FY16 PROJECT PROPOSAL SUMMARY PAGE
Continuing, Multi-Year Projects

Project Title: Long term monitoring: Environmental Drivers component – Long-term Monitoring of zooplankton populations on the Alaskan Shelf and Gulf of Alaska using Continuous Plankton Recorders.

Project Period: February 1, 2016 – January 31, 2017

Primary Investigator(s): Sonia Batten, SAHFOS soba@sahfos.ac.uk and Robin Brown, PICES Robin.Brown@PICES.int

Study Location: Lower Cook Inlet, Gulf of Alaska shelf and adjacent open ocean.

Project Website: http://www.gulfwatchalaska.org/

Abstract*: Many important species forage outside of Prince William Sound for at least some of their life history (herring, salmon, birds and marine mammals for example) so an understanding of the productivity of these shelf and offshore areas is important to understanding and predicting fluctuations in resource abundance. The Continuous Plankton Recorder (CPR) has sampled a continuous transect extending from the inner part of Cook Inlet, onto the open continental shelf and across the shelf break into the open Gulf of Alaska monthly through spring and summer since 2004. There are also data from 2000-2003 from a previous transect. The current transect intersects with the outer part of the Seward Line and provides complementary large scale data to compare with the more local, finer scale plankton sampling on the shelf and in PWS. We are continuing to sampling this transect spring through fall each year with monthly resolution. Resulting data will enable us to identify where the incidences of high or low plankton are, which components of the community are influenced, and whether the whole region is responding in a similar way to meteorological variability. Evidence from CPR sampling over the past decade suggests that the regions are not synchronous in their response to ocean climate forcing. The data can also be used to try to explain how the interannual variation in ocean food sources creates interannual variability in PWS zooplankton, and when changes in ocean zooplankton are to be seen inside PWS. The CPR survey is a cost-effective, ship-of-opportunity based sampling program supported in the past by the EVOS TC that includes local involvement and has a proven track record.

Estimated Budget:

EVOSTC Funding Requested* (*must include 9% GA)*:

FY12	FY13	FY14	FY15	FY16	TOTAL
$0.0	$66.8	$68.8	$70.7	$73.1	$279.5

Non-EVOSTC Funds to be used:

FY12	FY13	FY14	FY15	FY16	TOTAL
	$94.7	$148.0	$180.8	$169.0	$592.5

** Figures given in $1,000 increments*

Date: September 1, 2015

I. EXECUTIVE SUMMARY

The Continuous Plankton Recorder (CPR) transect samples the Alaskan shelf and crosses the slope into the open Gulf of Alaska, providing a record of taxonomically resolved near-surface zooplankton and large phytoplankton abundance over wide spatial scales. Many important species forage outside of Prince William Sound for at least some of their life history (herring, salmon, birds and marine mammals for example) so an understanding of the productivity of these shelf and offshore areas is important to understanding and predicting fluctuations in resource abundance. Our sampling transect extends from Cook Inlet to the open continental shelf, across the shelf break and into the open Gulf of Alaska in a continuous fashion (Figure 1), enabling us to identify where the incidences of high or low plankton are and whether the whole region is responding in a similar way to meteorological variability. Plankton are identified and counted so that community composition changes can be determined. Sampling is carried out monthly, spring through fall, so that changes in seasonal timing between years can also be detected. Results to date demonstrate a high degree of inter-annual variability, with sequential years often being substantially different. Timing of seasonal peaks, community composition and abundance of many groups of plankton each also often appear to be tied to physical forcing, suggesting that the productivity of the shelf region is likely controlled by bottom-up forcing. Recent anomalous warming across the wider Northeast Pacific was evident in unusual data from 2014 that are currently being worked up and are described briefly below. The physical forcing of plankton populations may also transfer climate variability to higher trophic levels through feeding. A manuscript is near submission which examines the links between plankton variability and PWS herring first year growth variability.

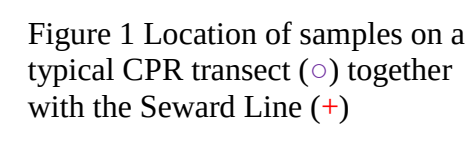

Figure 1 Location of samples on a typical CPR transect (○) together with the Seward Line (+)

II. COORDINATION AND COLLABORATION

A. Within a EVOTC-Funded Program

The CPR survey is complimentary to the net sampling and oceanographic data collected elsewhere in the program by Hopcroft, Campbell, Holderreid and Doroff. Each of these PIs focusses on a localized region, sampling the water column there (the Seward line, PWS and lower Cook Inlet, respectively) while the horizontally-sampling CPR links these regions and provides a larger-scale, synoptic view of lower trophic level variability. Monthly sampling by the CPR also provides the within-year timing context for the less frequent Seward Line sampling, for example. The unique nature of CPR sampling, and the fact that a commercial vessel is the research platform means that it is not possible to share equipment or sampling with the other lower trophic level group members. The group however, has already produced a document outlining the different zooplankton sampling strategies and ways to conduct intercomparisons (appended to the annual report submitted earlier in 2014) and there is regular communication within the group regarding sampling issues and results.

B. With Other EVOSTC-funded Projects

Prior to its inclusion in the EVOSTC Long term Monitoring Program, the CPR was a part of the previous Herring Restoration Program. As such, Dr Batten maintains contact with the current Herring Program PI, Dr Pegau, and attends their project meetings at the Alaska Marine Science Symposium. During the last year we have been working on a joint manuscript which demonstrates the link between the plankton, as indexed by the CPR, and first year PWS herring growth.

C. With Trustee or Management Agencies

The North Pacific CPR Survey also receives support from the North Pacific Research Board, most recently as part of its new Long Term Monitoring Program beginning July 2014. The Canadian Department of Fisheries and Ocean also supports the southeast sample collection and results are fed into annual DFO "State of the Ocean" reports. CPR data are also annually included in the NOAA Ecosystems Considerations report.

III. PROJECT DESIGN – PLAN FOR FY16

A. Objectives for FY16

The fundamental goal of this program is to provide continued large spatial scale data on plankton populations to extend the existing time series and integrate the data with more regional, locally more intensive, sampling programs. More specifically, we will provide monthly (spring to fall – typically April to September) sampling in 2016 of zooplankton and large phytoplankton along the transect from the oceanic Gulf of Alaska to Cook Inlet, analyzing every 4th oceanic and every shelf sample to provide taxonomically resolved abundances. Temperature loggers have been fitted to CPRs since 2011 and we will maintain in situ temperature data collection on this transect in 2016.

B. Changes to Project Design

No Changes.

IV. SCHEDULE

A. Project Milestones for FY 16

Objective 1. Sample collection on the transect from Cook Inlet to Puget Sound will begin in spring 2016 (likely April) and continue approximately monthly through to August/September 2016 (6 transects will be sampled). All shelf samples will be processed and every 4th oceanic sample. Along transect temperature data will be collected.
To be met by October 2016.

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 available in progress reports and from the PI as soon as practicable. Full, quality controlled data from 2016 will be available by June 2017.
To be met within 3 months of sampling for subset data with full data available by June 2017.
Note that availability of full QC data is earlier than originally proposed, owing to more efficient protocols implemented at SAHFOS.

B. Measurable Project Tasks for FY 16

FY 16, 1st quarter (February 1, 2016 - April 31, 2016)

February:	Shipping of serviced CPR from UK to Horizon Kodiak
March/April:	First transect sampled
	Annual progress report for FY 15 submitted.
April:	Begin 2016 sample processing (ongoing hereafter)

FY 16, 2nd quarter (May 1, 2016-July 30, 2016)

May-July: 3 transects sampled
June: Final QC data from 2015 available
First results from 2016 sampling available (ongoing hereafter)

FY 16, 3rd quarter (August 1, 2016 – October 31, 2016)

August-September: 2 transects sampled
October: CPR shipped back to UK for overhaul/repair.

FY 16, 4th quarter (November 1, 2016- January 31, 2017)

November: Attend annual PI meeting.
January: Attend Annual Science Symposium

V. PROJECT PERSONNEL – CHANGES AND UPDATES

PICES appointed a new Executive Director earlier this year, and so Robin Brown replaces Alex Bychkov as the PICES representative Primary Investigator on this project. A CV is appended at the end of this work statement.

VI. BUDGET

A. Budget Forms (Attached)

B. Changes from Original Proposal

No changes

C. Sources of Additional Funding

The North Pacific CPR Survey is funded by a consortium managed by the North Pacific Marine Science Organisation (PICES) and the Executive Director is a primary Investigator on this project. Members of the consortium comprise the EVOSTC, North Pacific Research Board (NPRB), Canadian Department of Fisheries and Oceans (DFO), Sir Alister Hardy Foundation for Ocean Science (SAHFOS) and Dr Sanae Chiba (JAMSTEC, Japan). Committed funding for the duration of this contract is given in the table below. Note that in addition to money DFO also provides laboratory and other facilities as in-kind support. Direct funds from DFO, NPRB and SAHFOS are used to fund sample collection and analysis, data analysis, travel, and report/manuscript writing. In-kind support by Dr Chiba covers analysis of western Pacific samples, freeing up the other funding for eastern Pacific sample analysis. SAHFOS in-kind support includes equipment, archiving and miscellaneous costs that ensure the sampling intensity is maintained.

Source	**FY**	**2016**	**2017**	***Notes***
DFO	Apr 1st to Mar 31st	$12,500		*Canadian $*
DFO	Apr 1st to Mar 31st	$10,000	$10,000	*In-kind support, Canadian $*
NPRB	July 1st to June 30th	$61,469	$63,680	*US$*
SAHFOS		$60,000	$60,000	*Estimated, includes salary support for S. Batten and in-kind support*
Dr Chiba		$37,500	$37,500	*Estimated in-kind support*

***Note the differing FY cycles of the different organisations which means the breakdown of funds between 2016 and 17 has been estimated*

Curriculum Vitae
Robin M. Brown

Personal Information

Full Name:	Robin Middleton Brown
Date of Birth:	July 18, 1954
Work Address:	North Pacific Marine Science Organization (PICES) P.O. Box 6000 9860 West Saanich Rd. Sidney, British Columbia V8L 4B2 ph: (250) 363-6364 fax: (250) 363-6827 email: Robin.Brown@pices.int

1976 Graduated from the University of British Columbia with a Bachelor of Science (Marine Biology) degree.

Employment:

February, 2015 – present	Executive Secretary, North Pacific Marine Science Organization (PICES)
August, 1999 to February, 2015	Division/Research Manager - Ocean Sciences Division at the Institute of Ocean Sciences Department of Fisheries and Oceans – Science Branch).
February, 1992 to August, 1999	Oceanographic Data Manager at the Institute of Ocean Sciences (Department of Fisheries and Oceans).
June, 1985 to January, 1991	Multidisciplinary Oceanographer with the Ocean Ecology Group at the Institute of Ocean Sciences (Department of Fisheries and Oceans).
May 1979-June 1985	Oceanographer with Seakem Oceanography Ltd., Sidney, B.C. (now AXYS Environmental Consulting Ltd.)
1976-1979:	Research Assistant - University of British Columbia

Awards and Recognition:

2012 - Deputy Minister's Commendation for efforts in support of the Cohen Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River.
2010 - Assistant Deputy Minister's Distinction Award for contributions to / coordination of the visit of the Emperor and Empress of Japan to the Institute of Ocean Sciences.
2009 - DFO Prix d'Excellence for contributions to the team that worked to have Bowie Seamount designated as a Marine Protected Area
1993 - Deputy Minister's Commendation for contributions to the Fisheries Management Information Study Team

International Experience:

North Pacific Marine Science Organization (PICES):

- Canadian delegate to the Governing Council (appointed in 2013)
- Member of the Finance and Administration Committee (appointed in 2012)
- Chair of the Advisory Panel on Status, Outlooks, Forecasts and Engagement (AP-SOFE) from 2009-2012. Continuing appointment as a member of this Advisory Panel since 2012.
- Chair of the Technical Committee on Data Exchange (TCODE) from 1995 – 2001. Continuing appointment as a member of this Committee since 2001.
- Chair of the Study Group on Ecosystem Status Reporting (2006-2007)
- Member of Science Board (1995-2001; 2009; 2012)
- Attended every PICES Annual Meeting since 1995 (PICES IV) and several other intersessional meetings and special PICES symposia
- Chairman of Local Organizing Committee for PICES-2007 in Victoria, B.C.

North Pacific Anadromous Fish Commission (NPAFC)

- Appointed as Lead Commissioner for Canada in 2013
- Lead Canadian representative on the Finance and Administration Committee.
- Elected as Vice- Chairman in May 2014

Coordinator – Visit of the Emperor and Empress of Japan to the Institute of Ocean Sciences (2007):
Canadian Representative – APEC Marine Resource Conservation Task Team (1995-1997)
Advisor – International GLOBEC Program – data management policy and practices (1994-1996)

Teamwork and Interagency Coordination:

Member of the Science Team providing analysis and advice to Fisheries and Oceans Canada for the Cohen Commission of Inquiry.
Co-chair of the Science and Monitoring Committee of the Federal-Provincial Japan Tsunami Debris Coordinating Committee (2012 – present).

Selected Publications and Reports

- Smith, J.N., **R.M. Brown**, W.J. Williams, M. Robert, R. Nelson and S.B. Moran. 2014. Arrival of the Fukushima radioactivity plume in North American continental waters. PNAS February 3, 2015 vol. 112 no. 5 pp. 1310-1315
- Chen, J., M.W. Cooke, J. Mercier, B. Ahier, M. Trudel, G. Workman, M. Wyeth and **R. Brown**. 2014. A report on radioactivity measurements of fish samples from the west coast of Canada. Radiat. Prot. Dosimetry .doi:10.1093/rpd/ncu150
- Lucas, B.G., Verrin, S., and **Brown, R**. (Editors). 2007. Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA). Can. Tech. Rep. Fish. Aquat. Sci. 2667: xii + 105 p
- Gargett, A. E., M. Li, and **R. Brown.** 2001. Testing the mechanistic explanations of observed correlations between environmental factors and marine fisheries. Can. J. Fish. Aquat. Sci. 58:208-219
- Gargett, A. E., M. Li, and **R. Brown**. 1998. Testing the Concept of an Optimal Stability 'Window'. *in* Holloway, G., P. Muller and Diane Henderson (ed.) 'Aha Huliko'a: Biotic Impacts of Extratropical Climate Variability in the Pacific. SOEST Special Publication-1998

- Mackas, D.L., R. Keiser, M. Saunders, D. R. Yelland, **R.M. Brown** and D.F. Moore. 1997. Aggregation of euphausiids and Pacific hake (*Meluccius productus*) along the outer continental shelf off Vancouver Island. Can. J. Fish. Aquat. Sci. 54:2080-2096.