- **FY07 Invitation: Narrative Forms for Proposals**

PROPOSAL SIGNATURE FORM

THIS FORM MUST BE SIGNED BY THE PROPOSED PRINCIPAL INVESTIGATOR AND SUBMITTED ALONG WITH THE PROPOSAL. If the proposal has more than one investigator, this form must be signed by at least one of the investigators, and that investigator will ensure that Trustee Council requirements are followed. Proposals will not be reviewed until this signed form is received by the Trustee Council Office.

By submission of this proposal, I agree to abide by the Trustee Council's data policy (*Trustee Council Data Policy**, adopted July 9, 2002) and reporting requirements (*Procedures for the Preparation and Distribution of Reports***, adopted July 9, 2002).

PROJECT TITLE: Acquisition of Continuous Plankton Recorder data (Submitted under the BAA)

Printed Name of PI: __Sonia Batten_____

Signature of PI: _____ Date _____

Printed Name of co-PI: _____

Signature of co-PI: _____ Date _____

Printed Name of co-PI: _____

Signature of co-PI: _____ Date _____

* www.evostc.state.ak.us/Policies/data.htm

** www.evostc.state.ak.us/Policies/Downloadables/reportguidelines.pdf

Trustee Council Use Only Project No._____ Date Received: _____

FY07 INVITATION
PROPOSAL SUMMARY PAGE

(to be filled in by proposer)

Project Title: Acquisition of Continuous Plankton Recorder data (Submitted under the BAA)

Project Period: 1/1/2007 to 30/9/2007

Proposer(s): Sonia D Batten, Sir Alister Hardy Foundation for Ocean Science (SAHFOS)
soba@sahfos.ac.uk

Study Location: Cook Inlet, Alaskan Shelf, Gulf of Alaska

Abstract: This project will use a Continuous Plankton Recorder to collect plankton samples from the Alaskan shelf and Gulf of Alaska to determine variability in abundance and distribution of herring prey. Understanding variability in their food source is one requirement for understanding variability in Prince William Sound herring populations. Recent CPR data have shown large differences in mesozooplankton biomass on the Alaskan shelf in 2004 and 2005. This project will increase the time series of data collected with previous EVOS TC funding and improve our understanding of how the food chain supporting Alaskan fisheries is regulated.

Funding:
EVOS Funding Requested: FY07 $ 135,400 (must include 9%GA)
TOTAL: 135,400

Non-EVOS Funds to be used: FY07 $

TOTAL: 135,400

Date: 24 July 2006

(NOT TO EXCEED ONE PAGE)

Project Plan: Acquisition of Continuous Plankton Recorder data (Submitted under the BAA)

NEED FOR THE PROJECT

Herring are a resource that is listed as 'non-recovering' and the current Invitation seeks proposals that will facilitate herring restoration activities. The research outlined in this proposal will provide information to contribute to the understanding of variability in herring abundance by gathering data on its prey, the zooplankton. Although directly responsive to the current Invitation, the work outlined in this proposal also extends the time series of samples and data collected under previous EVOS TC funding, giving a greater return for the requested funding; past EVOS TC funding has made a large contribution to our understanding of the zooplankton in this region and publications highlighting region-specific responses to climate variability, revised species distributions and the importance of eddies as a mechanism for transporting biota have all resulted from the previous EVOS TC support for Continuous Plankton Recorder (CPR) sampling.

Statement of Problem

Herring are a planktivorous fish with adults feeding opportunistically on a variety of plankton, especially large species (Blaxter, 1985). As adults they spend a significant portion of their life cycle foraging outside of their spawning and nursery grounds in Prince William Sound (PWS). It is not known exactly where adult herring spend the summer, but it is likely to extend over the continental shelf south west of PWS; concentrations have been found in the SW passes to the Gulf of Alaska (Norcross et al., 2001). Furthermore, water is transported into PWS from the Gulf of Alaska introducing oceanic zooplankton prey to the neritic habitats used by herring (Norcross et al., 2001). Understanding changes in their food supply from year to year, whether a shift in distribution, or timing, of zooplankton abundance could help understand the fluctuations in the population and in turn support management of this resource. Brown (2003) found evidence of bottom-up environmental forcing of PWS herring population size with adult growth varying in phase with zooplankton production and climate trends. Marty et al. (2003) report that poor body condition in Pacific Herring is one risk factor for disease and disease significantly affects recruitment.

Natural variability in herring populations is not well understood and separating out the effects of the oil spill and disease from natural variability is central to the restoration efforts. Our ability to assess the impact of a major event such as an oil-spill or disease outbreak is dependent on our ability to distinguish between natural variability, climate forcing and anthropogenic effects. It is only by collecting these data over a period of time and through the use of tools such as modeling that we will be able to evaluate the indirect impacts the Exxon Valdez oil spill may have on injured resources against a background of changing conditions. Biological variables may provide a more consistent diagnostic signal of ecosystem changes than climate indices (Ebbesmeyer *et al*, 1991; Hare & Mantua, 2000) since ecosystems may filter out some of the noise and amplify the signal. Commercial fish landings provide a useful measure of the state of the ecosystems that

each species occupies, but are sensitive to fishing effort. Zooplankton, which have short life spans compared to herring and are not directly harvested, should provide a useful way of detecting changes in near real time. The International Research Institute for Climate Prediction notes that '*Zooplankton species composition appears to be a sensitive indicator of water mass changes that may be key elements in marine ecosystem regime shifts*' (IRI, 2002).

Recent sampling with the CPR on the Alaskan shelf shows just how variable zooplankton can be here. Fig. 1 shows mesozooplankton biomass across the shelf during spring and summer each year according to recent CPR data. The difference between 2005 and 2004 is very clear (lower graphs); 2005 saw biomass levels about 10 times higher, throughout the summer. Although a different transect was sampled between 2000 and 2003 (upper graphs) only during May 2001 and 2003 were levels found comparable to 2005.

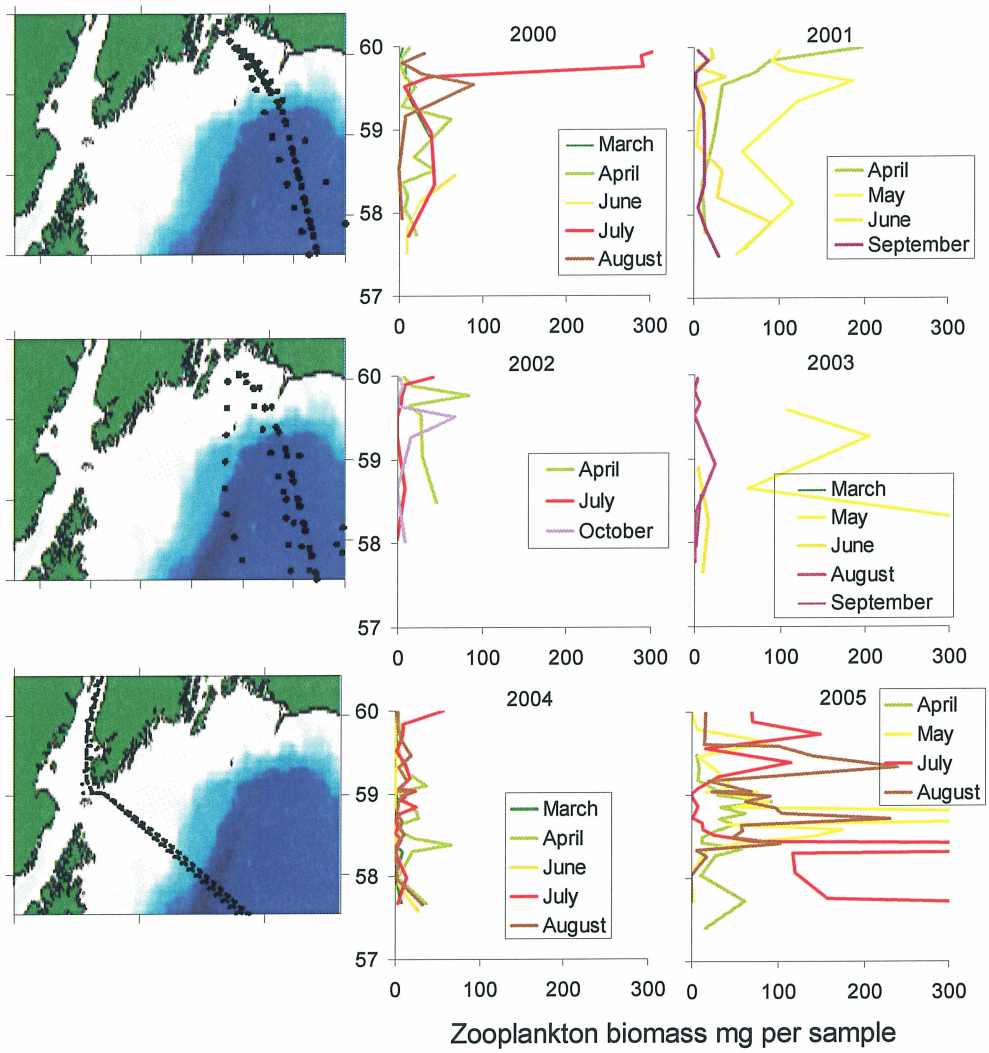

Fig 1. Mesozooplankton biomass across the Alaskan shelf (corresponding transects are shown in adjacent maps) from CPR samples. Biomass is plotted against latitude and the same scale is used throughout.

Data from the Seward line also suggest higher zooplankton abundance of some species in September 2005 (Hopcroft, unpublished data) than in previous years (from 1998). At the time of writing this proposal, only CPR data from early spring 2006 are available and so far biomass is similar to that seen in 2005 (the most recent data are posted at www.sahfos.org under 'Pacific Project') - continued collection of data is necessary to determine the magnitude of natural

variability. It is likely that warmer conditions enhanced the productivity in 2005 but as yet it is not clear whether this productivity has passed up the food chain.

The CPR transect samples the Alaskan shelf and crosses the slope into the open Gulf of Alaska. Many important species forage in the offshore areas for at least some of their life history (herring, salmon, birds and marine mammals for example) so an understanding of the productivity of these offshore areas is important to understanding and predicting fluctuations in resource abundance. Seasonal winds and currents drive downwelling on the shelf for much of the year which brings offshore water and plankton onto the shelf. We are also now realizing the importance of mesoscale eddies which occur all around the southern Alaskan shelf and exchange shelf and offshore water (and organisms), inextricably linking these two regions (e.g. Okkonen et al., 2003; Ladd et al., 2005). Our proposed sampling extends from the inner part of Cook Inlet, onto the open continental shelf, across the shelf break and into the open Gulf of Alaska in a continuous fashion, enabling us to identify how widespread the incidences of high or low plankton are and whether the whole region is responding in a similar way to meteorological variability.

Relevance to 1994 Restoration Plan Goals and Scientific Priorities

This proposal fits within the 'Monitoring and Research' program of the Restoration Plan, specifically under the provision '*long-term monitoring of an ecosystem relationship that provides an understanding important for restoration of one or more injured resources*' and addresses the 'Oceanographic Monitoring' component of the Herring Projects solicited under this Invitation (Appendix A). This project will provide data on the abundance and variability of herring prey.

The Restoration Plan recognizes that components of the ecosystem are inextricably linked and that it is very difficult to understand the dynamics of one species studied in isolation. The first policy of the Plan adopts the 'Ecosystem Approach' and states '*Monitoring and Research activities require more than resource-specific investigations to understand the factors affecting recovery from the oil spill. Restoration issues are complex, and research must often take a long-term approach to understand the physical and biological interactions that affect an injured resource or service, and may be constraining its recovery. The results of these efforts could have important implications for restoration, for how fish and wildlife resources are managed, and for the communities and people who depend upon the injured resources.'* This proposal will provide data on the base of the marine food chain, the plankton, and provide an additional year of data to add to the time series of zooplankton observations on the Alaskan shelf, which are necessary to characterize the inter-annual variability in plankton abundance. Sampling through 2007 would provide a 4th year of sampling out of Cook Inlet (to match the 4 years of sampling south of PWS). As we have just shown, there is already large interannual variability evident in zooplankton populations in this area and so adding a 4th year will improve our understanding of this variability and our ability to correlate abundances of herring and their prey.

PROJECT DESIGN

This project collects biological data from ships-of-opportunity on a transect running from Cook Inlet across the Gulf of Alaska to Puget Sound. The Continuous Plankton Recorder (CPR) has been deployed from ships-of-opportunity in the North Pacific on a routine basis since March 2000. Originally implemented to fulfill the requirements of the North Pacific Marine Science Organisation (PICES) to collect seasonal plankton data from the North Pacific, the survey also demonstrated its relevance to the EVOS GEM program and received support in FY02 and then FY03 to FY06. Funding was also obtained from the North Pacific Research Board (NPRB) for collection of data on a complementary transect that crosses the Gulf of Alaska from west to east (2003 to 2007), passing through Unimak Pass into the southern Bering Sea. Data analysis often combines data from the two projects to address wider scale issues. We are seeking funding for an additional year of sampling on one north to south transect and because all aspects of the sampling have been going smoothly, we are not suggesting any changes to the current sampling regime. Cooperation from Horizon Shipping has been excellent; officers and crew of the *Horizon Kodiak* have maintained the towing gear and carried out necessary repairs over the past 2 years to enable monthly deployments. The ship's route is extremely consistent from month to month (Fig 2) which makes comparisons relatively straightforward. Staff at Prince William Sound Community College have indicated their willingness to continue the servicing and downloading of samples through 2007 and so we propose to continue with all existing arrangements.

Objectives

The principle objective of this proposal is to continue the acquisition of plankton data on a transect from Cook Inlet to Tacoma (Fig 2) to determine zooplankton abundance and variability, which is the food source for PWS herring. Sampling will be carried out 6 times, approximately monthly between March and September 2007, to cover the period of zooplankton productivity in the spring and summer period. This will provide a 4th year of sampling on this transect, and since the first 2 years have shown a ten-fold difference in zooplankton biomass, better enable us to characterize the variability. Information on prey variability is one component of understanding herring recruitment variability.

We will also continue to analyse a sub-set of samples rapidly and make those results available on the project web site (www.sahfos.org and select Pacific Project) within 2-3 months of sample collection.

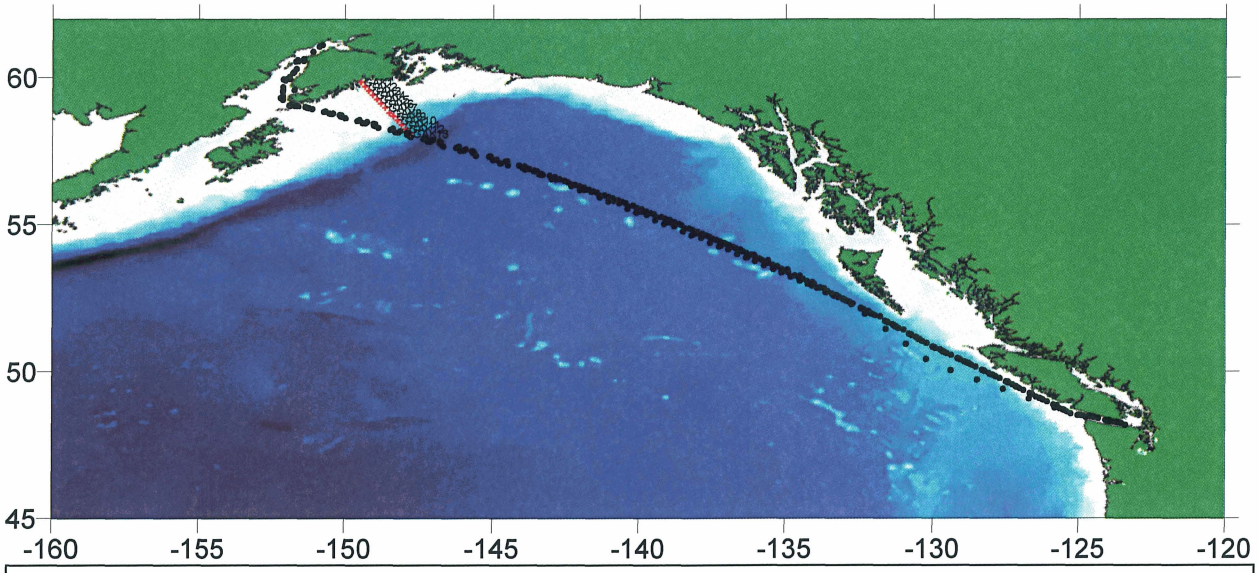

Figure 2. The location of the transect. 13 previous transect positions are shown (spring 2003- spring 2006) and their position overlaps almost entirely. The Seward Line is also shown, in red.

Procedural and Scientific Methods

Standard CPR methodology

The collection and processing of CPR samples and issues of quantitativeness are detailed in Batten et al. (2003) and have been described in previous proposals. Methods are summarised here:

The CPR is deployed from the stern of the vessel once it has cleared Port (or when the Captain deems it is safe to do so) and is towed behind the vessel on a fixed length cable so that it samples the surface mixed layer at a depth of about 7m. Water enters the front of the CPR, passes along a tunnel and through a silk filtering mesh (with a mesh size of 270μm) which retains the plankton and allows the water to exit at the back of the machine. The movement of the CPR through the water turns an external propeller which, via a drive shaft and gear-box, moves the filtering mesh across the tunnel. As the filtering mesh leaves the tunnel it is covered by a second band of mesh so that the plankton are sandwiched between these two layers, which then wind on into a storage chamber containing preservative. At the end of the tow the machine is returned to the laboratory and the mesh is cut into separate samples (each representing 18 km of tow and about $3m^3$ of seawater) which are randomly apportioned amongst the analysts for plankton analysis.

The first step is the assessment of phytoplankton colour (the greenness of the sample) which is a representation of the total phytoplankton biomass and includes the organisms that are too fragile to survive the sampling process intact but which leave an impression on the mesh. Hard-shelled phytoplankton are then semi-quantitatively determined under a microscope by viewing 20 fields of view and recording the presence of all the different taxa in each field. Small zooplankton are identified and counted into categories of abundance from a subsample (1/50 of the sample) whilst all zooplankton larger than about 2mm are counted with no subsampling. Identification is carried out to the highest practicable taxonomic level and is a compromise between speed of analysis and scientific interest. Since copepods make up the vast majority of

the zooplankton most copepods are identified to species level whilst rarer groups are identified to a lower level. Although CPR sampling is continuous, the midpoint of the sample is used to label it with latitude, longitude, time and date. All of the samples are archived after analysis so that they can be re-examined at any time.

The CPR is a relatively simple, rugged piece of oceanographic equipment. It can withstand being deployed from large ships moving at speeds of >20 knots and over 90% of tows successfully record plankton. A high level of expertise is needed to carry out the taxonomic analysis but SAHFOS has an excellent team of analysts, some members with over 30 years of experience.

All samples collected from the Alaskan shelf will be processed to maximize the spatial resolution possible, and every fourth oceanic sample will be processed to allow a comparison between open ocean and shelf conditions. Summary indices such as 'mesozooplankton biomass' and 'total diatom abundance'are routinely calculated from the abundance data.

Data Analysis and Statistical Methods

Previous proposals have already described the statistical validity of this approach and demonstrated that the sampling frequency and spacing is suitable to characterize seasonal, interannual and spatial variability at the mesoscale. Further information can be found in Batten et al., (2003) and previous funded EVOS TC proposals, but since our proposed sampling and processing protocols are unchanged and have been previously approved we have not repeated them here.

Description of Study Area

The project will sample waters on a transect from the Straits of Juan de Fuca outside of Puget Sound (48.45°N, 125°W, Captain's discretion) across the Gulf of Alaska to Cook Inlet and Anchorage. Sampling will end at about 60°N, 151.9°W (at Captain's discretion). See Figure 2 for a map of the transect. Ship tracks vary minimally from month to month.

Coordination and Collaboration with Other Efforts

We have collaborated with Drs Okkonen and Royer (UAF) in the past when they had installed a thermosalinograph on the same vessel that towed the CPR. Okkonen is planning to install the TSG on a vessel operating the same Cook Inlet – Washington transect so that complimentary physical and biological data will be available.

We have had discussions with Professional Norcross (UAF) and expect to contribute data from this project to her proposed projects, the most likely being Castellini and Norcross 'Herring Restoration in PWS: Condition Indices'. If other projects are funded following this invitation which require zooplankton data for modeling or resource management purposes we will work with those PIs to provide our data in the format they require.

SCHEDULE

Project Milestones

Objective 1. Sample collection on the transect from Cook Inlet to Puget Sound will begin in March 2007 and continue approximately monthly through to September 2007 (6 transects will be sampled). All shelf samples will be processed and every 4th oceanic sample.

Objective 2. A subset of samples (25%) will be processed within 3 months of collection at the Institute of Ocean Sciences (DFO, Canada) and results from this processing (e.g. estimated mesozooplankton biomass and comparisons with data from previous years) will be published on the project web site.

Measurable Project Tasks

FY 07, 1st quarter (October 1, 2006-December 31, 2006)
October: Project funding approved by Trustee Council

FY 07, 2nd quarter (January 1, 2007-March 31, 2007)
January: Attend Annual Science Symposium
February: Shipping of CPR from UK to Horizon Kodiak
March: First transect sampled, first servicing at PWSCC

FY 07, 3rd quarter (April 1, 2007-June 30, 2007)
April Begin sample processing (ongoing hereafter)
April-June Three transects sampled
June First results from 07 sampling on website (ongoing hereafter)

FY 07, 4th quarter (July 1, 2007-September 30, 2007)
July-Sept Two transects sampled, CPR shipped back to UK

FY 08, 1st quarter (October 1, 2007-December 31, 2007)
December: Final transect data posted on website

FY 08, 2nd quarter (January 1, 2008-March 31, 2008)
January: Attend Annual Science Symposium and give presentation

FY 08, 3rd quarter (April 1, 2008-June 30, 2008)
April 15th Submit final report

RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

Community Involvement and Traditional Ecological Knowledge (TEK)

During fall 2002 technicians at the Prince William Sound Community College were trained in CPR servicing and set up (as funded by the NPRB) and have serviced the CPRs ever

since. We propose to continue this sub-contracting and have agreement from Robert Benda (a biologist at PWSCC) that they are willing to continue through 2007. The vessel used in this study, the Horizon Kodiak, operates out of Anchorage so wherever possible we are using the local community to carry out this project.

Resource Management Applications

This project will provide data that resource managers can use to determine whether prey variability is affecting herring success in PWS.

PUBLICATIONS AND REPORTS

Several publications have arisen from the data already collected, there are some in preparation and we expect this to continue. However, as no specific manuscripts have been identified in this proposal we are not asking for publication costs to be funded; report and manuscript writing is covered by the salary requests for S. Batten and J.A. Lindley. We expect to participate in the annual 'Marine Science in Alaska Symposium' and have requested funding for this attendance in the January following the end of the project.

Literature cited

Batten, S.D., Clarke, R.A., Flinkman, J., Hays, G.C., John, E.H., John, A.W.G., Jonas, T.J., Lindley, J.A., Stevens, D.P., and Walne, A.W. (2003). CPR sampling – The technical background, materials and methods, consistency and comparability. Progress in Oceanography, 58, 193-215.

Blaxter, J.H.S. 1985. The herring: a successful species? Canadian Journal of Fisheries and Aquatic Science 42, 21-30.

Brown, E.D. (2003). Stock structure and environmental effects on year class formation and population trends of Pacific Herring, *Clupea pallasi*, in Prince William Sound, Alaska. Ph.D. thesis, University of Alaska Fairbanks, 271 pp.

Ebbesmeyer, C.C., Cayan, D.R., McLain, D.R., Nichols, F.H., Peterson, D.H. and Redmond, K.T. (1991). 1976 step in the Pacific climate: forty environmental changes between 1968-1975 and 1977-1984. In: J.L. Betancourt & V.L. Tharp (eds.). Proceedings of the 7th Annual Pacific Climate Workshop, April 1990. *Calif. Dept. Water Resources, Interagency Ecological Studies Program Technical Report* **26**, 115-126.

Hare, S.R. and Mantua, N.J. (2000). Empirical evidence for North Pacific regime shifts in 1977 and 1989. Progress in Oceanography, 47, 103-145.

IRI (2002). Regime shifts. In: Climate and fisheries. Report of the IRI-IPRC Pacific Climate-Fisheries Workshop, Honolulu, 14-17 November, 2001. 20-23.

Ladd, C., N. B. Kachel, C. W. Mordy, and P. J. Stabeno (2005), Observations from a Yakutat eddy in the northern Gulf of Alaska, J. Geophys. Res. - Oceans, 110, C03003, doi: 03010.01029/02004JC002710.

Marty, G.D., Quinn, T.J., Carpenter, G., Meyers, T.R. and Willits, N.H. (2003) Role of disease in abundance of a Pacific herring (Clupea pallasi) population. Canadian Journal of Fisheries and Aquatic Sciences, 60 (10): 1258-1265

Norcross, B.L., E.D. Brown, R.J. Foy, M. Frandsen, S.M. Gay, T.C. Kline, Jr., D.M.Mason, E.V. Patrick, A.J. Paul, and K.D.E. Stokesbury. 2001. A synthesis of life history and ecology of

juvenile Pacific herring in Prince William Sound, Alaska. Fisheries Oceanography 10(Suppl. 1), 42-57.

Okkonen, S.R., Weingartner, T.J., Danielson, S.L., Musgrave, D.L. and Schmidt, G.M. (2003). Satellite and hydrographic observations of eddy-induced shelf-slope exchange in the northwestern Gulf of Alaska. J Geophys. Res., 108 (C2), 3033, doi:10.1029/2002JC001342.

Resume: Sonia Dawn Batten Ph.D.

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QUALIFICATIONS

1990–1994. PhD. Marine Biology. '*Correlative studies of the ecophysiology and community structure of benthic macrofauna*' Southampton University, UK.
1987–1990. BSc. *Honours Degree in Oceanography with Biology*, 2(i). Southampton University, UK

CAREER HISTORY

2003 and 2004. Temporary Instructor, Malaspina University College, Fisheries and Aquaculture program.
2001 to present. Part-time Research Associate. Kintama Research Corporation, Canada.
2000 to present. Half-time Research Fellow. Sir Alister Hardy Foundation for Ocean Science, UK.
1996–2000. Assistant Director. Sir Alister Hardy Foundation for Ocean Science, UK
1994–1996. Postdoctoral Research Fellow. Sir Alister Hardy Foundation for Ocean Science, UK

During the past twelve years I have been working with the Continuous Plankton Recorder Survey through the Sir Alister Hardy Foundation for Ocean Science, which operates and maintains the multi-decadal, basin-wide database of plankton abundance and distribution from the North Atlantic. Since 2000 I have been based in western Canada, co-ordinating the north Pacific CPR survey. My main research focus has been the mesozooplankton; their distribution, ecology and role in the upper pelagic ecosystem. I have extensive experience of analysing and interpreting CPR data and have worked on several multidisciplinary projects in European waters. I have extensive project management, data analysis and publication/presentation skills through my experience as Assistant Director of SAHFOS and as acting as a PI on numerous research projects (including the current EVOS and NPRB projects in the North Pacific).

FIVE RECENT RELEVANT PUBLICATIONS

Batten, S.D., Hyrenbach, K.D., Sydeman, W.J., Morgan, K.H., Henry, M.F., Yen, P.Y. and Welch, D.W. (2006). Characterising Meso-Marine Ecosystems of the North Pacific. Deep Sea Research II. 53, 270-290.
Batten, S.D and Crawford, W.R. (2005). The influence of coastal origin eddies on oceanic plankton distributions in the eastern Gulf of Alaska. Deep Sea Research II, **52**, 991-1009.
Lindley, J.A., Batten, S.D., Coyle, K.O and Pinchuk, A.I. (2004). Regular occurrence of *Thysanoessa inspinata* (Crustacea: Euphausiacea) in the Gulf of Alaska. Journal of the Marine Biological Association of the UK, **84**, 1033-1037.

Batten, S.D. and Welch, D.W. (2004). Changes in oceanic zooplankton populations in the North-east Pacific associated with the possible climatic regime shift of 1998/1999. Deep Sea Research II, **51**, 863-873.
Batten, S.D., Clarke, R.A., Flinkman, J., Hays, G.C., John, E.H., John, A.W.G., Jonas, T.J., Lindley, J.A., Stevens, D.P., and Walne, A.W. (2003). CPR sampling – The technical background, materials and methods, consistency and comparability. *Progress in Oceanography,* **58**, 193-215.

COLLABORATORS ON PROJECTS/ PUBLICATIONS IN LAST 4 YEARS

Douglas Beare, Fisheries Laboratory, Aberdeen.
Ken Coyle, of Alaska Fairbanks, School of Fisheries and Ocean Sciences
William Crawford, Department of Fisheries and Oceans, Canada
Martin Edwards, SAHFOS
Juha Flinkman, Finnish Institute of Marine Research
Howard Freeland, Department of Fisheries and Oceans, Canada
Stephen Groom, Plymouth Marine Laboratory
Mike Henry, University of British Columbia
David Hyrenbach, University of Washington
Anthony John, SAHFOS
David Johns, SAHFOS
Tanya Jonas, SAHFOS
Alistair Lindley, SAHFOS
David Mackas, Department of Fisheries and Oceans, Canada
Ken Morgan, Canadian Wildlife Service
Alexei Pinchuk, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences
P. C. Reid, SAHFOS
Anthony Richardson, SAHFOS
Darren Stevens, SAHFOS
William Sydeman, Point Reyes Bird Observatory Conservation Science
Marc Trudel, Department of Fisheries and Oceans, Canada
Anthony Walne, SAHFOS
David Welch, Department of Fisheries and Oceans/Kintama Research, Canada
Warren Wooster, School of Marine Affairs, University of Washington
Peggy Yen, Point Reyes Bird Observatory Conservation Science

Budget Justification FY07 = $135.4K

Salaries and wages - $69.2K

Name	Role	Cost per month in FY07	Months in FY07
Dr. S. Batten	Project co-ordinator, researcher	$5,885	3
Capt. P. Pritchard	Ops. Manager, liaison with Horizon and PWSCC to set up sampling	$6,103	0.8
R. Barnard/L. Gregory	Mechanical technicians, service CPRs and components	$4,176	0.5
Team of 12 technicians	Taxonomic analysts, process CPR samples	$3,471	5.4
D. Moore	Plankton taxonomic analyst and technician (based at IOS, BC). Co-ordinates sample processing when returned from ship	$5,076	3.5
D. Stevens	Data manager, maintains database and website	$4,662	0.8
Dr. A. Lindley	Researcher and taxonomist. Will contribute to data analysis	$3,918	1
Total			**$69,200**

Matching/in-kind funding. The NPRB funds 3 months of Dr S. Batten's time for co-ordinating Pacific CPR activities in FY07. DFO (Canada) contributes in-kind support (through a collaborative agreement with SAHFOS) to provide lab facilities and library facilities for local sample processing.

Travel - $1.7K
Support is requested for attendance by S. Batten at the annual EVOS meeting in Anchorage. Travel from Nanaimo, British Columbia to Anchorage, Air Fare: $700 + 5 days per diem for lodging and meals @ $200 per day = **$1700**

Contractual – $18.9K
Servicing and repair of CPRs will be carried out at PWSCC, Valdez. Includes salary costs, repair materials and shipping of samples to BC.
FY07 = **$3900**
Leasing of CPRs per transect (to cover replacement) $1286 per transect.
FY07 = **$7716** (6 transects from Anchorage to Puget Sound)
Shipping of CPRs to/from UK at start/end of field season for major overhaul at $2376 per shipment in FY07
FY07 = **$4752**
Computing facilities are provided to SAHFOS by the Marine Biological Association at an agreed rate. Pro-rata costs are included here at **$468** pa.

Tow payment to ship. To cover maintenance and gratuity to crew for deploying CPR the ship is paid $340 per transect, FY07=**$2040**

Commodities - $6.7K

Filtering mesh @ $200 per unit, 3 units needed for each Anchorage to Tacoma transect, FY07 = **$3600**
Tow wire **$450** per wire
Misc. lab supplies FY07 = **$1748**

Indirect costs

Indirect costs to cover administrative support, office costs etc are charged at 40% of personnel/subcontracting costs ($27.7K); TC Agency G&A = 9% ($11.2K)

Data Management and Quality Assurance/Quality Control Statement

1. This study is designed to collect CPR samples along a transect that runs from just outside Puget Sound, WA, across the Gulf of Alaska into Cook Inlet and up to Anchorage, AK. The CPR is towed behind the cargo vessel, the *Horizon Kodiak*, and so the exact location of the sampling is outside our control. However, with 14 transects towed over the last two and a half years, it is clear that the route does not noticeably vary. The only variability appears to be within Cook Inlet when a pilot is taken aboard. Three cassettes, each capable of being towed for 450 nautical miles are used on this transect. Although sampling is continuous the towed filtering mesh is divided into discrete samples. A single CPR sample consists of a length of mesh and filtered plankton that represents 18.5 km (10 nautical miles) of tow and 3 m3 of filtered seawater (assuming 100% efficiency) – the Project Plan gives more methodological details. The ships log is used to assign the time, date, latitude, and longitude of the midpoint of the sample. Constant speed and direction are assumed between sequential log entries.

   Continuous Plankton Recorder samples are collected and processed according to a standard set of procedures established by the Atlantic CPR survey run by SAHFOS and which have been unchanged since 1958. SAHFOS was also active in the Scientific Committee on Oceanic Research (SCOR) WG 115 'Standards for the Survey and analysis of Plankton' whose terms of reference include the standardisation of techniques and integration/calibration of data.

   In the work proposed here, typically 20 samples are collected from Cook Inlet and the Alaskan shelf and then up to 100 samples are collected from the open north Pacific on each transect. In order to spread the resources over the sampled area and through the seasons all samples collected over the shelf are processed but then every fourth open ocean sample is processed (to give a total of about 45 samples processed per transect). All collected samples, whether processed or not, are archived and can be processed at a later date if necessary. An analysis was undertaken to verify that this level of coverage was adequate to incorporate the large scale patchiness (on the order of 10s to 100s of kms) which may contribute to observed variability.

2. It is assumed that all taxonomic enumerations are valid once the QC described in 5 below has been completed. However, some factors could affect how quantitative the samples are. Poor preservation owing to insufficient concentrations of formaldehyde in the CPR storage tank occurs rarely, but can result in difficulty in distinguishing some taxonomic features and organisms may be only identified to a higher taxonomic level. Poor preservation is noted in the database. If the sampling mesh runs out before the CPR is hauled, or there is a tear or jam in the mesh caused by floating debris, then it is not possible to accurately determine the positions of the samples from the ship's log. Samples are still processed as normal, but are labelled as 'Qualitative'. Data are only used for large area investigations where precise location is not important. Such occurrences are rare and, for example, would still allow the data to be used to construct a seasonal cycle for the Gulf of Alaska, but not to examine the composition of plankton in eddies or other mesoscale features.

3. a. The metadata file has been produced as instructed and is included electronically in this proposal submission. In addition, metadata from the pacific CPR project have been included in the North Pacific Ecosystem Metadatabase (a project supported by the NPRB) and the Pacific CPR data that are currently available have been submitted to the NODC (and will continue to be submitted), which also houses some of the Atlantic CPR data.
   b. The CPR survey of the North Pacific falls into the 'Taxonomic sampling' category. Effectively, a sample of seawater at a specific location is collected and the organisms smaller than about 2cms within it are identified and counted. At present, 269 taxonomic entities have been recorded from the North Pacific samples, ranging from a coarse level of identification for some groups such as Chaetognaths to life stages of important copepods such as Neocalanus. The data are stored as abundances for each taxonomic entity (including zero) for each unique sample, together with the local time, date and location of the midpoint of the sample, and the analyst who processed the sample.

4. Not relevant to this proposal

5. The ship arrives in Anchorage after sampling and the sampling mechanisms are unloaded and shipped to Prince William Sound Community College where they are unloaded. The roll of mesh containing plankton is unloaded from the mechanism, wrapped in absorbent lint, sealed in plastic bags and couriered to the IOS, Sidney, British Columbia. Once the ship's log information has been used to determine the positions of the samples they are cut, labelled with a unique identifier consisting of the transect name and number and the numerical sample identifier (e.g. 75AT15 would be the 75th deployment of the CPR on the Anchorage to Tacoma transect and the 15th sample along that deployment). The samples to be processed are distributed to a team of plankton analysts (based at SAHFOS in the UK and at IOS in British Columbia). Processing at IOS occurs first, to give rapid data, then all the samples are couriered to SAHFOS in the UK where the remaining samples are processed. Distribution is pseudo-random so that adjacent processed samples are never examined by the same person. Taxonomic enumerations are carried out using a high power microscope. Phytoplankton taxa are recorded in a semi-quantitative way (number of fields of view out of 20 across the sample), small zooplankton are enumerated from a 0.02 subsample, large zooplankton are enumerated from the whole sample. Zooplankton abundances are recorded in logarithmic categories of abundance.

   After processing, adjacent sample counts are compared. Differences of more than two categories require that the sample be re-processed to verify that the difference is real and not human error. Once this quality control step is completed, the sample is sprayed with additional preservative (a buffered formaldehyde mix which also contains a fungicide and bactericide), it is wrapped in plastic and stored in numerical sequence. Curation of the sample archive is an ongoing part of SAHFOS activities.

6. Not relevant to this proposal.

7. The data will normally be averaged to provide means of single or aggregated taxa for a given sub-region on a monthly, seasonal or annual basis. Summary indices such as total mesozooplankton abundance or biomass for a subset of the samples (processed rapidly) are

posted on the project's website soon after sampling. Comparisons will be made and tested for significance using non-parametric statistics (CPR data generally follow a Poisson distribution). Conventional software such as Excel or Systat will be used. Community composition changes will be examined using multi-dimensional scaling (available in Systat) or other ordination techniques.

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Budget Category:	Authorized FY 2006	Proposed FY 2007
Personnel		$69.2
Travel		$1.7
Contractual		$18.9
Commodities		$6.7
Equipment		$0.0
Subtotal	$0.0	$96.5
Indirect		$27.7
Project Total w/o G&A	$0.0	$124.2
Trustee Agency GA (9% of Project Total)		$11.2
Total Cost w/G&A		$135.4
Full-time Equivalents (FTE)		1.3
	Dollar amounts are shown in thousands of dollars.	
Other Resources		

Comments:

NPRB contributes an additional 3 months of S. Batten's salary for co-ordinating Pacific CPR project and research on data.

DFO (Canada) contributes in-kind support (through a collaborative agreement with SAHFOS) to provide lab facilities and library facilities for local sample processing.

FY07

Project Number: 070624
Project Title: Acquisition of Continuous Plankton Recorder data
Name: Sonia Batten

FORM 4A
Non-Trustee
SUMMARY

Prepared: 17th July 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2006 - September 30, 2007

Personnel Costs:			Months	Monthly		Proposed
	Name	Position Description	Budgeted	Costs	Overtime	FY 2007
						0.0
	Dr Sonia Batten	PI/Researcher	3.0	5.9		17.7
	Capt. P. Pritchard	Operations manager	0.8	6.1		4.9
	R. Barnard/L. Gregory	Mech. Technicians	0.5	4.2		2.1
	Team of 12 technicians	Taxonomic analysis	5.4	3.5		18.9
	D. Moore	Plankton analyst	3.5	5.1		17.9
	D. Stevens	Data manager	0.8	4.7		3.8
	Dr. A. Lindley	Researcher	1.0	3.9		3.9
						0.0
						0.0
						0.0
						0.0
		Subtotal	15.0	33.4	0.0	
					Personnel Total	$69.2

Travel Costs:		Ticket	Round	Total	Daily	Proposed
	Description	Price	Trips	Days	Per Diem	FY 2007
						0.0
						0.0
						0.0
	S. Batten attending annual EVOS meeting	0.7	1	5	0.2	1.7
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
						0.0
					Travel Total	$1.7

FY07

Project Number: 070624
Project Title: Acquisition of Continuous Plankton Recorder data
Name: Sonia Batten

FORM 4B
Personnel
& Travel
DETAIL

Prepared: 17th July 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2006 - September 30, 2007

Contractual Costs: Description	Proposed FY 2007
Leasing of Continuous Plankton Recorders	7.7
Transport of CPRs to and from UK at start/end of field season	4.8
Servicing and setting up of CPRs (inc. repair and shipping) between tows contracted out to Prince William Sound Science Centre	3.9
Tow payments to ship	2.0
Computing services (these are provided by the Marine Biological Association at an agreed rate PA. Pro rata costs indicated)	0.5
Contractual Total	$18.9

Commodities Costs: Description	Proposed FY 2007
Filtering mesh	3.6
Tow wires	0.5
Lab supplies	1.8
Shipping of samples	0.8
Commodities Total	$6.7

FY07

Project Number: 070624
Project Title: Acquisition of Continuous Plankton Recorder data
Name: Sonia Batten

FORM 4B
Contractual & Commodities DETAIL

Prepared: 17th July 2006

2007 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2006 - September 30, 2007

New Equipment Purchases: Description	Number of Units	Unit Price	Proposed FY 2007
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
			0.0
Those purchases associated with replacement equipment should be indicated by placement of an R.		**New Equipment Total**	$0.0

Existing Equipment Usage: Description	Number of Units	
existing CPRs will be used. Lease costs charged above cover replacement/repair		
external bodies	1	
internal mechanisms	4	
Existing microscopes will also be used, (including one purchased in FY03)	7	

FY07

Project Number: 070624
Project Title: Acquisition of Continuous Plankton Recorder data
Name: Sonia Batten

FORM 4B
Equipment
DETAIL

Prepared: 17th July 2006