Project Title: Coordinating Volunteer Vessels of Opportunity to Collect Oceanographic Data in Kachemak Bay and Lower Cook Inlet

Project Number:	02671
Restoration Category:	Research and Monitoring
Proposer:	Cook Inlet Keeper, Kachemak Bay Research Reserve
Lead Trustee Agency:	ADFG(requested)
Alaska SeaLife Center:	No
Duration:	1st year, 1-year project
Cost FY02:	$34.8
Geographic Area:	Kachemak Bay/Lower Cook Inlet
Injured Resource/Service:	Subtidal and intertidal communities, sediments, mussels, clams, archeological resources

ABSTRACT

Cook Inlet Keeper and the Kachemak Bay Research Reserve will organize a network database of local community volunteers for the purpose of collecting oceanographic data from regional ships of opportunity. An extensive outreach program will be undertaken to identify and construct a database of private and commercial vessels making frequent trips in the Kachemak Bay, lower Cook Inlet and the Gulf of Alaska regions. Future work will be designed to utilize this extensive database to identify volunteer boats for collecting time-series of water quality parameters from transects along Kachemak Bay and extending into lower Cook Inlet. A thermo-salinograph, installed onto a vessel at the Kachemak Bay Research Reserve, will be used to clarify regions for future data collection. These data will also be correlated with existing stationary sensors and volunteer-monitoring projects to expand spatial and temporal knowledge of water quality and mixing patterns and their relationship to the dispersal of larvae and pollutants in the region.

INTRODUCTION

Cook Inlet Keeper and the Kachemak Bay Research Reserve are requesting one year of funding from the *Exxon Valdez* Oil Spill Trustees Council through the Ecosystem Synthesis/GEM Transition: Innovative Tools and Strategies to Improve Monitoring. We propose to coordinate the oceanographic data needs of the Kachemak Bay Research Reserve with the volunteer program organized by the Cook Inlet Keeper. Community volunteers have expressed interest in providing vessels as platforms to collect basic time-series of temperature and salinity in Kachemak Bay and lower Cook Inlet. Charter fishing boats, for example, traverse the length of Kachemak Bay and Kennedy Entrance twice each day on the way to the Barren Islands fishing grounds. The spatial and temporal distribution of these and other similar vessels has not been catalogued. This information is integral to establishing a protocol for using volunteer vessels in a long-term oceanographic data collection project. Temperature and salinity data can be continuously recorded using electronic loggers during these passages. These data are fundamental to understanding mixing dynamics in the Kachemak Bay region. The physical oceanography of this region has not been well studied and an understanding of the physical environment is critical to understanding the fundamental basis of ecosystem dynamics and habitat distribution.

The abundance of marine organism populations is highly variable in space and time, and possibly linked to fluctuations in oceanic water properties and circulation patterns. Evidence from research in the Pacific Northwest suggests that differences in primary productivity, salinity, and water temperature are often reflected in biological community dynamics. In estuaries such as Kachemak Bay, large gradients can occur at small spatial scales due to the effects of precipitation, surface runoff, groundwater flow, and evaporation. Outside Kachemak Bay, the regional circulation is characterized by ocean currents, such as the Alaska Coastal Current in the Gulf of Alaska flowing onto the shelf near the entrance to Cook Inlet. Nutrient rich bottom water is upwelled and mixed with surface water. As these enriched waters stream into Kachemak Bay, fresh water runoff from the surrounding ice fields and watersheds dilute the salinity and increase the sediment load. The inflowing water, therefore, initially supports a marine system while the north-side, outflowing water is more turbid and less saline. This difference needs to be quantified to further our understanding of the spatial and temporal patterns of observed changes in this system.

One of the unique characteristics of marine populations relative to their terrestrial counterparts is that early life stages of most marine species are planktonic and are moved by ocean currents for weeks to months. At present, we have only a limited understanding of how ocean circulation affects the various life stages of marine populations. This fundamental gap in our knowledge about marine populations limits advances on many fronts. Managing fisheries, understanding the dynamics and evolution of marine populations, and predicting the responses of coastal ecosystems to perturbations such as pollution, habitat loss, and the spread of exotic introduced species all await breakthroughs in our understanding of ocean circulation.

Despite numerous studies in the late 1960's -1970's, there has been limited work since that time in characterizing the physical oceanographic processes in the Kachemak Bay and lower Cook Inlet. The main study on circulation and mixing effects in Kachemak Bay is a study by Burbank

in 1977 (figure 1[1]).

Circulation in the greater Cook Inlet is dominated by strong tidal currents. The long, narrow configuration of Cook Inlet produces the world's second highest tidal heights (the highest are in the Bay of Fundy, Newfoundland). Tidal heights at the mouth and the head of the inlet are 180 ° out of phase. Thus water in the Cook Inlet acts somewhat like a standing wave (Whitney, 1999). The spring to neap tide variation can produce almost a two-fold increase in tidal velocities (SHIO, 1994). Wind is also an important factor affecting the circulation of water in Kachemak Bay and Cook Inlet. In the summer winds are predominantly from the South to Southwest, while in the winter the winds are from the North and Northeast (Wennekens et al., 1975; Whitney, 1999). In addition to the mean wind direction, strong, locally variable winds descend from the surrounding mountains and influence net circulation patterns. Circulation in the region is also strongly influenced by the flow of the Alaska Coastal Current. Water from the ACC becomes entrained into the strong inflow of the bay in the region of the Kennedy entrance.

Previous studies of Kachemak Bay have concluded that the circulation of water in the bay is complex and reflects the combined influences of diurnal and monthly lunar inequalities in tidal forcing, seasonal changes in the tidal regime, meteorological effects and fresh water forcing (Wennekens et al., 1975). Winds have a profound effect on the net circulation of both Kachemak Bay and Cook Inlet. Transient events such as gales may be the most significant factor impacting the transport and dispersal of planktonic larvae and pollutants (Wennekens et al., 1975). Burbank (1977) proposed the existence of several important gyres and eddies at the entrance to and interior of Kachemak Bay (figure 1) but no subsequent studies have further elucidated their spatial and temporal extent. The movement of water in this region is critical to understanding ecosystem dynamics such as larval dispersal, habitat distribution as well as for predicting patterns of pollutant (e.g. oil) dispersal. In other regions of Cook Inlet, back eddies such as the one on the north side of the East Forelands have been shown to deposit oil on the beach when the oil is originating from the south along the shoreline (Whitney, 1999). Thus the currents and eddies predicted for the entrance to and interior of Kachemak Bay could be extremely important for localized movement and shoreline deposition of organic matter and pollutants such as oil.

A daunting challenge in our understanding of marine ecosystems is identifying the connections between physical variability in the ocean and changes in marine communities. All ecosystems experience physically variable environments, but marine ecosystems are dominated by a particularly complex suite of physical forces. The dynamic nature of the fluid medium in which marine species live affects both the performance and movement of individuals. Studies of individual pieces in this puzzle have generated important insights. For instance, we have studies showing the effects of variation in water temperature, salinity or wave-generated hydrodynamic forces on survivorship and growth or the effects of the changes in ocean circulation on the movement of individuals. However, synthetic studies that integrate the effects of variation in several climatic components are rare. Also rare are studies providing insight into cyclic climatic changes, such as inter-decadal shifts, and unidirectional changes, such as climate change.

Kachemak Bay is a NOAA National Estuarine Research Reserve (NERR). The NERR system has 26 sites throughout the United States that are dedicated to research and education of the

[1] Figure 1 is attached separately to the electronic version of the proposal

marine/terrestrial interface of estuarine ecosystems. Kachemak Bay is located at the interface between land and ocean waters and thus near the juncture of major oceanographic and land-based processes. Watershed influences on the intertidal and bay habitats range from freshwater input, transport of nutrients, sediments and contaminants to topographic influences on winds and precipitation amounts and rates. Changes in watershed vegetation cover due to urbanization, spruce bark beetle infestation, logging and forest fires will alter transport dynamics and nutrient cycling, and thus the habitat quality and structure of biological communities in the intertidal zone and the bay itself. Oceanographic processes, working from the other end of the ocean-bay-shore continuum, influence nutrient transport, life history dispersal mechanisms of plants, invertebrates and fishes, sediments and contaminants. As part of the NERRs system, the Kachemak Bay Research Reserve has a program to continuously measure seasonal oceanographic water characteristics including nutrients, phytoplankton, temperature and salinity at two stations in the Bay (Homer and Seldovia) as part of the national System Wide Monitoring Program (SWMP). These sensor arrays measure water temperature, conductance, salinity, pH, turbidity, dissolved oxygen, depth, PAR, and fluorescence on a continuous basis. Additionally the National Weather Service, National Data Buoy Center, will be deploying a long-term data buoy in Kennedy Entrance in June 2001.

This study will work in conjunction with the existing studies in the region, both those on-going at the Research Reserve as well as within the Cook Inlet Keeper. On-going studies are similarly working to gain and organize a community-based network of volunteers as well as to further the understanding of circulation and mixing in Kachemak Bay. In addition, collaboration between the Keeper's Citizen's Environmental Monitoring Program and the Kachemak Bay Research Reserve's scientific programs allows for greater community involvement and understanding of the regional circulation and water quality.

NEED FOR THE PROJECT

A. *Statement of the Problem*

Many locally-operated vessels traverse the Kachemak Bay, lower Cook Inlet and Gulf of Alaska region for commercial fishing, charter fishing, transportation (ferries) and for recreational purposes. The spatial and temporal extent of these vessels over this region has not been catalogued. These vessels could be utilized to provide basic information to scientists on regional oceanographic conditions.

There is a need for understanding the movement and changes of water masses and seasonal mixing dynamics in this area. This study will address this need by using vessels of opportunity and an existing volunteer network to collect time-series of temperature and salinity in the Kachemak Bay region as well as by compiling a thorough background description of all scientific work completed throughout the region's history. A greater understanding of the previous work in the region will assist future studies by clarifying relevant variables for use in long-term monitoring. Additional coordination and

communication with on-going monitoring and oceanographic projects in the region will also enhance the applicability and viability of this study. The outreach program methods and database results, while initially focussed upon the immediate Kachemak Bay regional vessels, will be applicable at larger spatial scales including the lower Cook Inlet and the greater Gulf of Alaska region.

Using vessels of opportunity, it will be possible to seasonally monitor basic oceanographic variables. The collection and processing of these data is critical to understanding the underlying physical mechanisms controlling the ecosystem dynamics, and hence the distribution and recovery of many of the species listed in Table 4 of the invitation to submit restoration proposals. It is also information that is directly beneficial to recreation and tourism in this region, as well as vital to understanding the potential movement of water-borne pollutants such as oil.

B. ***Rationale/Link to Restoration***

Given the lack of comprehensive information on vessel activity in the proposed study area, this study will provide a baseline dataset of the spatial and temporal distribution of vessels in the Kachemak Bay, lower Cook Inlet and Gulf of Alaska region. This data set of vessels will be further organized according to the stakeholder's interest in volunteering to assist with regional data collection. Utilization of these ships of opportunity provides a low-cost means to collect a time series of basic oceanographic data. Oceanographic data in this area is limited, thus these data will be used to enhance critical understanding of regional mixing processes and dynamics. These baseline data will be collected by volunteers in the community with the results benefiting local communities, villages and the greater scientific understanding of circulation and mixing in the bay. The use of the volunteer network of the Cook Inlet Keeper and ships of opportunity ensures stakeholder involvement in the project.

C. ***Location***

This study will be undertaken in Homer with work involving the participation of personnel and volunteers from the Cook Inlet Keeper and the Kachemak Bay Research Reserve. An extensive outreach program, coordinated by the Cook Inlet Keeper, will include communities along Kachemak Bay and the lower Cook Inlet. Drift cards will be deployed at a range of locations and will be subsequently collected along the entire Kachemak Bay region. The benefits of the project will be realized by the entire community and stakeholders and the Kachemak Bay region. Community involvement will include the villages and Native corporations of Port Graham, Seldovia and Nanwalek. Preliminary transects for measuring temperature and salinity will focus upon regions of the bay and lower Cook Inlet which are traversed regularly by charter boats identified in the database. These preliminary transects will be used to establish which regions will be most beneficial for volunteer involvement in future data collection.

COMMUNITY INVOLVEMENT

Integral to this project is the degree of community involvement and participation in the study. The community based volunteer monitoring network of the Cook Inlet Keeper will be directly linked to the research needs of the Kachemak Bay region and the research reserve, forming closer bonds between the local groups and the scientific community.

Cook Inlet Keeper was the first community-based organization in Alaska to start a federally and state-approved volunteer water quality monitoring program. In 1996, Keeper convened a Technical Advisory Committee (TAC) composed of professionals from universities, state and federal agencies, and laid the framework to train volunteers to monitor physical, chemical, and biological parameters of water quality in and around Kachemak Bay. Since that time, Keeper has fostered similar monitoring programs in the Anchorage Bowl, Mat-Su Valley, and Kenai River watershed. Keeper is now leading the most unified, defensible community-based water quality monitoring effort in Alaska, and has been praised by Alaska's Department of Environmental Conservation for *laying a credible foundation that establishes the role of citizen monitoring as part of a comprehensive watershed management program from which all Alaskans can share in its rewards, both now and into the future.*

The outreach portion of this project will be organized under the Cook Inlet Keeper and will utilize their staff and extensive network of volunteers and citizen monitors to identify volunteer ships of opportunity, and assist in the design of transects, sampling locations and schedules. The primary goal of this project is to utilize the extensive coordinating experience of the Keeper in assembling a database of community vessels by location and seasonal activity, and to orchestrate an outreach program which will identify volunteers and vessels in the region. The Keeper will also host workshops for interested stakeholders to identify volunteers for long-term data monitoring from community-based vessels, as well as to assist the scientific community in identifying relevant variables and sampling locations for the data collection and long-term monitoring. Keeper volunteers and local communities will also be extensively involved in the deployment and collection of drift cards released at locations in the region in the fall and the spring.

We propose to include the larger oceanographic community in defining the variables to be monitored as well as in defining the temporal and spatial scales for data collection. A proposed scientific workshop being held in March, 2002 will focus upon the design of monitoring programs in the nearshore and offshore oceanographic environments in the Gulf of Alaska region. The possibility exists to coordinate a forum on the determination of oceanographic variables and temporal and spatial scales with the existing workshop being held. Coordination with this workshop will directly benefit this project, as well as address the concerns of the peer reviewers of the initial proposal, in that the larger oceanographic community will be consulted in the design and feasibility of an on-going monitoring program using ships of opportunity. Results from this workshop will greatly enhance the objectives of this study in clarifying both the pertinent variables for monitoring as well as the spatial and temporal scales of variability.

PROJECT DESIGN

A. *Objectives*

Six main objectives will be achieved by this study. These objectives are realized through a combination of the Cook Inlet Keeper Outreach program, and the Kachemak Bay Research Reserve Research and Development program.

CIK Outreach program:

1. Organize a network database of regional vessels according to their spatial and temporal distribution in the Kachemak Bay, lower Cook Inlet and Gulf of Alaska.

2. Prepare and execute an extensive outreach program including local workshops in order to identify these vessels and to communicate with potential citizens interested in volunteering their time and vessels for a long-term monitoring project

3. Establish a link between regional research objectives and data collection and an existing successful volunteer monitoring program.

KBRR Research and Development program:

4. Conduct a thorough investigation to compile all of the existing background oceanographic research on the Kachemak Bay and lower Cook Inlet in order to best evaluate which oceanographic variables will be the most relevant for collection in a long-term data set by ships of opportunity. Included in this investigation would be an analysis of on-going studies in similar regions as well as the KBRR oceanographic workshop, which would assist in achieving the goals of this project by combining the expertise of the greater oceanographic community in establishing relevant parameters to be monitored.

5. Collection of important drift card data for inferring regional surface currents. These data will be correlated with regional wind conditions, and time-series data (from both transects and stationary buoys) and used to infer seasonal surface circulation patterns.

6. Collect preliminary temperature and salinity data to evaluate important regions for future data collection with volunteer vessels. This preliminary data will be used to establish a protocol for correlation of future temperature and salinity baseline data sets with existing stationary sensor platforms measuring parameters of temperature, salinity, pH, DO, PAR, turbidity, Chla and nutrients. Data collection could be expanded in later studies by the inclusion of additional instrument sensors for water quality parameters along the same spatial and temporal resolution as designated in the course of this study.

A. ***Methods***

There are two main phases of this project involving input from both the Cook Inlet Keeper (CIK) and the Kachemak Bay Research Reserve (KBRR). These two phases are the Cook Inlet Keeper Outreach program, and the KBRR Research and Development program. These two programs will occur concurrently, with some of the objectives detailed for the KBRR program dependent upon the results of the CIK Outreach program and the resulting vessel database.

The Cook Inlet Keeper will use its expertise in community volunteer involvement to develop an outreach program for identifying regional vessels. This outreach program will include local media and regional announcements in order to best identify community volunteers. The primary objective of the Keeper's outreach program will be the establishment of a comprehensive database of all regional vessels currently operating in the Kachemak Bay, lower Cook Inlet and, to some extent, the greater Gulf of Alaska region. This database will be organized according to the spatial and temporal distribution of these vessels in the region, the owners and operators of the vessels, and the nature of their activity (i.e. charter fishing, recreational charters, transportation/ferry, commercial fishing). Using community-based workshops, the Keeper will further refine the database to delineate which vessels would be interested in participating as a ship of opportunity in a data collection project to begin the following year.

The KBRR Research and Development program will use input from the oceanographic community as well as the database of vessels assembled by the Cook Inlet Keeper in defining scientific objectives for an on-going monitoring program. This work will involve: preliminary water quality data collection to define regions for future study; an on-going drift card study for inferring regional surface currents; an extensive survey into additional instrumentation for volunteer vessels; training of volunteers in instrument deployment; development of a protocol for data acquisition and processing; an extensive background research survey of existing regional studies and communication with on-going regional programs.

Once the database has been assembled, and vessels of opportunity have been identified, examination will be given to the spatial and temporal distribution of these vessels in choosing regions for data sampling. Preliminary data collection by the KBRR will focus on regions of high vessel spatial coverage identified in the database. The goal of this data collection will be to develop a protocol for data acquisition and processing as well as to define sub-regions for future data collection which characterize regional dynamics.

Preliminary transects will use a SeaCat thermo-salinograph installed onto a vessel at the Kachemak Bay Research Reserve. The Reserve's existing SeaBird CTD will also be used for obtaining profiles of salinity and temperature for use in conjunction with the one-dimensional samples from the thermo-salinograph. These preliminary transects will cover regions within the extent of the volunteer vessels, and will be used to further refine regions of importance for collection of oceanographic data. Transects will include along-axis and across axis locations, covering regions of inflowing and outflowing water to the bay. These

regions are also consistent with existing stationary NOAA and National Weather Service buoys as well as existing water quality monitoring programs. Data analysis will be performed on this preliminary work to refine the data processing protocol to be used in future work, specifically the production of graphs, maps, animations, and other correlation materials to graphically display information on seasonal oceanographic conditions and the relation to regional circulation and mixing processes. Data will be analyzed to identify critical regions for future study in other aspects of Kachemak Bay ecosystem dynamics.

Drift cards will be used to infer regional surface currents. A preliminary knowledge of these currents will help to further refine the relevant regions for future data collection by ships of opportunity. Drift cards will be constructed and deployed over two different seasons and for five different locations. Drift cards will be constructed of either plastic or painted wood and labeled with pertinent information for their recovery. Each drifter will be color coded by season and location, and labeled with the following:

When found: (date and time)

Where found: (latitude and longitude)

Who found it: (finder's name and address)

Return to: (KBRR address)

Deployments will occur in the Fall/Winter and in the spring. Locations for deployment include: Anchor Point, Beluga Slough, Homer Spit, Seldovia and Bear Cove. These locations are also consistent with regional data collection. Volunteers from the local community will be involved in retrieving and tracking the positions of drift cards. Retrieval will also be coordinated with the annual beach walk and clean up and will involve the participation of the KBRR, Cook Inlet Keeper and well as the Alaska Center for Coastal Studies.

The KBRR will examine the feasibility and viability of using additional instrumentation on volunteer vessels throughout the course of this study. Themo-salinographs provide a low-cost method of sampling salinity and temperature at a single-depth over a large spatial area. Additional sensors for dissolved oxygen, inorganic nitrogen or other water quality variables may be added to the sensor at any time. Profiles of water quality variables are not possible with this type of instrument, although with several vessels of different drafts sampling in the same spatial area, an approximate profile may be inferred.

In order to address the concern that profiles of water quality parameters are necessary to describe regional dynamics, a suite of instruments will be evaluated for use in future studies. These instruments may include: expendable bathythermographs (XBTs, manufactured by Sippican, Inc.) or low-cost thermo-sensors (TR-1050, RGB instruments) which both measure temperature profiles, SeaBird CTDs measuring temperature and salinity profiles, YSI instruments measuring salinity, temperature and dissolved oxygen profiles or an Acoustic Doppler Current Profiler (ADCP) measuring current velocity. These instruments will be examined for their feasibility in this study by cost, ability of a volunteer vessel to deploy the

instrument in a timely and accurate manner, and the overall importance of the resulting water quality data in describing regional oceanographic features and dynamics.

Once an instrument has been identified by this study, it will be purchased for use in training workshops and preliminary data collection. The KBRR, together with the CIK, will create datasheets for volunteers to use when participating in the future monitoring study. These datasheets will include the time, data, location of the sampling (as determined by existing shipboard GPS systems on volunteer vessels) and other additional information as determined throughout the course of the project. A workshop will be organized and executed to train volunteers on the use and application of the thermo-salinographs and any additional instrument identified for use in future surveys. The KBRR will develop a data acquisition and processing protocol throughout the study to efficiently download and process incoming data from the ships of opportunity.

In addition to the work described, a concurrent extensive background search of all previous regional oceanographic work will be compiled. Communication with personnel conducting other on-going projects in the Gulf of Alaska region will also be instrumental in defining the pertinent variables to be monitored in future data collection in this region, using the ships of opportunity identified in this study. The oceanographic workshop scheduled for March will be particularly useful in addressing these issues due to the proposed focus of the workshop on the development of monitoring systems for the Gulf of Alaska.

B. *Cooperating Agencies, Contracts and Other Agency Assistance*

The cooperating agencies on this project are the Cook Inlet Keeper, NOAA and the ADFG. The involvement of the ADFG however is only through the Kachemak Bay Research Reserve involvement as the KBRR is a NOAA funded research institution with state funded agency (i.e. ADFG) administration.

SCHEDULE

A. *Measurable Project Tasks for FY02 (October 1, 2001 - September 30, 2002)*

October 30:	Order equipment for KBRR boat (thermo-salinograph) Construct and deploy Fall Drift cards (KBRR) Develop outreach plan (CIK)
December 15:	Outreach plan developed, database set-up completed (CIK)
January 31:	Attend annual workshop
February 28:	Construct spring drift cards (KBRR)

March 15:	Outreach plan and database completed (CIK), Volunteers identified for future studies KBRR personnel involvement in workshop on oceanographic monitoring.
April 15:	Preliminary spring transects completed according to database location identification (KBRR, CIK) Submit annual report
May 30:	Begin summer data collection transects, deploy spring drift cards (KBRR, CIK)
July 31:	Analyze collected transect data (KBRR) Protocol established for data collection and processing (KBRR, CIK)
September 30:	Submit final report

B. ***Project Milestones and Endpoints***

March 31, 2002:	Database of volunteers completed and organized according to temporal and spatial distribution of vessels. Fall/Winter drift cards deployed and being retrieved. Thermo-salinograph installed onto KBRR vessel. Oceanographic workshop completed, monitoring variables identified.
July 31, 2002:	Spring/Summer drift cards deployed and being retrieved. Preliminary data analysis completed, protocol established for data collection, processing and correlation with stationary buoys.
September 30, 2002:	Volunteer vessel database completed. Report completed including preliminary analysis of data collection and protocol for data collection and processing in future studies. Completion of drift card study.

C. ***Completion Date***

Completion of project is by September 30, 2002

PUBLICATIONS AND REPORTS

An annual report will be filed in April 2002 and a final report will be provided at the end of FY 2002.

PROFESSIONAL CONFERENCES

No funds are requested for travel to professional conferences.

NORMAL AGENCY INVOLVEMENT

No aspects of this project are fully funded, and it should be noted that the SWMP instruments and data collection by KBRR requires non-federal match in order to continue.

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

This study is also coordinated with the local villages, volunteers and Native corporations of Port Graham, Seldovia and Nanwalek.

PROPOSED PRINCIPAL INVESTIGATORS

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PRINCIPAL INVESTIGATORS

Dr. Stram has a Ph.D. in Oceanography from the Graduate School of Oceanography at the University of Rhode Island (2001). Her research has focussed upon interdisciplinary numerical modeling of physical and biological processes in estuaries. She has supervised the field collection of time-series data from the Rio Chone estuary in Ecuador, where she was the director of two separate research field surveys in the region, coordinating activities amongst government and community-based agencies. She served as a Pre-Doctoral Fellow for the Environmental Protection Agency under their Program to Develop Indicators of Estuarine Health and Integrity.

Dr. Schoch is the Science Coordinator for the Kachemak Bay Research Reserve in Homer, Alaska (a NOAA National Estuarine Research Reserve). He has a dual Ph.D. in Biological Oceanography and Geological Oceanography from the College of Oceanic and Atmospheric Sciences at Oregon State University (1999) and continues to work with his post-doc advisors (Lubchenco and Menge) as a Senior Fellow for the Partnership for Interdisciplinary Studies of the Coastal Ocean (PISCO) studying marine ecosystem dynamics. His research interests are in the physical and biological linkages between marine nearshore and continental shelf ecosystems, specifically how physical processes such as currents, wave energy, sediment dynamics, and nutrient fluxes structure intertidal and subtidal communities. His current research projects include studying larval distributions and forces affecting recruitment, monitoring the variability of primary productivity as a function of ocean climate, and investigating kelp bed community dynamics. He serves as the science advisor for the Olympic Coast National Marine Sanctuary Advisory Council, and is the chair of their Research Advisory Committee. He also serves as the technical advisor to the Sanctuary Marine Conservation Working Group, consulting on the design and development of a marine reserve network on the outer coast of Washington. He also consults to the Washington Department of Natural Resources on intertidal habitat modeling in Puget Sound and Georgia Straits.

OTHER KEY PERSONNEL

Cook Inlet Keeper personnel involved with the project:

Joel Cooper is the Scientific Research Coordinator for the Cook Inlet Keeper. He will be involved in overseeing and managing the outreach program and establishing the volunteer database.

Dale Banks is the Volunteer Monitoring Coordinator/Research Assistant for the Cook Inlet Keeper. He will assist the scientific research coordinator in the outreach program and the establishment and maintenance of the volunteer vessel database.

LITERATURE CITED

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Figure 1: Net surface circulation proposed in Kachemak Bay and lower Cook Inlet (from Burbank, 1977)

FY 02 *EXXON VALDEZ* TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Budget Category:	Authorized FY 2001	Proposed FY 2002	LONG RANGE FUNDING REQUIREMENTS					
Personnel		$5.2						
Travel		$0.4						
Contractual		$15.2						
Commodities		$0.0						
Equipment		$12.2						
Subtotal	$0.0	$33.0	Estimated FY 2003					
General Administration		$1.8						
Project Total	$0.0	$34.8						
Full-time Equivalents (FTE)		0.1						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:
This project will benefit from work being undertaken by NOAA this year at no cost to the EVOS Trustees Council. These activities and estimated value in dollars may include:

$10,000/ stationary buoy deployed (2) = $20,000 ($20.0)
$10,000 per year for maintaining and processing buoy data (estimate)
Total NOAA matching funds: $ 30,000 ($30.0)

KBRR will provide office space and logistical support for Dr. Stram with an approximate value of $5000 ($5.0)

Approximate in-kind match available = $35,000 ($35.0)

FY02

Revised:7/9/01

Project Number: 02671
Project Title: Coordinating Volunteer Vessels of Opportunity to Collect Oceanographic Data in Kachemak Bay and Lower Cook Inlet
Agency: ADFG

FY 02 *EXXON VALDEZ* TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Personnel Costs:		GS/Range/ Step	Months Budgeted	Monthly Costs	Overtime	
Name	Position Description					
Dr. Carl Schoch	Science Coordinator, KBRR (approx. 1 week/month for four mos)		1.0	5.2	0.0	
	Subtotal		1.0	5.2	0.0	
					Personnel Total	

Travel Costs:	Ticket Price	Round Trips	Total Days	Daily Per Diem	
Description					
Annual EVOS meeting for Co-Pis in Anchorage for 2 days	0.2	1	2	0.1	
				Travel Total	

FY02

Revised: 7/9/01

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Agency: ADFG

FY 02 *EXXON VALDEZ* TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2001 - September 30, 2002

Contractual Costs:	
Description	
Long Distance Phone Calls for KBRR project staff associated with the project 4A Linkage	
When a non-trustee organization is used, the form 4A is required. **Contractual Total**	
Commodities Costs:	
Description	
Commodities Total	

FY02

Revised: 7/9/01

Project Number: 02671
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Agency: ADFG

FY 02 *EXXON VALDEZ* TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2001 - September 30, 2002

New Equipment Purchases:	Number	Unit	
Description	of Units	Price	
1 SBE 21 Themo-salinograph plus shipping and handling	1	7.2	
Equipment purchase for sampling water quality variable profiles (actual equipment purchase is dependent upon research and development phase of project as described in the DPD)	1	5.0	
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	

Existing Equipment Usage:	Number	
Description	of Units	
SeaBird CTD instrument use in preliminary data collection (KBRR)	1.0	
Research Reserve vessel used in conducting preliminary transects	1.0	

FY02

Revised: 7/9/01

Project Number: 02671
Project Title: Coordinating Volunteer Vessels of Opportunity to Collect Oceanographic Data in Kachemak Bay and Lower Cook Inlet
Agency: ADFG

FY 02 *EXXON VALDEZ* TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Budget Category:	Authorized FY 2001	Proposed FY 2002	LONG RANGE FUNDING REQUIREMENTS					
Personnel		$14.7						
Travel		$0.0						
Contractual		$0.0						
Commodities		$0.0						
Equipment		$0.0						
Subtotal	$0.0	$14.7	Estimated					
Indirect			FY 2003					
Project Total	$0.0	$14.7						
Full-time Equivalents (FTE)		0.3						
	Dollar amounts are shown in thousands of dollars.							
Other Resources								

Comments:

FY02

Revised: 7/9/01

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FY 02 *EXXON VALDEZ* TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2001 - September 30, 2002

Personnel Costs:			Months	Monthly		
	Name	Position Description	Budgeted	Costs	Overtime	
	Cook Inlet Keeper					
	Joel Cooper	Research Coordinator (.5 time for two months)	1.0	3.1		
	Dale Banks	Volunteer Monitor Coordinator (.5 time for two months)	1.0	2.1		
	Dr. Diana Stram	Co-PI (approx. weeks)	1.0	9.5		
		Subtotal	3.0	14.7	0.0	
					Personnel Total	

Travel Costs:		Ticket	Round	Total	Daily	
	Description	Price	Trips	Days	Per Diem	
					Travel Total	

FY02

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FY 02 *EXXON VALDEZ* TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2001 - September 30, 2002

Contractual Costs:	
Description	
Contractual Total	
Commodities Costs:	
Description	
Commodities Total	

FY02

Revised: 7/9/01

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FY 02 *EXXON VALDEZ* TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2001 - September 30, 2002

New Equipment Purchases:	Number of Units	Unit Price	
Description			
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	

Existing Equipment Usage:	Number of Units	
Description		

FY02

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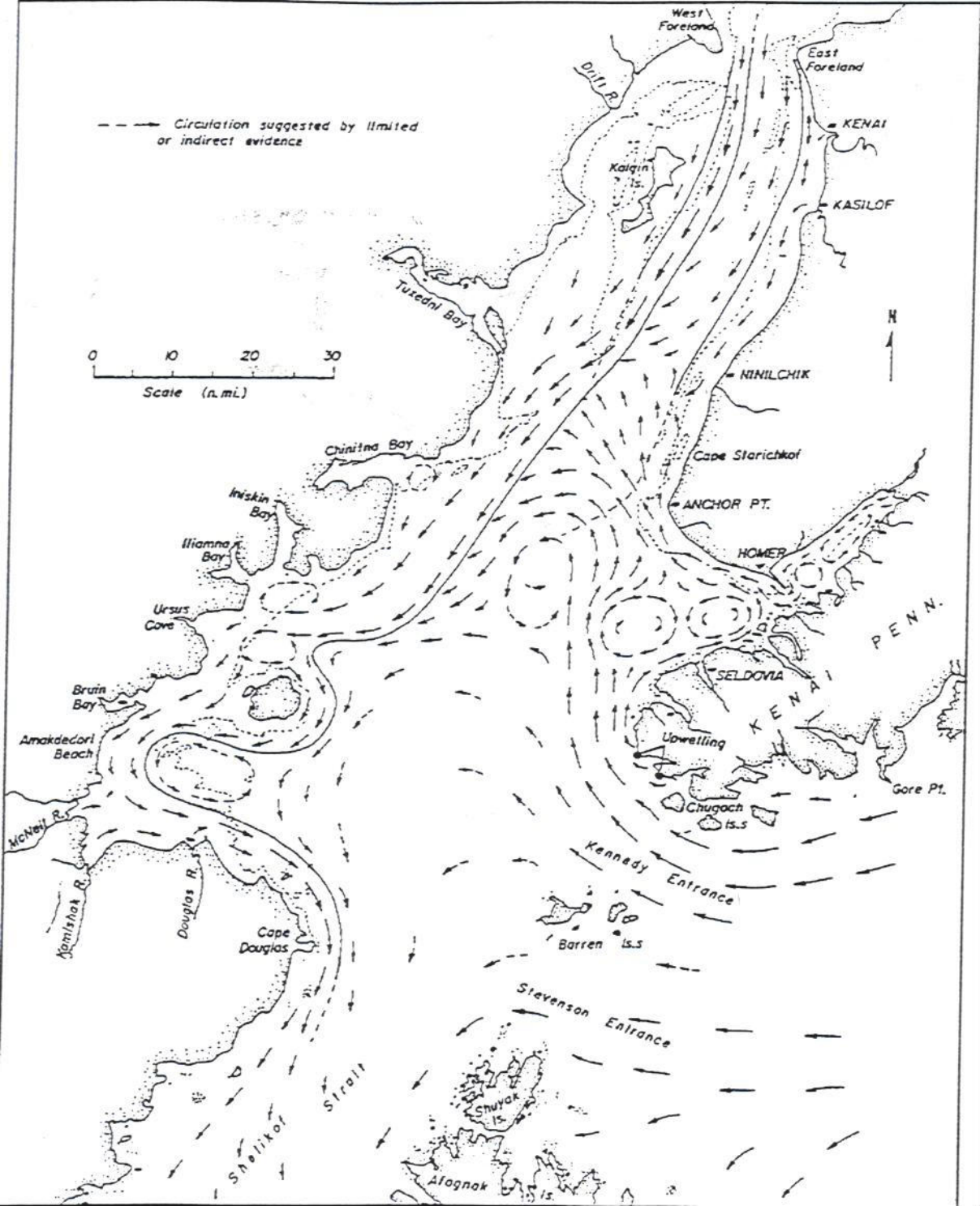

Circulation suggested by limited or indirect evidence