Council.

FY06, 1st quarter (October 1, 2005-December 31, 2005)

October: Re-solicit information on ancillary Gulf of Alaska datasets through newsletter articles, science conference presentations, etc.

FY06, 2nd quarter (January 1, 2006-March 31, 2006)

March: Expand nodes of Z39.50 federated search to other data clearinghouses.

FY06, 3rd quarter (April 1, 2006-June 30, 2006)

May: Implement a metadata record-relevance scoring algorithm.

FY06, 4th quarter (July 1, 2006-September 30, 2006)

September: Continue populating metadatabase tables with metadata pertinent to GEM's objectives.

September: Deliver functional turn-key system to GEM.

September: Submit Final Report to Trustee Council.

IV. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

A. Community Involvement and Traditional Ecological Knowledge (TEK)

This is not an active scientific research project based on the traditional model of observation, hypothesis generation and supporting field work, so it is not particularly relevant to this proposal element. Rather this project serves another very important and often overlooked function, that being to support and facilitate scientific research. These functions are explicitly identified in the GEM Draft Science Plan (*Exxon Valdez* Oil Spill Trustee Council 2003) as being important elements in the overall GEM data management plan.

Traditional knowledge is under-represented in the NPEM. However, the theme page includes several links to Native Alaskan organizations, and we are communicating with the Alaska Native Knowledge Network and the Alaska Native Science Commission to increase metadata holdings on traditional ecosystem knowledge. Incorporation of TEK can be accommodated by the FGDC metadatabase standard without modification of the schema, and we would encourage such information to be included into the GEM metadatabase as it becomes available. No community contacts have been identified for this section.

B. Resource Management Applications

In a letter of support for an earlier proposal by the principal investigators submitted to NOAA ESDIM in 2001, the EVOS Trustee Council stated that "a biophysical metadatabase, such as we are proposing, would help EVOS research programs to (1) determine what data are available for retrospective studies and baseline resolution, (2) provide a solid historical context of available data which would be essential to understand the sources of change in valued natural resources, (3) identify causes of change in the marine ecosystem, including natural variation, human influence and their interaction, (4) develop tools, technologies and information to help resource managers and regulators improve management of marine resources and address problems that may arise from human activities and (5) develop the capacity to predict the status and trends in natural resources for use by resource managers and consumers."

We feel this project will be particularly relevant to resource managers in that it will provide the capability to produce useable tools, as well as produce knowledge or products to help resource managers and regulators improve management of marine resources and address problems that arise from human activities. Compiling historical biophysical metadata on the Gulf of Alaska ecosystem will benefit anyone or any project related to studying this most biologically and economically important subarctic ecosystem. The metadatabase will prove extremely useful to researchers and resource managers undertaking field work or designing field sampling programs, designing process studies, conceptualizing, constructing and validating simulation models, or collecting data for retrospective analyses. One key benefit of assembling a Gulf of Alaska ecosystem metadatabase is that it will facilitate past, present and future comparisons of biological processes and their coupling to the physical structure and variability of the environment. Decadal data sets of biotic and abiotic variables collected on such a large geographic scale will provide insight into climate- and global-scale variability, predator-prey interactions, factors driving climate change, and the marine ecosystems response to it. Moreover,

the metadatabase allows individuals to monitor changes and provide baselines for formulating and testing hypotheses that advance understanding of interactive processes regulating ecosystem production. Another important benefit is the cataloging of information about endangered species, such as Steller sea lions (SSL), and the ecosystem in which they live. With the metadatabase, scientists and resource managers can obtain data to perform regional comparisons, better define regional differences in forcing and response, and determine the extent to which long-term changes are regionally focused or coherent with variability in SSL abundance.

The project will facilitate data sharing, promote research coordination among practicing scientists, and will support research, management and education by delivering information to scientists, resource managers, educators and stakeholders. Our goal is to increase the information available to resource managers so that they can be more responsible environmental stewards, as well as to non-scientific stakeholders, while at the same time keeping the actual data under control of the scientists and/or programs that collect it.

V. PUBLICATIONS AND REPORTS

We do not anticipate publications arising from this project to appear in peer-reviewed journals. However, we do plan to advertise the existence of the project in science newsletters in the hope of identifying obscure or undocumented pieces of information by communicating directly with scientists through the reading material they routinely scan.

VI. PROFESSIONAL CONFERENCES

We anticipate making presentations describing this project at the annual PICES meetings, scheduled to take place in the fall of 2003 in Seoul, Republic of Korea, and in fall of 2004 in Honolulu, Hawaii. We will also present this project at the annual American Fisheries Society meeting, scheduled to take place on 2005, in Anchorage Alaska, and at the annual *Exxon Valdez* Oil Spill Trustee Council PI meetings for GEM research.

VII. REFERENCES

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Prediction of Ecosystem and Biodiversity Changes in the North Pacific". PICES Scientific Report No. 18, ISBN 0-9685100-8-6, ISSN 1198-273X, 210pp.

American Geophysical Union, 1997: *AGU Position on the Importance of Archiving and Availability of Geophysical Data.* Washington, DC.

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Bering Sea Task Force, 1999: Draft Report to Governor Tony Knowles. Unpublished document available on request from *Bering-sea-net@list.state.ak.us*. March.

Exxon Valdez Oil Spill Trustee Council, 2002: *Gulf of Alaska Ecosystem Monitoring and Research (GEM) Program Document*. http://www.oilspill.state.ak.us/gem/documents.html.

Exxon Valdez Oil Spill Trustee Council, 2003: *Gulf of Alaska Ecosystem Monitoring and Research (GEM) Draft Science Plan*. *http://www.oilspill.state.ak.us/pdf/gem/Master_TC_Review_Draft_Science_Plan_050103.pdf*

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Megrey, B.A., and S.A. Macklin, 1998: Bering Sea ecosystem biophysical metadatabase: A collaborative research tool for fisheries oceanography and ecosystem investigations. *PICES Press,* Vol. 6, No. 1, January 1998, 37-40.

Michener, W.K., J.W. Brunt, J.J. Helly, T.B. Kirchner, and S.G. Stafford, 1997: Nongeospatial metadata for the ecological sciences. *Ecological Applications, 7,* 330-342.

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National Research Council, 2002: *A Century Of Ecosystem Science: Planning Long-Term Research in the Gulf of Alaska.* Chapter 6, "Data and Information Management". *http://www.oilspill.state.ak.us/gem/documents.html#NRC_report*.

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Attachment 1

August 31, 2001

National Oceanic and Atmospheric Administration
ESDIM Review Panel
c/o Stephen K. Brown
Headquarters – National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3282

Dear Mr. Brown and ESDIM Panelists:

The North Pacific Marine Science Organization (PICES) endorses the proposal by Bernard Megrey and Allen Macklin to create a North Pacific Ecosystem Metadatabase (NMFS_02-08). This project is clearly beneficial to NOAA and also will help PICES achieve its goals. that are (i) to promote and co-ordinate marine scientific research in the northern North Pacific and adjacent marginal seas; (ii) to advance scientific knowledge about the ocean environment, global weather and climate change, living resources and their ecosystems, and the impact of human activities on them; and (iii) to promote the collection and rapid exchange of scientific information on these issues. PICES, an intergovernmental marine science organization, was created in 1992 and its current membership includes Canada, Japan, the People's Republic of China, the Republic of Korea, the Russian Federation, and the United States of America.

In March 2001, PICES co-sponsored (with the Census of Marine Life, through the Alfred P. Sloan Foundation, and the International Pacific Research Center) an international workshop on "Impact of climate variability on observation and prediction of ecosystem and biodiversity changes in the North Pacific". At this workshop, participants from all PICES' member countries (mainly representatives of various national monitoring and prediction programs) compiled lists of existing time-series on physical and chemical oceanography and climate; phytoplankton, zooplankton, and micro-nekton; fish and crustaceans; and marine mammals and birds for the eastern, western, and open North Pacific. I assure you that a very vast and rich declaration of data ensued from this activity. The most common recommendation from participants was to ensure that the time-series information and scientific contacts identified at the workshop be recorded and updated in a data archiving and sharing utility, particularly the North Pacific Ecosystem Meta-database, presently the Bering Sea Ecosystem Biophysical Meta-database. I presume that the time-series identified at the workshop will provide some, but not all of the metadata that will be used to expand the current meta-database.

PICES will participate in this endeavor by providing the data lists compiled for the workshop. We will also review and recommend metadata keywords for the expanded data set. PICES' Technical Committee on Data Exchange (TCODE) will undertake this task. TCODE has already placed the PICES long-term time-series information into the meta-database. PICES also will provide a link to the meta-database from the PICES web site, and will consider mirroring the website to stimulate cooperation from the international community. PICES is eager to see the data holdings of its member countries put into an accessible and searchable form. Unfortunately, PICES cannot fund this or other research endeavors.

The U.S. National Oceanic and Atmospheric Administration (NOAA), as represented by Dr. Megrey and Mr. Macklin, has worked hard through PICES and other organizations to publicize the existing meta-database to the international science community as a research tool and in an effort to obtain reference to undisclosed international data. It is exactly such a full suite of North Pacific Ocean data that is needed by NOAA and other scientists to determine the signature and impacts of climate variability. PICES recognizes and appreciates the leadership role that NOAA has demonstrated by developing this meta-database. PICES enthusiastically supports this work as a valuable international scientific contribution and strongly recommends that ESDIM fund it.

Sincerely,

Dr. Alexander Bychkov
Executive Secretary

Attachment 2

August 29, 2001
National Oceanic and Atmospheric Administration
ESDIM Review Panel
c/o Stephen K. Brown
Headquarters – National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3282
Via facsimile: (301) 713-9395

RE: ESDIM Proposal NMFS_02-08, Project Title: North Pacific Ecosystem Metadatabase, Principal Investigator: Megrey, Bernard A.

Dear Panelists and Mr. Brown,

I am writing to endorse creation of the North Pacific Ecosystem Metadatabase (NPEM) as proposed to ESDIM by Bernard Megrey and Allen Macklin. The NPEM utility would help Exxon Valdez Oil Spill Trustee Council (EVOSTC) research programs in a number of ways, such as determining what data are available for retrospective studies, finding baseline data sets that need to be continued, and locating partners for joint monitoring projects. As a result of EVOSTC efforts to assemble a regional metadatabase of marine science organizations and research activities in the Gulf of Alaska during the past two years, we know that our organization is not unique in its need for NPEM. The effort at compiling the Gulf Ecosystem Monitoring (GEM) metadatabase was motivated by ten years of experience in studying an ecosystem-scale disaster. The experience points toward the need for a solid historical context in order to understand the sources of change in valued natural resources. A geographically and institutionally comprehensive metadatabase of marine science investigations in the North Pacific such as NPEM is essential to develop that historical context.

As our Gulf Ecosystem Monitoring (GEM) program comes on line in October 2002, the GEM metadatabase allows us to know which variables NOAA and other agencies may be able to help monitor in the Gulf. Compiling our own regional metadatabase required substantial effort and expense, and I was disappointed to find that there were no similar efforts at the federal level on which we could call for help. In the future it would be beneficial, to our program and others, in the North Pacific region, such as the North Pacific Research Board, if NOAA would help underwrite this metadatabase. Specifically, the proposed North Pacific Ecosystem Metadatabase will help us attain three of our major goals. The first is to identify causes of change in the marine ecosystem, including natural variation, human influence and their interaction. The next is to develop tools, technologies and information that can help resource managers and regulators improve management of marine resources and address problems that may arise from human activities. The last is to develop the capacity to predict the status and trends of natural resources for use by resource managers and consumers.

EVOSTC scientists participated in the international meeting during March 2001 that identified ecosystem-related, North Pacific time series and recommended that these efforts be archived in a sharable database. In their NPEM proposal, Megrey and Macklin talk about the "amazing

diversity and quantity" of data that were divulged at the meeting. I heartily agree with this assessment and truly hope that these data won't be lost back into the nooks and crannies of foreign and domestic institutions.

We would be willing to cooperate in developing the metadatabase in three ways, by contributing the contents of our own metadatabase, by urging our researchers to contribute applicable information, and by providing a link from our web site to the NPEM metadatabase web site. We are now in the process of developing our data management and information transfer program. Should NOAA support the metadatabase proposal from Dr. Megrey and Mr. Macklin for funds to help support the North Pacific Ecosystem Metadatabase, we would ask the Council to consider becoming a partner in this effort by providing material and financial support under the GEM program. In the meantime, we encourage you to fund this proposal.

Sincerely,

Phillip R. Mundy, Ph. D.
Chief Scientist
Gulf Ecosystem Monitoring

Stewart Allen Macklin
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Professional Preparation

B.S. Atmospheric Science (March 1970), University of Washington, Seattle, Washington
M.S. Atmospheric Science (April 1975), University of Washington, Seattle, Washington

Appointments

April 1976 – present: Meteorologist. NOAA/PMEL, Seattle, Washington
July 1979 – February 1980: NASA Meteorological Consultant. Institute of Ocean Sciences, Wormley, England, UK
September 1975 – April 1976: Research Meteorologist. University of Washington, Seattle, Washington
June 1970 – April 1975: Research Assistant. University of Washington, Seattle, Washington.

Five Relevant Publications

Macklin, S.A. (2001) Bering Sea and North Pacific Ocean Theme Page. *PICES Press*, 9(1), January 2001, 29-30, 34.

Macklin, S.A., and B.A. Megrey (1997): NOAA funds comprehensive Bering Sea database. *Witness the Arctic, Chron. Arctic System Science Research Program, 5 (2),* 21.

Macklin, S.A. (1997): NOAA seeks entries for a Bering Sea ecosystem metadatabase. *Earth System Monitor, 8 (1),* 3.

Macklin, S.A. (1997): NOAA seeks contributions for inventory of Bering Sea data. *U.S. JGOFS News 8 (4),* 15.

Megrey, B.A., and S.A. Macklin (1998): Bering Sea ecosystem biophysical metadatabase: A collaborative research tool for fisheries oceanography and ecosystem investigations. *PICES Press*, 6(1), January 1998, 37-40.

Five Other Publications

Macklin, S.A., V.I. Radchenko, S. Saitoh, and P.J. Stabeno (2002): Editorial: Variability in the Bering Sea. *Progress in Oceanography*, 55(1-2), 1-4.

Macklin, S.A., G.L. Hunt, Jr., and J.E. Overland (2002): Collaborative research on the pelagic ecosystem of the southeastern Bering Sea shelf. *Deep-Sea Res. II*, 49(26), 5813-5819.

Macklin, S.A. and P.J. Stabeno (2000): Marine ecosystem studies of physical and biological interactions in the eastern Bering Sea and western Gulf of Alaska. *Arctic Research of the United States*, 14, 25-32.

Macklin, S.A. (1999): Bering Sea FOCI. In *Dynamics of the Bering Sea*, T.R. Loughlin and K. Ohtani (eds.), North Pacific Marine Science Organization (PICES), University of Alaska Sea Grant, AK-SG-99-03, 733-751.

Megrey, B.A., A.B. Hollowed, S.R. Hare, S.A. Macklin, and P.J. Stabeno (1996): Contributions of FOCI research to forecasts of year-class strength of walleye pollock in Shelikof Strait, Alaska. *Fish. Oceanogr. 5 (Suppl. 1),* 189-203.

Synergistic Activities

- Coordinator of two, long-lived NOAA-academic research programs since 1989: Fisheries-Oceanography Coordinated Investigations (FOCI, www.pmel.noaa.gov/foci) and Southeast Bering Sea Carrying Capacity (SEBSCC, www.pmel.noaa.gov/sebscc). These programs investigate marine environments with a goal of better understanding ecosystems and developing predictive capability for commercial marine fish stocks. Each program involves upwards of 20 principal investigators and budgets of >$1M annually. Routine services provided by Macklin are publication of annual research summaries, milestone achievements and other reports, coordination of research vessels and field operations, organization of monthly and annual meetings, workshop organization and leadership, maintenance of web sites and databases, production of seminar series, and editing special journal volumes, e.g., *Deep-Sea Research II* and *Progress in Oceanography*. As program representative, Allen interacts with personnel of the North Pacific Fishery Management Council, the North Pacific Marine Research Board, the Exxon Valdez Oil Spill Trust Council, the North Pacific Marine Sciences Organization, GLOBEC, NOAA Coastal Ocean Program, the universities of Washington and Alaska, and other government and academic institutions.
- Director of Bering Sea and North Pacific Ocean Theme Page, Co-Director of North Pacific Ecosystem Metadatabase, Director of NOAA/OAR Northwest Region Metadatabase: As an information manager, Macklin developed the Bering Sea & North Pacific Theme Page (www.pmel.noaa.gov/bering), a Worldwide Web information resource for investigation and management of biology, oceanography, meteorology and ecology of the Bering Sea and North Pacific Ocean. Beyond its clearinghouse role, the theme page provides a forum for presenting and discussing new ideas, plans and research results. Contained within the theme page are the North Pacific Ecosystem Metadatabase and the OAR NW Region Metadatabase. These metadatabases provide catalogs and links to ecosystem research data for much of the Pacific Ocean and Arctic.
- Synthesizer of biophysical information to realize forecast capability for marine species and regions: As a meteorologist, Allen has conducted coastal ecosystem research in the Bering Sea and Gulf of Alaska for 27 years, applying his research to prediction of walleye pollock recruitment based on environmental observations.
- Professional affiliations: American Meteorological Society, Member, 1975 – present; American Geophysical Union, Member, 1981 – present; North Pacific Marine Sciences Organization (PICES), Member, 1991 – present; Co-chair, Alaska Ocean Observing System Data Management and Communications Steering Committee, 2003-present.

Collaborations: 1999-2003

V. Alexander (UAF), R. Brodeur (NOAA/NMFS), V. Byrd (FWS), K. Coyle (UAF), M. Dagg (LUMCON), A. Hollowed (NOAA/NMFS), G. Hunt, Jr. (UCI), D. Johnson (NOAA/COP), C. Ladd (NOAA/PMEL), P. Livingston (NOAA/NMFS), S. McKinnell (PICES), B. Megrey (NOAA/NMFS), C. Mordy (NOAA/PMEL), D. Musgrave (UAF), J. Napp (NOAA/NMFS), J. Overland (NOAA/PMEL), V. Radchenko (SakhNIRO), T. Royer (ODU), S-i. Saitoh (Hokkaido University), J. Schumacher (Two Crow Environ. Consult.), E.Sinclair (NOAA/NMFS), P. Stabeno (NOAA/PMEL), G. Swartzman (UW), E. Turner (NOAA/COP), T. Whitledge (UAF)

Graduate Advisors: R.G. Fleagle, J.A. Businger, University of Washington

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Education

Ph.D. 1989 Fisheries Science, University of Washington, Seattle, Washington.
M.En. 1978 Systems Ecology, Miami University, Oxford, Ohio.
B.S. 1974 Environmental Science, Cleveland State University, Cleveland, Ohio.

Professional Experience

06/92-present Principal Investigator, Recruitment Modeling Studies, Fisheries Oceanography Coordinated Investigations (FOCI), National Marine Fisheries Service, Alaska Fisheries Science Center.
08/87-11/88 Research Fisheries Biologist, Stock Assessment Analyst, National Marine Fisheries Service, Northwest and Alaska Fisheries Center.

Selected Publications In Books And Journals

Megrey, B.A. and E. Moksness. 2002. Visualization of spatial data. *ICES J. Mar. Sci*. 59(1): 150.

Megrey, B.A., S. Hinckley, and E. Dobbins. 2002. Using scientific visualization tool to facilitate analysis of multi-dimensional data from a spatially explicit, biophysical individual-based model of marine fish early life history. *ICES J. Mar. Sci.* 59(1): 203-215.

Megrey, B.A. and S. Hinckley. 2001. The effect of turbulence on feeding of larval fishes: a sensitivity analysis using an individual-based model. *ICES J. Mar. Sci.* 58(5): 1015-1029.

Hermann, A.J., S. Hinckley, B.A. Megrey, J.M. Napp. 2001. Applied and theoretical considerations for constructing spatially explicit individual-based models of marine larval fish that include multiple trophic levels. *ICES J. Mar. Sci.* 58(5): 1030-1041.

Hinckley, S., B.A. Megrey, K.L. Mier. and A.J. Hermann. 2001. Importance of spawning location and timing to successful transport to nursery areas: a simulation modeling study of Gulf of Alaska walleye pollock. *ICES J. Mar. Sci* 58(5): 1042-1052.

Megrey, B.A. (editor). 2000. Report of the 2000 Model Task Team International Workshop to Develop a Prototype Lower Trophic Level Ecosystem Model for Comparison of Different Marine Ecosystems in the North Pacific. *PICES Scientific Report No 15*, 203 pp.

Wespestad, V.G., L. Fritz, J. Ingraham, B.A. Megrey. 2000. On relationships between cannibalism, climate variability, physical transport and recruitment success of Bering Sea walleye pollock. *ICES J. Mar. Sci* 57(2):272-278.

Megrey, B.A. and S.A. Macklin. 1998. Bering Sea Ecosystem Biophysical Metadatabase: A Collaborative Tool for Fisheries Oceanography and Ecosystem Investigations. *PICES Press* 6(1): 37-40.

Megrey. B.A. 1997. Call for Data: Bering Sea Ecosystem Metadatabase. *AK Fish. Res. Bull.* 4(1):79-80.

Megrey, B.A., A.B. Hollowed, S.R. Hare, S.A. Macklin, and P.J. Stabeno. 1996. Contributions of FOCI research to forecasts of year-class strength of walleye pollock in Shelikof Strait, Alaska.

Fish. Oceanogr. 5(11):189-203.

Collaborations in the Past 48 Months

NOAA/NMFS Alaska Fisheries Science Center, Seattle, WA: Dr. Anne Hollowed, Dr. Sarah Hinckley, Mr. Lowell Fritz, Mr. James Ingraham, Dr. Jeffrey Napp, Dr. James Ianelli. Dr. Kerim Ayden
NOAA/ERL, Pacific Marine Environmental Laboratory, Seattle, WA: Dr. Phyllis J. Stabeno, Mr. S. Allen Macklin, Dr. Albert Hermann, Dr. Jim Overland
Dr. Erro Aro, Finish Game and Fisheries Research Institute, Helsinki, Finland
Dr. Nicholas Bax, CSIRO, Hobart, Tasmania
Dr. François Carlotti, Université P. et M. Curie, Paris, France
Dr. Fei Chai, University of Maine, Orono, ME
Dr. Niels Daan, Netherlands Institute for Fishery Investigations, Ijmuiden, The Netherlands
Dr. Ken Drinkwater, Bedford Institute of Oceanography, Halifax, Canada
Dr. John Fields, University of Cape Town, Cape Town, South Africa
Dr. John Glaister, New South Wales Fisheries, Sidney Australia
Dr. Olav Rune Gødo, Institute of Marine Research, Bergen Norway
Dr. Mike Heath, FRS Marine Laboratory, Aberdeen, Scotland
Dr. Paul Hart, Leicester University, Leister, United Kingdom
Dr. Douglas Hay, DFO, Pacific Biological Station, Nanaimo Canada
Dr. George Hunt, University of California Irvine
Dr. Shin-ichi Ito, Tohoku National Fisheries Research Institute, Sendai, Japan
Dr. Makoto Kashiwai, Hokkaido National Fisheries Research Institute, Kurshiro, Japan
Dr. Jacquline King, DFO, Pacific Biological Station, Nanaimo Canada
Dr. Michio J. Kishi, Faculty of Fisheries, Hokkaido University, Hokkaido, Japan
Dr. Andre Krovnin, VNIRO, Moscow, Russia
Dr. Jae Bong Lee, National Fisheries Research and Development Institute, Pukyong, Korea
Dr. Gordon McFarlane, DFO, Pacific Biological Station, Nanaimo Canada
Dr. Li Minq Qi, Chinese Society of Fisheries, Beijing, China
Dr. Harald Loeng, Institute of Marine Research, Bergen, Norway
Dr. Erlend Moksness, Institute of Marine Research, Flodevigan, Norway
Dr. Bruce Phillips, Curtin University of Technology Western Australia, Perth, Australia
Dr. Patrick Monfray, Unite Mixte CEA-CNRS, Gif-sur-Yvette, France
Dr. Eugene Murphy, British Antarctic Survey, Cambridge University, England
Dr. Geir Ottersen, Institute of Marine Research, Bergen, Norway
Dr. Tony Pitcher, University of British Columbia, Vancouver, Canada
Dr. Kenneth Rose, Coastal Fisheries Institute, Louisiana State University, Baton Rouge, LA
Dr. Claude Roy, Sea Fisheries Institute, Cape Town, South Africa
Dr. Jeffery Runge, University of New Hampshire, Durham, NH
Dr. James D. Schumacher, Two Crow Environmental Consultants, Silver City, NM
Dr. Igor Shevchenko, Pacific Research Inst. of Fisheries and Oceanography, Vladivostok, Russia
Dr. Francisco Werner, University of North Carolina Chapel Hill, Charlotte, NC
Dr. Vidar G. Wespestad, Resource Analysts International, Seattle, WA
Dr. Brad de Young, Memorial University of Newfoundland
Dr. Chang Ik Zhang, Pukyong National University, Pusan, Korea

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

Budget Category:	Proposed FY 04	Proposed FY 05	Proposed FY 06		TOTAL PROPOSED
Personnel	$0.0	$0.0	$0.0		$0.0
Travel	$7.4	$12.0	$7.4		$26.8
Contractual	$120.5	$146.4	$92.0		$358.9
Commodities	$2.1	$9.5	$3.3		$14.9
Equipment	$10.0	$0.0	$0.0		$10.0
Subtotal	$140.0	$167.9	$102.7		$410.6
General Administration (9% of Subtotal)	$12.6	$15.1	$9.2		$37.0
Project Total	$152.6	$183.0	$111.9		$447.6

Cost-share (NOAA) Funds:

	FY 04	FY 05	FY 06	TOTAL
Personnel ----------				
Macklin (2 months/year)	$32.7	$34.1	$35.4	$102.2
Megrey (2 months/year)	$32.7	$34.1	$35.4	$102.2
Travel ----------				
PICES: Seoul, Korea	$8.8			$8.8
AmerFishSoc: Anchorage		$2.8		$2.8
Commodities ----------				
Development ArcIMS software		$6.2		$6.2
Computer and Network Services	$2.4	$2.5	$2.6	$7.5
ArcIMS annual maintenance		$1.2	$1.2	$2.4
ArcIMS developers tech support		$1.4	$1.4	$2.8
TOTAL ----------	$76.6	$82.3	$76.0	$234.9

FY 04-06

Date Prepared: 6/15/2003

Project Number:
Project Title: NGOA Metadatabase
Agency: NOAA

FORM 3A
TRUSTEE
AGENCY
SUMMARY

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 04 - FY 06

Personnel Costs:		GS/Range/	Months	Monthly		Personnel
Name	Description	Step	Budgeted	Costs	Overtime	Sum
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		0.0	0.0	0.0	
					Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Macklin and Megrey to Anchorage to confer with GEM data managers	0.8	2	4	0.3	2.8
Macklin and Megrey to Anchorage for GEM annual meeting	0.8	2	10	0.3	4.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$7.4

FY 04

Project Number:
Project Title: NGOA Metadatabase
Agency: NOAA

FORM 3B
Personnel
& Travel
DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

Contractual Costs:	Contract Sum
Description	
Relational database and web engineer (10 months at $10.0K per month)	100.0
Database technician (3.3 months at $6.2K per month)	20.5
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$120.5

Commodities Costs:	Commodity Sum
Description	
Development software and upgrades	0.8
Miscellaneous supplies (disks, mailing, copying, etc.)	0.7
Red Hat Linux Professional Server (2)	0.6
Commodities Total	$2.1

FY 04

Project Number:
Project Title: NGOA Metadatabase
Agency: NOAA

FORM 3B
Contractual
&
Commoditie

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 04 - FY 06

New Equipment Purchases:	Number	Unit	Equipment
Description	of Units	Price	Sum
Development and production database and web servers (estimate from Dell Computer, government sales	2	5.0	10.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
		New Equipment Total	$10.0

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency

FY 04

Project Number:
Project Title: NGOA Metadatabase
Agency: NOAA

FORM 3B
Equipment
DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

Personnel Costs:		GS/Range/	Months	Monthly		Personnel
Name	Description	Step	Budgeted	Costs	Overtime	Sum
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		0.0	0.0	0.0	
					Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Macklin and Megrey to Anchorage to confer with GEM data managers	0.8	2	4	0.3	2.8
Macklin and Megrey to Anchorage for GEM annual meeting	0.8	2	10	0.3	4.6
Macklin and Megrey to Honolulu for annual PICES meeting to solicit data	0.5	2	12	0.3	4.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$12.0

FY 05

Project Number:
Project Title: NGOA Metadatabase
Agency: NOAA

FORM 3B
Personnel
& Travel
DETAIL

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

Contractual Costs:	Contract Sum
Description	
Relational database and web engineer (7 months at $10.4K per month)	72.8
Database technician (11.5 months at $6.4K per month)	73.6
If a component of the project will be performed under contract, the 4A and 4B forms are required. **Contractual Total**	$146.4

Commodities Costs:	Commodity Sum
Description	
ArcIMS	6.2
ArcIMS annual maintenance	1.2
ArcIMS developers tech support	1.4
Miscellaneous supplies (disks, mailing, copying, etc.)	0.7
Commodities Total	$9.5

FY 05

Project Number:
Project Title: NGOA Metadatabase
Agency: NOAA

FORM 3B
Contractual
&
Commoditie

EXXON VALDEZ **OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 04 - FY 06

New Equipment Purchases:		Number	Unit	Equipment
Description		of Units	Price	Sum
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
			New Equipment Total	$0.0

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency

FY 05

Project Number:
Project Title: NGOA Metadatabase
Agency: NOAA

FORM 3B
Equipment
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 04 - FY 06

Personnel Costs:		GS/Range/	Months	Monthly		Personnel
Name	Description	Step	Budgeted	Costs	Overtime	Sum
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
	Subtotal		0.0	0.0	0.0	
					Personnel Total	$0.0

Travel Costs:	Ticket	Round	Total	Daily	Travel
Description	Price	Trips	Days	Per Diem	Sum
Macklin and Megrey to Anchorage for GEM annual meeting	0.8	2	4	0.3	2.8
1 PI and 1 programmer to Anchorage to install GEM metadatabase	0.8	2	10	0.3	4.6
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
					0.0
				Travel Total	$7.4

FY 06

Project Number:
Project Title: NGOA Metadatabase
Agency: NOAA

FORM 3B
Personnel
& Travel
DETAIL

***EXXON VALDEZ* OIL SPILL TRUSTEE COUNCIL**
DETAILED BUDGET FORM FY 04 - FY 06

Contractual Costs:	Contract
Description	Sum
Relational database and web engineer (2 months at $10.8K per month)	21.6
Database technician (10.5 months at $6.7K per month)	70.4
Contractual Total	$92.0

Commodities Costs:	Commodity
Description	Sum
ArcIMS annual maintenance	1.2
ArcIMS developers tech support	1.4
Miscellaneous supplies (disks, mailing, copying, etc.)	0.7
Commodities Total	$3.3

FY 06

Project Number:
Project Title: NGOA Metadatabase
Agency: NOAA

FORM 3B
Contractual
&
Commoditie

EXXON VALDEZ OIL SPILL TRUSTEE COUNCIL
DETAILED BUDGET FORM FY 04 - FY 06

New Equipment Purchases:		Number	Unit	Equipment
Description		of Units	Price	Sum
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
				0.0
			New Equipment Total	$0.0

Existing Equipment Usage:	Number	Inventory
Description	of Units	Agency

FY 06

Project Number:
Project Title: NGOA Metadatabase
Agency: NOAA

FORM 3B
Equipment
DETAIL

Budget Justification: "NGOA Metadatabase"

The requirements of the overall GEM Data Management Plan are quite ambitious and laudable. In fact, GEM is setting a new standard in affirming the importance of programmatic data and metadata, and is investing heavily toward that legacy. This proposal to build for GEM a metadatabase of historical northern Gulf of Alaska datasets exploits an existing operational metadatabase (NPEM) that we began developing in 1997. Adapting an existing structure is a strategy that offers a high level of cost efficiency in that it eliminates the need to build a system from the bottom up.

From our experience, the suggested funding limit of $90K and the suggested time limit of one year associated with this proposal category, relative to the necessary steps and time required to take the project to completion, impose severe restrictions on the desired product. Therefore, we have used cost and time estimates that we feel are accurate, based on our history of building web-accessible, geo-referenced metadatabases and populating them. Note that this is a scalable project. We can reduce the complexity of the product and produce it faster and for less money. However, it will not contain all the features specified in the request for proposals.

Here are some points that apply to all fiscal years:

1. Salaries, services, travel costs are adjusted upward 4% annually.
2. All work (except that undertaken while on travel) is performed in Seattle, Washington at the Pacific Marine Environmental Laboratory and the Alaska Fisheries Science Center by NOAA and contract personnel.
3. Cost-sharing amounts for personnel include salary and indirect costs.
4. Macklin and Megrey only provide direction and consultation for the project. A highly skilled web engineer, currently P. Dan Klawitter, Macrostaff, carries out design, development, and technical implementation. A database technician, currently Kimberly Bahl, Joint Institute for the Study of Atmosphere and Oceans, performs metadata discovery and entry.
5. Cost reduction for Anchorage travel can be achieved if consultations with GEM data managers can be scheduled for the same period as annual GEM PI meetings.
6. A copy of ArcIMS and associated technical support packages will be needed for both the development server as well as the production server. The PIs currently own one copy (included as a cost sharing item) that will be used on the development server. An additional copy will be purchased for the production server and given to GEM when the system is delivered.

Budget categories by fiscal year

FY 2004

Personnel $65.1K (cost sharing): Macklin and Megrey (co-PIs) salary and indirect costs for a total of four months project direction. Consult with GEM data managers; decide schema, hardware and software configuration; design solicitation strategy for NGOA historical data; lead biweekly team meetings; attend annual GEM meeting; produce quarterly and annual reports.

Travel $7.4K: Macklin and Megrey to Anchorage to confer with GEM data managers on schema, FGDC and non-FGDC descriptors, strategy; Macklin and Megrey to Anchorage for GEM annual meeting.

$8.8K (cost sharing): Macklin and Megrey to annual PICES meeting in Seoul to present project to Technical Committee on Data Exchange and general assembly; explore mechanisms for federated search with Korean Oceanographic Data Center.

Contractual $120.5K: Web engineer to participate in hardware and software selections and acquisition; installation and configuration of development and production servers; design and preparation of metadatabase tables; adaptation of NPEM scripts for metadata contribution, search, and delivery; documentation; participation in biweekly team meetings; provide information for presentation and reports. Database technician to help populate metadatabase tables; test system; assist with metadata solicitation; metadata QC and entry; maintain site statistics; participate in bi-weekly team meetings; provide information for presentations and reports.

Commodities $2.1K: Development software and upgrades for web scripting, graphics; miscellaneous supplies (disks, mailing, copying, etc.) for metadata solicitation; Red Hat Linux Professional Server (2) contract for operating system support and upgrades.

$2.4K (cost sharing): connectivity and computing support for team personnel.

Equipment $10.0K: Development and production servers for metadatabase system.

FY 2005

Personnel $68.2K (cost sharing): Macklin and Megrey (co-PIs) salary and indirect costs for a total of four months project direction. Direct acquisition, installation and configuration of Z39.50 search engine; establish GEM historical metadatabase as NSDI clearinghouse node; direct acquisition, installation, and application of ArcIMS, a map-oriented geo-referencing tool; with GEM staff, evaluate scoring algorithms to permit computation of the relevance of metadata records; solicit metadata via scientific newsletter articles and presentations at PICES, American Fisheries Society and GEM conferences; lead biweekly team meetings; attend annual GEM meeting; produce quarterly and annual reports.

Travel $12.0K: Macklin and Megrey to Anchorage to confer with GEM data managers on relevance scores for metadata searches; Macklin and Megrey to Anchorage for GEM annual meeting; Macklin and Megrey to Honolulu for GEM metadatabase and metadata solicitation presentations at PICES annual meeting.

$2.8K (cost sharing): Megrey to annual American Fisheries Society meeting in Anchorage to present project and solicit metadata.

Contractual $146.4K: Web engineer to install configure and implement Z39.50 server and ArcIMS geo-referencing for metadata; provide feedback on proposed relevance scoring methods; participation in biweekly team meetings; provide information for presentation and reports. Database technician to help populate metadatabase tables; test system; assist with metadata solicitation; metadata QC and entry; maintain site statistics; participate in bi-weekly team meetings; provide information for presentations and reports.

Commodities $9.5K: ArcIMS software package, annual maintenance contract, and developer support for production server; miscellaneous supplies (disks, mailing, copying, etc.) for metadata solicitation.

$11.3K (cost sharing): ArcIMS software package, annual maintenance contract, and developer support for development server; connectivity and computing support for team personnel.

FY 2006

Personnel $70.8K (cost sharing): Macklin and Megrey (co-PIs) salary and indirect costs for a total of four months project direction. Expand federates of Z39.50 connectivity; direct implementation of scoring algorithm for computation of metadata search relevance; re-solicit metadata via scientific newsletter articles and presentations; lead biweekly team meetings; attend annual GEM meeting; produce quarterly and annual reports.

Travel $7.4K: PI and web engineer to Anchorage to deliver turn-key system; Macklin and Megrey to Anchorage for GEM annual meeting.

Contractual $92.0K: Web engineer to enhance Z39.50 connectivity; implement relevance scoring method; deliver turn-key system to GEM data management; participation in biweekly team meetings; provide information for presentation and reports. Database technician to help populate metadatabase tables; test system; assist with metadata solicitation; metadata QC and entry; maintain site statistics; participate in bi-weekly team meetings; provide information for presentations and reports.

Commodities $3.3K: ArcIMS annual maintenance contract and developer support for production server; miscellaneous supplies (disks, mailing, copying, etc.) for metadata solicitation.

$5.2K (cost sharing): ArcIMS annual maintenance contract and developer support for development server; connectivity and computing support for team personnel.