FY20 EVOSTC NEW PROJECT PROPOSAL

Proposals requesting FY20 funding are due to shiway.wang@alaska.gov and elise.hsieh@alaska.gov by August 16, 2019. Please note that the information in your proposal and budget form will be used for funding review. Late proposals, revisions or corrections may not be accepted. We may make inquiries regarding the project and proposer(s), including consulting with agencies or other parties that may be interested in this work. Please indicate below if your proposal contains confidential information.

Does this proposal contain confidential information? ☐Yes ☒No

Gulf Watch Ocean Acidification Monitoring

20200127 Gulf Watch Ocean Acidification Monitoring

Primary Investigator(s) and Affiliation(s)

Jeff Hetrick, Director, Alutiiq Pride Shellfish Hatchery

Rob Campbell, Biological Oceanographer Coordinator Prince William Sound Science Center

Steve Baird, Research Coordinator Kachemak Bay National Estuarine Research Reserve

Wiley Evans, Ph.D., Hakai Institute, Regional Expert Ocean Technology Transfer Project IOOS and NOAA.

Date Proposal Submitted

August 16, 2019

Project Abstract

The abstract should provide a brief overview of the overall goals and hypotheses of the project and provide sufficient information for a summary review as this is the text that will be used in the public work plan and may be relied upon by the PAC and other parties.

The Chugach Regional Resources Commission (CRRC) operates the Alutiiq Pride Shellfish Hatchery (APSH) and the Alaska Ocean Acidification Laboratory in Seward, Alaska. This project would incorporate ocean acidification sampling into the Gulf Watch Program currently funded by Exxon Valdez Oil Spill (EVOS) Trustee Council (TC). The Gulf Watch program, through its routine sampling, would add the collection of ocean acidification samples to several of its sampling sites. This would add to the current data set from these sites and offer a broader understanding of ocean acidification in the Prince William Sound and Lower Cook Inlet. The Prince William Sound Science Center (PWSCC) and the Kachemak Bay National Estuarine Research Reserve (KBNERR) are current partners in the Gulf Watch program and routinely conduct marine (vessel) sampling transects on a time series. The cost to sample and process ocean acidification samples ($34.3K per year) would be the only additional cost to the PWSCC and KBNERR existing programs and would go directly to CRRC.

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

FY20	FY21	FY22	FY23	FY24	TOTAL
$34,300	$34,300	$34,300	-	-	$103,000

Non-EVOSTC Funds to be used, please include source and amount per source:

FY20	FY18	FY22	FY23	FY24	TOTAL
-	-	-	-	-	0

**If the amount requested here does not match the amount on the budget form, the request on the budget form will considered to be correct.*

1. PROJECT EXECUTIVE SUMMARY

Please provide a summary of the project including key hypotheses and overall goals. Describe the background and history of the problem. Include a scientific literature review that covers the most significant previous work history related to the project. Include which injured resources and services will be studied and describe how these resources and services will benefit from this project.

Ocean acidification has been studied in the open ocean for many years. The APSH developed an Ocean Acidification Lab starting in 2012 in response to industry leaders recognizing the impacts of ocean acidification on shellfish hatchery. From that time APSH has developed a lab capable of delivery climate data for a continuous monitoring program of in-take water from Resurrection Bay and an extensive discrete sampling program for 12 partners throughout Alaska. A project funded by the Bureau of Indian Affairs provided 2 years of support to sample communities and waters of Lower Cook Inlet and Prince William Sound. CRRC solicited samples from the PWSCC and KBNERR while conducting their Gulf Watch sampling to broaden the geographical coverage. That funding has expired and now CRRC is requesting that the EVOS TC include the processing of ocean acidification samples within its Gulf Watch Program. This proposed project would be an addition to existing monitoring capability to the Gulf Watch Program currently funded by the EVOS TC.

2. PROJECT HISTORY

Is this a new or continuing project? If continuing, please describe the history of the project and what has been accomplished to date. Please include any references to products (i.e., publications, reports, and websites).

CRRC is an inter-tribal fish and wildlife commission certified by the Internal Revenue Service as a 501 (c)(3) nonprofit organization. The seven tribes of the Chugach Region located in South- central Alaska established CRRC in 1984 to address environmental and natural resources issues of concern to their members. CRRC also assists its member tribes in developing their technical capacity to be more meaningfully involved in the environmental and natural resource decisions and regulations that affect their traditional use areas and resources.

The APSH is a division of CRRC. Among other hatchery operations, the APSH also operates the Ocean Acidification and Research Lab at the hatchery in Seward, Alaska. This connection links us closely with coastal villages through an Ocean Acidification Sampling Project funded by the Bureau of Indian Affairs (BIA) Landscape Conservation Program in 2016. The goal of this program is to make a region-wide assessment of ocean acidification in south-central Alaska specifically Lower Cook Inlet and Prince William Sound. All the communities within CRRC's service area participated in collecting ocean acidification samples including Chenega, Tatitlek, Eyak, Valdez, Qutekcak, Port Graham, Nanwalek. We have also included Seldovia due to their proximity to our member Tribes of Port Graham and Nanwalek. CRRC also partnered with the Prince William Sound Science Center, the Kasitsna Bay Laboratory, and Kachemak Bay National Estuarine Research Reserve during these initial efforts.

The BIA funding described above ended in 2018, but CRRC has continued to collect ocean acidification samples in the Tribes through a water quality program funded by the Environmental Protection Agency and its Indian General Assistance Program (IGAP). Each of the villages in the Chugach Region has tribal environmental personnel funded through the Environmental Protection Agency's Indian General Assistance Program (IGAP) or other sources. The environmental staff members are CRRC's vector for information exchange with villages

Funding from the EVOS TC to enable the collection and processing of samples that area collected by PWSCC and KBNERR would enable CRRC to continue with the original goal of a region-wide sampling program and provide ocean scientists with valuable near-shore ocean acidification data.

3. PROJECT DESIGN

A. Objectives

List the objectives of the proposed research and briefly state why the intended research is important. If your proposed project builds on recent work, provide detail on why the data set needs to be continued and whether any changes are proposed. If the proposed project is for new work, explain why the new data is needed.

The objective of the proposal is to extend the sampling coverage of the Chugach Regional Resources Commission's Ocean Acidification Program and take advantage of EVOS existing investments into the Gulf Watch Program. CRRC has funded cooperation with the Gulf Watch Program through BIA funds which have expired. Long term data sets are important for documenting ocean acidification changes through time**.**

Procedural and Scientific Methods

For each objective listed in A. above, identify the specific methods that will be used to meet the objective. In describing the methods for collection and analysis, identify measurements to be made and the anticipated precision and accuracy of each measurement and describe the sampling equipment in a manner that permits an assessment of the anticipated raw-data quality.

If applicable, discuss alternative methods considered, and explain why the proposed methods were chosen. In addition, projects that will involve the lethal collection of birds or mammals must comply with the EVOSTC's policy on collections, available on our website.

CRRC has developed a field kit designed for samplers to take "discrete" field samples that are shelf stable. Samplers collect samples and preserve them prior to shipping to the ocean acidification Lab in Seward. Samples are processed utilizing the Burke-O-later (BOL).

CRRC has developed a Quality Assurance Project Plan (QAPP) for its Ocean Acidification Program (Attachment 1). The QAPP has been approved by the Environmental Protection Agency and is part of CRRC's Indian Government Assistance Program (IGAP) water monitoring program in the Chugach region. The manual details all of the sampling protocols, that includes methods for taking the samples, preserving samples, data collecting, corrective actions and data processing protocols.

Each sample will be analyzed for inorganic carbon chemistry; Total Alkalinity, aragonite and calcite saturation states (Ωarag, Ωcalc), and concentrations of bicarbonate ion ([HCO3–]), carbonate ion ([CO32–]), and dissolved carbon dioxide ([CO2])—using CO2SYS software.

C. Data Analysis and Statistical Methods

Describe the process for analyzing data. Discuss the means by which the measurements to be taken could be compared with historical observations or with regions that are thought to have similar ecosystems. Describe the statistical power of the proposed sampling program for detecting a significant change in numbers. To the extent that the variation to be expected in the response variable(s) is known or can be approximated, proposals should demonstrate that the sample sizes and sampling times (for dynamic processes) are of sufficient power or robustness to adequately test the hypotheses. For environmental measurements, what is the measurement error associated with the devices and approaches to be used?

Data collected in the field by Gulf Watch partners will adhere to previously described and implemented procedures. In field measurements of temperature, salinity and dissolved inorganic chemistry will be recorded with each sample as described in CRRC's QAPP (Attachment 1). Samples are preserved in field with mercuric chloride which makes the samples shelf stable. Samples are sent to the OA Laboratory for processing.

The OA laboratory is Seward utilizes the "Burke-O-Later" to process samples. Each "run" of samples requires calibration with liquid standards which allows adjustments of calculations and results in .001% accuracy. The OA laboratory in Seward is one of very few that produces climate data.

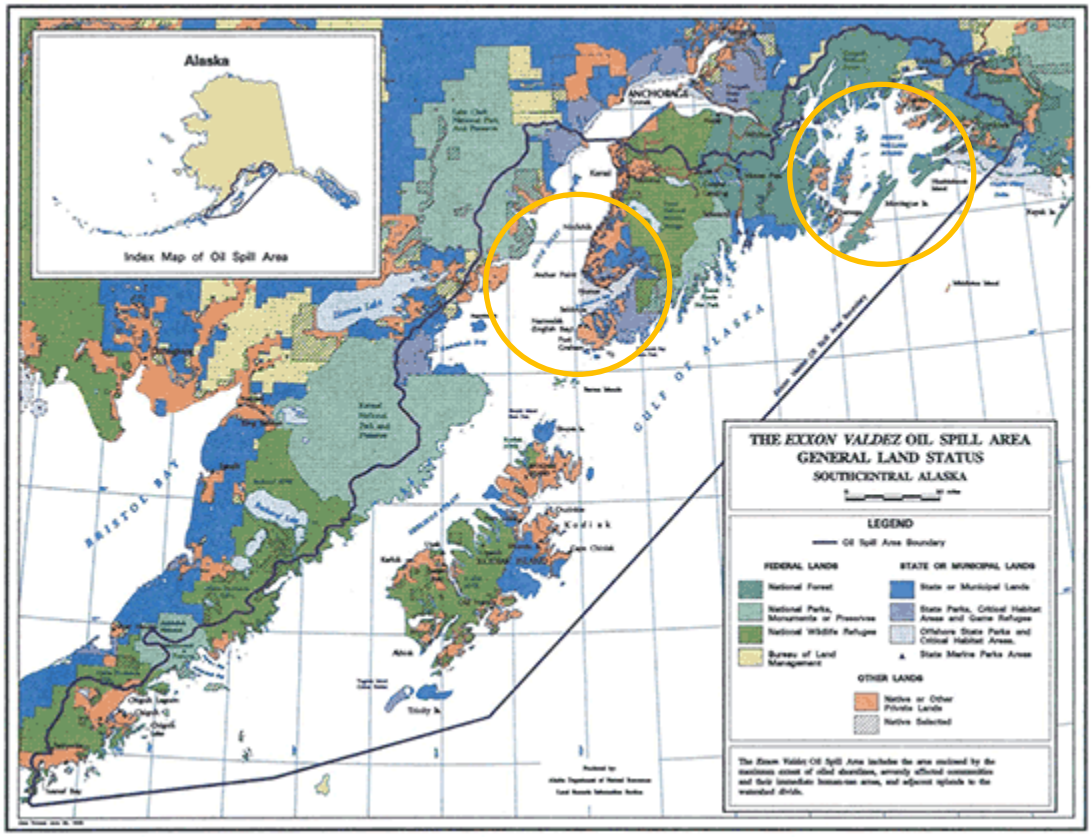
The proposed sample size for each location has been determined from previous sampling programs. Samples that yield levels outside expected range trigger review by the QAPP (Attachment 1).

All data generated by analysis of the Burke-O-Later is adjusted by the processing of the standards before and after daily processing. The data generated at the OA Laboratory receives a secondary review by the Hakia Institute prior to entering the OA data portal.

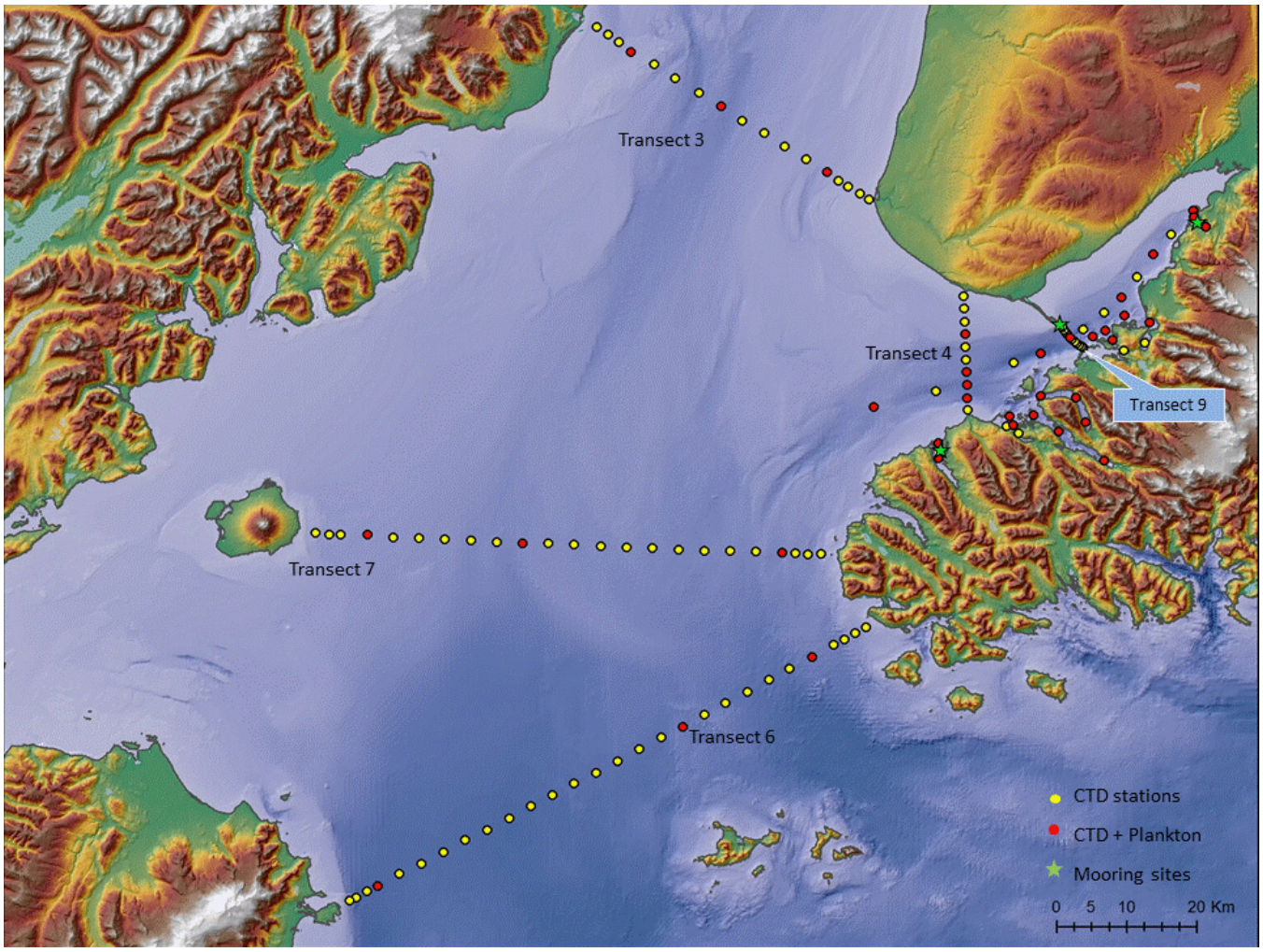
Description of Study Area

Where will the project be undertaken? Describe the study area, including maps and figures, if applicable, decimally-coded latitude and longitude readings of sampling locations or the bounding coordinates of the sampling region (e.g., 60.8233, -147.1029, 60.4739, -147.7309 for the north, east, south and west bounding coordinates).

This study will take place in Lower Cook Inlet and Prince William Sound, Alaska (see map below of general locations). The proposed study area is in the EVOS spill area. The Tribes in the Chugach Region that are served by Chugach Regional Resources Commission (CRRC) include the Tatitlek Village IRA Council, Native Village of Eyak (Cordova), Port Graham Village Council, Nanwalek IRA Council, Chenega Bay IRA Council, Qutekcak Native Tribe (Seward), and the Valdez Native Tribe. All these Tribes were impacted by the EVOS. There are approximately 1,000 tribal members living in these communities. These people, known as Alutiiq, or Sugpiaq, are a southern coastal people of Alaska. The seven Tribes of CRRC are in Prince William Sound and Lower Cook Inlet, a remote region limited in travel to small aircraft, charter aircraft and boat travel, with seasonal Alaska marine highway service.



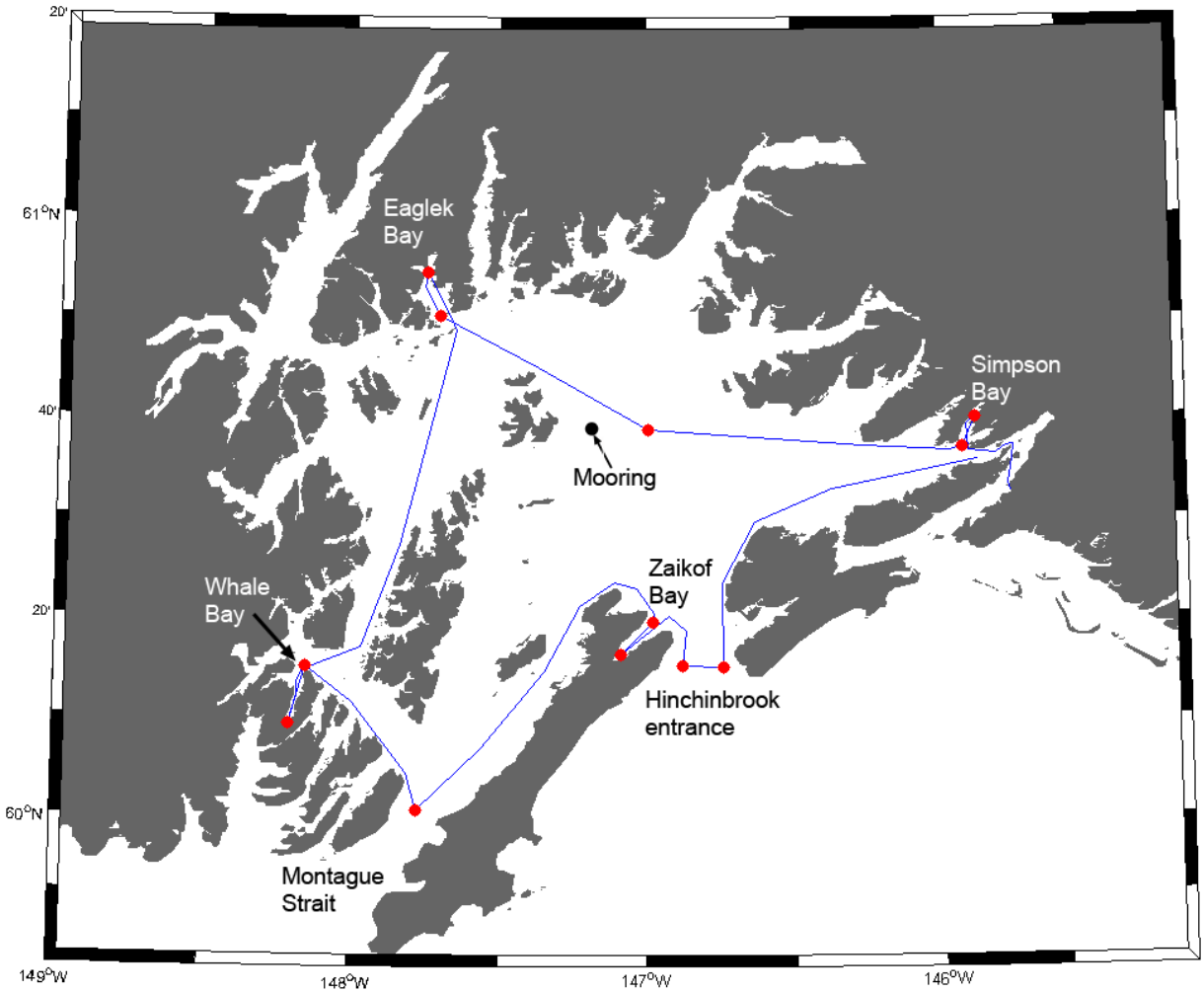
The Kachemak Bay Estuarine Research Reserve conducts water sampling under its Gulf Watch Program. They sample transects across Kachemak Bay and have selected two transects 4 and 9 to be included into an ocean acidification monitoring program.



Kachemak Bay Sample Sites:

Sample Site	Latitude	Longitude	Sample Site	Latitude	Longitude
4-1	59.49200	-151.6500	9-1	59.56900	-151.35012
4-2	59.50500	-151.6500	9-2	59.57241	-151.36669
4-3	59.52500	-151.6500	9-3	59.57241	-151.37129
4-4	59.54200	-151.6500	9-4	59.57508	-151.36669
			9-5	59.57720	-151.37129
4-5	59.55800	-151.6500	9-6	59.57998	-151.37727
4-6	59.57500	-151.6500	9-7	59.58303	-151.38287
4-7	59.59200	-151.6500	9-8	59.58645	-151.38747
4-8	59.60800	-151.6500	9-9	59.58981	-151.39220
4-9	59.62500	-151.6500	9-10	59.59310	-151.39708
4-10	59.64200	-151.6500	9-11	59.59664	-151.40165

The Prince William Sound Science Center (PWSCC) conducts water sampling in the Prince William Sound during March, May, June, August, October and November. Three sites have been selected for ocean acidification sampling. The Naked Island site is the profile site selected for their sampling program. Simpson Bay is representative of the eastern PWS and close to Tatitlek where CRRC has a near-shore sampling site and Whale Bay the western PWS and is adjacent to Chenega Bay. The CRRC sampling program is focused on sites in the tidal zone and the linkage to other nearshore sites and open ocean is not well understood.



Prince

William Sound Sample Sites

Profile Site (Naked Island)	60.61	-147.20
Whale Bay	60.23	-148.17
Simpson Bay	60.61	-145,91

4. COORDINATION AND COLLABORATION

A. Within an EVOSTC Funded Program

Provide a list and clearly describe the functional and operational relationships with the other EVOSTC-funded Program (Herring Research and Monitoring, Gulf Watch Alaska and Data Management Programs). This includes any coordination that has taken or will take place and what form the coordination will take (project guidance, shared field sites or researchers, research platforms, sample collection, data management, equipment purchases, etc.).

Gulf Watch Alaska

This project would be a collaboration with a currently funded EVOS TC Gulf Watch under the Long-Term Research and Monitoring Program. APSH has a long-standing relationship with the PWSCC and KBNERR through collection and processing of a subset of ocean acidification samples for the aforementioned project funded by the BIA Landscape Conservation Program in 2016 among other partnerships and professional relationships throughout the years. This project would utilize the existing Gulf Watch scheduled cruises and sampling sites and would only require partners to collect and preserve additional ocean acidification samples, sampled to APSH's QAPP standards, from a few selected sites.

APSH Director, Jeff Hetrick and Ocean Acidification Lab Supervisor Jacqueline Ramsay have been involved with the ocean acidification research community since 2013 when the first continuous monitoring device was installed at the APSH in Seward. Since that time, APSH staff has been an active partner with the Alaska Ocean Observatory Systems (AOOS), Northwest Association of Networked Ocean Observing Systems (NANOOS), and IPACOA, the University of Alaska, the Hakia Institute and researchers in Alaska and throughout the west coast.

In addition to the long-term "Monitoring for Ocean Acidification near coastal villages and communities in south-central Alaska: Building Capacity and Assessing Vulnerability" project, originally funded by the BIA and continued by CRRC, APSH has coordinated sampling programs with the Tribes in the Chugach Region including Tatitlek, Chenega Bay, Valdez, Eyak, Qutekcak, Port Graham, Nanwalek and Seldovia. APSH has also processed samples for the National Park Service, PWSCC and the KBNERR and Kasitsna Bay Laboratory. Recently, APSH began partnerships with communities outside their region; King Cove, Nome, Kotzebue and Utqiagvik.

APSH has also collaborated with the University of Alaska Fairbanks College of Fisheries and Ocean Sciences with carbonate exposure studies with juvenile shellfish and have completed work on butter clams, cockles, littleneck clams and razor clams and will be conducting a large salmon exposure study in 2020.

Data Management

All data collected and sample results from the APSH lab is shared with the IPACOA web portal managed by Alaska Ocean Acidification Network. The raw data is calibrated from liquid and gas standards. APSH has undergone external reviews and is rated in the top 10 % of blind lab reviews for accuracy. The APSH lab produces climate data which means that the results are within 1% of the standards provided by…lab.

All data results are processed by APSH under its quality assurance program and further reviewed by Hakai Institute and then shared to the IPCOA portal.

B. With Other EVOSTC-funded Projects

Indicate how your proposed project relates to, complements or includes collaborative efforts with other proposed or existing projects funded by the EVOSTC that are not part of an EVOSTC-funded program.

Water chemistry data is vital to all researchers involved with researching the marine environment in Prince William Sound and Lower Cook Inlet. The Gulf Watch Program is a well-developed water sampling program. The addition of processing ocean acidification sampling is limited to the cost of processing the samples at the Ocean Acidification Lab in Seward.

The Prince William Sound Science Center is testing innovative plankton monitoring systems at it's profile site near Naked Island. Inorganic chemistry data will add another layer of data to help understand the dynamics of plankton populations. That research is funded by a variety of sources including Scripps Institute of Oceanography and the North Pacific Research Board (NPRB).

C. With Trustee or Management Agencies

Please discuss if there are any areas which may support EVOSTC trust or other agency work or which have received EVOSTC trust or other agency feedback or direction, including the contact name of the agency staff. Please include specific information as to how the subject area may assist EVOSTC trust or other agency work. If the proposed project requires or includes collaboration with other agencies, organizations or scientists to accomplish the work, such arrangements should be fully explained, and the names of agency or organization representatives involved in the project should be provided. If your proposal is in conflict with another project or program, note this and explain why.

This proposal will require lead scientists and staff at Kachemak Bay National Estuarine Research Reserve (Steve Baird) and Prince William Sound Science Center (Rob Campbell) to schedule and include ocean acidification sampling in their marine sampling trips. Collaborators will need to send samples to Seward and insure the QAPP is adhered to. If any sampling deficiencies are discovered the QAPP has provisions for samplers to make adjustments to ensure samples are being collected properly.

There are no known conflicts with other projects or programs.

D. With Native and Local Communities

Provide a detailed plan for any local and native community involvement in the project.

The Chugach Regional Resources Commission is the lead organization for this project. CRRC has a well-developed Natural Resource Program and specifically a water quality monitoring program funded by the Environmental Protection Agency through its Indian General Assistance Program (IGAP). Each of the communities under the CRRC umbrella have an IGAP program which includes water quality monitoring and ocean acidification sampling as part of their work plan. This program has oversight from the IGAP coordinator in Anchorage and partnership with the Ocean Acidification Lab in Seward.

Until CRRC's involvement OA sampling was limited to buoys and offshore sampling sites operated by AOOS. CRRC has added a near-shore sampling program to evaluate what values are realized near their communities. The addition of the Gulf Watch Program will add geographical coverage but also provide a link from open ocean sampling to near-shore sampling and intertidal values.

The information gathered to date has been very important in evaluating that link.

5. DELIVERABLES

List and describe expected products that will come from this project. Deliverables include but are not limited to papers, reports, recordings, films, websites, presentations, data and metadata. Project PI(s) will be responsible for all deliverables unless otherwise noted below.

Dissolved Inorganic Carbon (DIC) Sample Processing Deliverables

The OA lab at the Alutiiq Pride Shellfish Hatchery processes seawater samples using a state-of-the-art analyzer, the Burke-o-Lator, to analyze the inorganic carbon chemistry and provides the client with processed QA/QC'd data that is ready for interpretation.

From the DIC and pCO2 measurements we acquire during analysis, we can calculate all remaining inorganic system parameters—pH, TA, aragonite and calcite saturation states (Ωarag, Ωcalc), and concentrations of bicarbonate ion ([HCO3–]), carbonate ion ([CO32–]), and dissolved carbon dioxide ([CO2])—using CO2SYS software.

To do so, we require samples to be acquired according to protocol and the following;

- Water temperature (T) at the time of sample collection.
- Pressure (P) or depth that the sample was collected from (i.e. the depth of the experimental tank, if the water collection spigot is located at the bottom, or the depth at which the CTD fired the Niskin bottle).
- Salinity (S) we measure salinity of for DIC samples using bench top calibrated analyzers, but if you have high quality salinity measurements (i.e. from bottle analyses [best quality] or CTD measurements), please provide your salinity data to us when you return the full sample bottles to us.
- Data Log with samples.

The data collected will collated and presented to the EVOS Tc on an annual basis. It will be available for partners use in data analysis for their specific region and for Gulf Watch to use in their data sets. Results from the sampling will be available through the IPACOA (IOOS Partners Across Coasts Ocean Acidification) data portal.

6. PROJECT STATUS OF SCHEDULED ACCOMPLISHMENTS

Milestones are annual steps to meet overall project objectives.

Tasks are annual steps to meet milestones (for example, sample collection, data analysis, manuscript submittal, etc.)

Deliverables are products that will be produced from the project (see section 5 above).

For each milestone, task, and deliverable listed, specify by each quarter of each year these will be accomplished.

For multi-year projects, reviewers will use this information in conjunction with annual project reports to assess whether the project is meeting its objectives and is suitable for continued funding.

Project milestone and task progress by fiscal year and quarter, beginning February 1, 2017. Yellow highlight indicates proposed fiscal year Work Plan. Fiscal Year Quarters: 1= Feb. 1-April 30; 2= May 1-July 31; 3= Aug. 1-Oct. 31; 4= Nov. 1-Jan 31.

	FY20				FY21				FY22				FY23				FY24			
Milestone/Task	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Milestone																				
Collect Samples	x	x	x	x	x	x	x	x	x	x	x	x								
Milestone																				
Process Samples		x	x	x	x	x	x	x	x	x	x	x								
Reporting																				
Annual reports					x				x											
FY work plan			x				x													
Final report													x							
Deliverables																				
Data posted online																				

7. Budget

Budget Forms (Attach)

Please provide completed budget forms. Please note that costs associated with international travel for meetings, symposia, or presentations will not be considered for funding. Costs associated with outreach or education efforts shall not exceed 2% of the total project budget (before including the 9% GA).

Budget Category:	Proposed FY 20	Proposed FY21	Proposed FY22	Proposed FY23	Proposed FY24	TOTAL PROPOSED	ACTUAL CUMULATIVE
Personnel	$15,075.0	$15,075.0	$15,075.0	$0.0	$0.0	$45,225.0	
Travel	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Contractual	$11,925.0	$11,925.0	$11,925.0	$0.0	$0.0	$35,775.0	
Commodities	$250.0	$250.0	$250.0	$0.0	$0.0	$750.0	
Equipment	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	
Indirect Costs (*will vary by proposer*)	$4,239.0	$4,239.0	$4,239.0	$0.0	$0.0	$12,717.0	
SUBTOTAL	$31,489.0	$31,489.0	$31,489.0	$0.0	$0.0	$94,467.0	
General Administration (9% of subtotal)	$2,834.0	$2,834.0	$2,834.0	$0.0	$0.0	$8,502.0	
PROJECT TOTAL	**$34,323.0**	**$34,323.0**	**$34,323.0**	**$0.0**	**$0.0**	**$102,969.0**	
Other Resources (Cost Share Funds)	$0.0	$0.0	$0.0	$0.0	$0.0	$0.0	N/A

Prince William Sound Science Center Sampling

6-8 trips, 2 stations, 6 sample per station, 1 triplicate per station= 75 samples

Profile site (Naked Island) and Whale Bay (near Chenega)

PWSSC Staff and Boat time provided by Gulf Watch

Shipping- Cordova to Seward $100

APSH Processing samples ($75 per) 75 samples $5,625

Kachemak Bay National Estuarine Research Reserve

Kachemak Bay National Estuarine Research Reserve

Transect 4 and 9 (6 trips, 2 sites, 6 samples per site, 1 triplicate per site)

8 trips, 2 stations, 6 sample per station, 1 triplicate per station

KBNERR Staff and Boat time provided by Gulf watch

Shipping Homer to Seward $150

APSH Sample Processing 84 samples $6,300

APSH Director 1 FTE for 1 month $15,075

Subtotal $27,250

CRRC- Project Management 15.57% indirect $4,239

CRRC request $31,489

EVOS TC General Administration 9% $2,834

Total Cost $34,323

Sources of Additional Funding

Identify non-EVOSTC funds or in-kind contributions used as cost-share for the work in this proposal. List the amount of funds, the source of funds, and the purpose for which the funds will be used. Do not include funds that are not directly and specifically related to the work being proposed in this proposal. Please attach documentation from additional project funding sources which confirms and describes matching funds, including date(s) the matching funds are/will be authorized.

The Alutiiq Provide Shellfish Hatchery Ocean Acidification Lab is funded primarily from the Bureau of Indian Affairs through the Chugach Regional Resources Commission compact and the Environmental Protection Agency's (EPA) Indian Governmental Assistance Program (IGAP). The Ocean Acidification label also receives substantial support from the Alaska Ocean Observatory System (AOOS) and NOAA Fisheries. These funds are not used as match for this application but are listed to show other funding sources for the OA Laboratory.

8. Literature Cited

Provide literature cited in the proposal.

Chugach Regional Resources Commission (CRRC). 2018. Quality Assurance Project Plan, Sea Water Quality Monitoring Program. Prepared by: Alutiiq Pride Shellfish Hatchery for the Chugach Regional Resources Commission. Funding from EPA's Indian Environmental General Assistance Program. September 2018.

*See Attachment 1

9. Project Personnel

The CV's of all Principal Investigators and other senior personnel involved in the proposal must be provided. Each resume is limited to two consecutively numbered pages and must include the following information:

- *A list of professional and academic credentials, mailing address, and other contact information (including e-mail address)*
- *A list of up your most recent publications most closely related to the proposed project and up to five other significant publications. Do not include additional lists of publications, lectures, etc.*
- *A list of all persons (including their organizational affiliations) in alphabetical order with whom you have collaborated on a project or publication within the last four years. If there have been no collaborators, this should be indicated.*

CVs are presented in the order listed here:

Jeff Hetrick (Principal Investigator) - Project Leader. Received AOOS Funding 97131
Jacqueline Ramsay- Ocean Acidification Lab
Wiley Evans-Hakai Institute (Principal Investigator) - Data Management, Regional Expert
Rob Campbell (Principal Investigator) - Lead Prince William Sound Sampling
Steve Baird (Principal Investigator) - Kachemak Bay Estuarine sampling

James "Jeff" Hetrick
P.O. Box 7
Moose Pass, Alaska 99631
(907) 288 3667
jjh@seward.net

Experience

Chugach Regional Resources Commission
Director Alutiiq Pride Shellfish Hatchery, Seward, Alaska
June 2001-Current
Director of the Alutiiq Pride Shellfish Hatchery and Mariculture Technical Center in Seward, Alaska. Active in developing the shellfish aquatic farm industry in Alaska. Pioneered hatchery technology for razor clams, native cockles, Purple-hinged rock scallops, pinto abalone, littleneck, softshell and butter clams, blue and red king crab and sea cucumbers. Also developed ocean acidification continuous monitoring and discrete sampling lab and OA exposure studies on important subsistence species.

Cook Inlet Aquaculture Association
Hatchery Manager Soldotna, Alaska
1988-2001
Successfully developed sockeye salmon pathology protocols to combat IHNV enabling the mass production of sockeye salmon smolt. Pioneered age zero smolt technology and developed production scale thermal marking program.

Alaska Department of Fish and Game Asst. Hatchery Manager 1984-1988

Education

Bachelor of Science- Biological Science/Fisheries 1980, University of Maryland, College Park, Md.
Master of Business Administration - Portland State University, Portland, Oregon | California Coast University, California 1995

Skills

Over 30 years' experience in Alaskan salmon and shellfish culture and enhancement and marine resource development specializing in remote native villages and rural area. Excellent communication, computer, grant writing and organizational and project management skills.

Affiliations /Memberships

Professional
Western Regional Aquaculture Center – Executive Board Member
Alaskan Shellfish Growers Association - Executive Committee
National Aquaculture Association- Board Member
Pacific Coast Shellfish Growers Association- Board Member
Alaska Department of Fish Game –Seward Advisory Group

Publications

Weeks, Carrie & Ramsay, Jacqueline & Evans, Wiley, & Hetrick, Jeff & Kurtz, Deborah & Mathis, Jeremy & Hales, Burke. Enhanced OA observing by citizen scientist initiatives and land-based measurement strategies in coastal Alaska. Poster presented at: Alaska Marine Science Symposium. 2018, Jan 22-26; Anchorage, AK.

Ramsay, Jacqueline & Evans, Wiley & Hetrick, Jeff & Hales, Burke. Building a baseline for Ocean Acidification trends in coastal communities of South-central Alaska. Poster presented at: Alaska Marine Science Symposium. 2017, Jan 23-27; Anchorage, AK.

Kelley, Amanda & Miller, Cale & Hetrick, Jeff & Ramsay, Jacqueline & Evans, Wiley. Examining the effects of ocean acidification on a native Alaskan bivalve *Saxidomus gigantea*, the butter clam. Poster presented at: Alaska Marine Science Symposium. 2017, Jan 23-27; Anchorage, AK.

Doroff, Angela & Trammell, E. Jamie & Abrahamson, Syverine & Baird, Steve & Shepherd, Jessica & Geist, Marcus & Aisu, Megumi & Hetrick, Jeff. Building a Foundation of Decision-Support Tools Integrating Existing Mapping and Monitoring Information for the Benefit of Long-Term Shellfish Sustainability and Management in Kachemak Bay and Cook Inlet, Alaska. Poster presented at: Alaska Marine Science Symposium. 2017, Jan 23-27; Anchorage, AK.

Evans, Wiley & Mathis, Jeremy & Ramsay, Jacqueline & Hetrick, Jeff. (2015). On the Frontline: Tracking Ocean Acidification in an Alaskan Shellfish Hatchery. PLoS ONE. 10.10.1371/journal.pone.0130384.

Swingle, James & Daly, Benjamin & Hetrick, Jeff. (2013). Temperature effects on larval survival, larval period, and health of hatchery-reared red king crab, *Paralithodes camtschaticus*. Aquaculture. 384–387. 13–18. 10.1016/j.aquaculture.2012.12.015.

Jacqueline Ramsay, MSc.
P.O. Box 2444, Seward, Alaska 99664, 907-362-0013

Education

University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Juneau, AK

- M.Sc. Fisheries, University of Alaska Fairbanks, December 2007
- B.S. Zoology/Evolution and Ecology, University of California Davis, School of Agriculture, Davis, CA, May 1997
- A.S. Biological Sciences Sierra College, Rocklin, CA June 1994

Professional Experience

Alutiiq Pride Shellfish Hatchery, Chugach Regional Resources Commission

Shellfish Biologist - Ocean Acidification Lab Manager September 2012 to present.

- Manage program for coastal seawater monitoring for carbonate chemistry.
- Shellfish brood stock and larval animal husbandry including abalone, king crab, oyster and geoduck culture. Algae culture and collection.
- Water quality, microbiology and pathogen monitoring, chemical safety.
- Writing: Reports, grants, permit requests and acquisition.

State of Alaska, Division of Natural Resources.

Seward District Recorder May 2011 to August 2012.

- Manager of the Seward Recorder's office for the division of Natural Resources. The recorders office maintains and preserves the permanent public record.

University of Alaska Fairbanks, Seward Marine Center

Research Professional II, Laboratory Manager October 2006 to November 2009.

- Daily management of the UAF Endocrinology Laboratory.
- Oversaw graduate students and their projects, complied with nuclear regulatory commission guidelines for acquisition and disposal of radioisotopes. Produced reports and wrote grants. Responsible for training lab users in chemical hygiene and safety as well as laboratory protocols. Helped design and implement experimental parameters for the field and laboratory. Participated in field and laboratory monitoring of Stellar Sea Lions and sample acquisition.

National Oceanic and Atmospheric Administration, Auke Bay Laboratory, Juneau, AK

Scientific Technician Contractor 2006**.**

- Identification and analysis of zooplankton samples in the lab and on field research cruises for the Southeast Coastal Monitoring Program.

Associate Science Editor of the Fishery Bulletin Contractor 2005.

- Established new office, characterized manuscript status, identified and assigning priority to editorial tasks and assigned reviewers and screened and edited manuscripts.

Analytical Chemist Contractor 2005.

- Produced esterified proteins for fatty acid analysis of sea lion prey using mass spec.

University of Alaska Southeast, Juneau, AK

Teaching Assistant 2004.

- Taught laboratory component of upper division Marine Biology and Physiology science course, corrected assignments, assigned grades.

California Department of Fish and Game, Shellfish Health Laboratory
University of California Davis, Bodega Marine Laboratory, Bodega Bay, California.
Post Graduate Researcher, June1996 to November 2000.

- Conducted research and creel surveys on red and black abalone as well as pacific oysters for pathogens in wild and hatchery animals and the management of their health. Conducted field studies on oyster health in Tomales Bay.

Publications:

- Evans, W., Mathis, J.T., **Ramsay, J.**, Hetrick, J., 2015. On the Frontline: Tracking $CaCO_3$ Corrosivity in an Alaskan Shellfish Hatchery. PLOS ONE.
- Weekes, C., Evans, W., Hales, B., **Ramsay, J.**, Hetrick, J., Mathis, J. "Enhancing ocean acidification observing in Alaska through citizen science initiatives and land-based measurement strategies" Frontiers in Earth Science *(accepted for press Nov. 2018)*

Laboratory Skills and Techniques

- HPLC – High Pressure Liquid Chromatography
- CO_2 /DIC analysis of seawater samples
- Microscopy
- Microbiology
- Western Blot Protein Analysis
- Immuno-precipitation of stress proteins
- Radio isotope immuno assay for hormone identification and analysis
- Spectrometry
- Cellular immune assays

Field Experience

- June 2017 - UAF- Seward Line sampling cruise on RV Tiglax
- July 2007 – UAF/Alaska SeaLife Center – Gulf of Alaska – Stellar Sea Lion juvenile branding cruise.
- August 2006 - NOAA - Bering Sea, Alaska – mid-water juvenile salmon monitoring cruise. Pollock and salmon stomach analysis.
- May 2006 - NOAA- Southeast Alaska, Lynn Canal. Coastal monitoring cruise for juvenile salmon and zooplankton, aboard the M/V John N. Cobb. Salmon and bycatch vital statistics.
- June 2006 - NOAA - Southeast Alaska coastal monitoring cruise for juvenile salmon and zooplankton, aboard the M/V John N. Cobb. CTD casts, plankton tows.
- July 2005 - NOAA - sampling in Taku inlet Southeast Alaska, for juvenile salmon including beach seining and mid-water trawls.
- August - 2002 – Crab survey for United States Geological Survey, Biological Resources Division conducted in Glacier Bay, aboard the USGS research vessel Alaskan Gyre.
- 1996-2000- U.C. Davis, field out plant studies for ongoing oyster aquaculture research, small boat operations.
- 1999 – U.C. Davis research in shark radio telemetry tagging and monitoring, Tomales, CA. outboard.
- March 1997 NMFS – Larval fish survey for National Marine Fisheries Service, RV David Starr Jordan between San Francisco Bay, the Farralon Islands, and Pt. Reyes.

Certifications/Other Experience:
HAZWOPPER, Wilderness First Aid, Multiple safety training certifications including: chemical spills, blood borne pathogens workplace safety, PADI Open Water, Naui Research Diver, Forklift Operator, small generator and boiler operation. Small craft experience.

BIOGRAPHICAL SKETCH – WILEY EVANS

Hakai Institute
1713 Hyacinthe Bay Road
Heriot Bay, BC V0P 1H0
Phone: 250-914-4055
Email:wiley.evans@hakai.org

EDUCATION

Oregon State University, Oceanography, Ph.D., 2011
Oregon State University, Oceanography, M.S., 2006
University of Hawaii-Hilo, Marine Science, B.A., 2003

PROFESSIONAL EXPERIENCE

2016 - Research Scientist, Hakai Institute
2013 - 2016 Research Associate, NOAA-PMEL, UAF-OARC
2011- 2013 Postdoctoral Scientist, University of Alaska-Fairbanks

FIVE CLOSELY RELATED PUBLICATIONS

Evans, W., B. Hales, P.G. Strutton, R.K. Shearman and J.A. Barth (2015), Failure to bloom: Intense upwelling results in negligible phytoplankton response and prolonged CO_2 outgassing over the Oregon shelf, *Journal of Geophysical Research*, 120, doi: 10.1002/2014JC010580.

Evans, W., J. T. Mathis, J. Ramsay and J. Hetrick (2015), On the Frontline: Tracking Ocean Acidification in an Alaskan Shellfish Hatchery, *PLOS ONE*, doi: 10.1371/journal.pone.0130384.

Evans, W., J. T. Mathis and J. N. Cross (2014), Calcium Carbonate Corrosivity in an Alaskan Inland Sea, *Biogeosciences*, 11, 365-379, doi: 10.5194/bg-11-365-2014.

Evans, W., and J. T. Mathis (2013), The Gulf of Alaska coastal ocean as an atmospheric CO_2 sink, *Continental Shelf Research*, 65, 52-63, doi: 10.1016/j.csr.2013.6.013.

Evans, W., B. Hales, P.G. Strutton and D. Ianson (2012), Sea-air CO_2 fluxes in the western Canadian coastal ocean, *Progress in Oceanography*, doi: 10.1016/j.pocean.2012.01.003.

FIVE OTHER PUBLICATIONS

Turk, D., N. Bednarsek, **W. Evans**, M. I. Garcia-Ibanez, B. Hales, and J. Cross (2017), Role of Technology in Ocean Acidification: Monitoring, Water-Quality Impairments, CO_2 Mitigation, and Machine Learning, *Reference Module in Earth Systems and Environmental Sciences*, doi: 10.1016/B978-0-12-409548-9.10165-4.

Evans, W., J. T. Mathis, J. N. Cross, N. Bates, K. Frey, B. Else, T. Papkyriakou, M. DeGrandpre, F. Islam, W.-J. Cai, B.-S. Chen, M. Yamamoto-Kawai, E. Carmack, W. J. Williams, and T. Takahashi (2015), Sea-air CO_2 exchange in the western Arctic coastal ocean, *Global Biogeochemical Cycles*, 29, doi: 10.1002/2015GB005153.

Mathis, J.T., J.N. Cross, **W. Evans** and S.C. Doney (2015), Ocean Acidification in the Surface Waters of the Pacific-Arctic Boundary Regions, *Oceanography*, 28(2): 122-135, doi: http://dx.doi.org/10.5670/oceanog.2015.36.

Mathis, J. T., S. R. Cooley, N. Lucey, S. Colt, J. Ekstrom, T. Hurst, C. Hauri, J. N. Cross, **W. Evans** and R. A. Feely (2015), Ocean Acidification Risk Assessment for Alaska's Fishery Sector, *Progress in Oceanography*, 136, 71-91, doi: 10.1016/j.pocean.2014.07.001.

Cao, Z., M. Dai, **W. Evans**, J. Gan and R. A. Feely (2014), Diagnosing CO_2 fluxes off the Oregon-California coast, *Biogeosciences*, 11, 6341-6354.

Full list of publications and cruise experience at: https://viu.academia.edu/WileyEvans

SYNERGISTIC ACTIVITIES

Workshops: British Columbia Seafood Expo, Courtney, BC, June 13, 2017; MEOPAR Ocean Acidification Workshop, Ottawa, ON, Mar. 23-24, 2017; Alaska OA Network Workshop, Anchorage, AK, November 30- December 1, 2016; AOOS OA Scoping Workshop, Anchorage, AK, January 29-30, 2016; Panelist for the Ocean Acidification Session at the Climate Change and Aquaculture in Canada: Pacific Workshop, Campbell River, BC, June 25, 2015; Ocean Acidification in Alaska, Anchorage, AK, December 2-3, 2014;

Service: Member of the Global Ocean Acidification Observing Network North America Hub; Member of Alaska OA Network Executive Committee; Member of the Pacific Coastal Collaborative Ocean Acidification and Hypoxia Task Force; Contributed to The Second State of the Ocean Carbon Cycle Report (SOCCR-2); Participated in the North American West Coast Carbon Synthesis Activity: North sub-region, North American Carbon Program; Participated in SOCAT V3 coastal and Arctic pCO_2 data QC; Participated in SOCAT V2 coastal and Arctic pCO_2 data QC workshop.

Reviews: Manuscripts for *Nature Communications*, *Proceedings of the National Academy of Sciences of the United States of America, Nature Scientific Reports, Limnology and Oceanography: Methods*, *Global Biogeochemical Cycles, Geophysical Research Letters, Journal of Geophysical Research – Oceans*, *Deep-Sea Research I*, *Biogeosciences*, *Carbon Balance and Management*, *Progress in Oceanography*, and *Marine Chemistry*. Proposals for the National Ocean and Atmospheric Administration (NOAA) Earth System Science Global Carbon Cycle Program, the National Science Foundation (NSF) Arctic Science Division, the National Science Foundation (NSF) Chemical Oceanography Division, and the North Pacific Research Board (NPRB).

COLLABORATORS

Mike DeGrandpre, U. Montana; Allison Bidlack, UAS/ACRC; Taro Takahashi, LDEO; Richard Feely, NOAA; Jeremy Mathis, NOAA; Burke Hales, OSU; Helen Gurney-Smith, DFO; Simone Alin, NOAA; Samantha Siedlecki, UW; Darren Pilcher, NOAA; Daniela Turk, Dalhousie U.; Nina Bednarsek, Alfred-Wegener Institute; Jessica Cross, NOAA; Josepth A. Needoba, CMOP; Tawnya Peterson, CMOP; Karen E. Frey, Clark University; Amanda Kelly, UAF

ADVISORS

PhD: Burke Hales and Peter G. Strutton; Postdoctoral: Jeremy T. Mathis

Robert William Campbell
Prince William Sound Science Center
P.O. Box 705, Cordova, AK, 99574
rcampbell@pwssc.org
(907)424-5800

EDUCATION

Doctor of Philosophy, University of Victoria, School of Earth and Ocean Sciences (1999-2003)
Thesis: "Overwintering ecology of *Neocalanus plumchrus*"
Master of Science, Biology, Dalhousie University (1996-1998)
Thesis: "Reproduction of *Calanus finmarchicus* in the western North Atlantic: fecundity and hatching success"
Bachelor of Science (Hons), Biology, University of Toronto (1991-1996)
Thesis: "Simulation and bioenergetic modeling of Walleye (*Stizostedion v. vitreum*) populations"

APPOINTMENTS

2007 – present Oceanographer, Prince William Sound Science Center
2010 – present Affiliate faculty, University of Alaska Anchorage
2004-2006 Post-doctoral researcher, University of Hamburg, Germany

PROFESSIONAL SOCIETY MEMBERSHIP/PROFESSIONAL SERVICE

Member, American Society of Limnology and Oceanography (1998-present)
2007: Member-at-large, Education and Human Resource Image Library Subcommittee
Member, International Council for the Exploration of the Sea
Member, Exxon Valdez Trustee Council Integrated Herring Restoration Plan Working Group.
Proposal Reviewer: NPRB, National Science Foundation, Deutsche Forschungsgemeinschaft.
Report Reviewer: Exxon Valdez Trustee Council
Manuscript Reviewer, Canadian Journal of Fisheries and Aquatic Sciences, ICES Journal of Marine Science, Journal of Marine Systems, Journal of Plankton Research, Marine Biology, Marine Ecology Progress Series, Progress in Oceanography

RECENT RELEVANT PUBLICATIONS

Campbell, R.W. 2018. Hydrographic trends in Prince William Sound, Alaska, 1960–2016. Deep Sea Res. doi: 10.1016/j.dsr2.2017.08.014

McKinstry, C.A.E., and R.W. Campbell. In press. Seasonal variation of zooplankton abundance and community structure in Prince William Sound, Alaska, 2009–2016. Deep Sea Res. doi: 10.1016/j.dsr2.2017.08.016

Crusius, J., Schroth, A.W., Resing, J.A., Cullen, J. and **R.W. Campbell**. 2017. Seasonal and spatial variabilities in the northern Gulf of Alaska surface water iron concentrations driven by shelf sediment resuspension, glacial meltwater, a Yakutat eddy, and dust. Global Biogeochemical Cycles. Doi: 10.1002/2016GB005493

Schroth, A.W., Crusius, J., Gassó, S., Moy, C.M., Buck, N.J., Resing, J.A. and **R.W. Campbell**. 2017. Aleutian Low position drives dramatic inter-annual variability in atmospheric transport of glacial iron to the Gulf of Alaska. Geophys. Res. Lett. 44, doi:10.1002/2017GL073565.

Batten, S.D., Moffitt, S., Pegau, W.S. and R. Campbell. 2016. Plankton indices explain interannual variability in Prince William Sound herring first year growth. Fisheries Oceanography 25(4):420-432.

Schroth, A.W., Crusius, J., Hoyer, I. and R. Campbell. 2014. Estuarine removal of glacial iron and implications for iron fluxes to the ocean. Geophysical Research Letters. doi: 10.1002/2014GL060199

Mackas, D., et. al. 2013. Zooplankton time series from the Strait of Georgia: Results from

year-round sampling at deep water locations, 1990–2010. Progress in Oceanography. 115:129-159.

OTHER PUBLICATIONS

Campbell, R.W and J.F. Dower. 2008. Life history and depth distribution of Neocalanus plumchrus in the Strait of Georgia. J. Plankton Res. 30:7-20.

Campbell, R.W., Boutillier, P. and J.F. Dower. 2004. Ecophysiology of overwintering in the copepod Neocalanus plumchrus: Changes in lipid and protein contents over a seasonal cycle. Mar. Ecol. Prog. Ser. 280:211-226.

Campbell, R.W. 2004. Comments on "Some ideas about the role of lipids in the life cycle of Calanus finmarchicus ". J. Plankton Res. 26:979-980.

Campbell, R.W. and J.F. Dower. 2003. The role of lipids in the regulation of buoyancy by zooplankton. Mar. Ecol. Prog. Ser. 263:93-99.

Kattner, G., Hagen, W., Lee, R.F., Campbell, R.W., Deibel, D., Falk-Petersen, S., Graeve, M., Hansen, B.W., Hirche, H.J., Jonasdottir, S.H., Madsen, M.L., Mayzaud, P., Müller-Navarra, D., Nichols, P., Paffenhöffer, G.A., Pond, D., Saito, H., Stübing, D., and P. Virtue. 2007. Perspectives on zooplankton lipids. Can. J. Fish. Aquat. Sci. 64:1628-1639.

Irigoien, X., Harris, R.P., Verheye, H.M., Joly, P., Runge, J.A., Starr, M. Pond, D., Campbell, R.W., Shreeve, R., Ward, P., Smith, A.N., Dam, H.G., Napp, J., Peterson, W., Tirelli, V., Koski, M., Smith, T., Harbour, D., Strom, S. and R. Davidson. 2002. Copepod Hatching Success Rate in Marine Ecosystems With with High Diatom Concentrations - the Paradox of Diatom-Copepod Interactions Revisited. Nature. 419:387-389.

SELECTED RECENT PRESENTATIONS

Campbell, R.W., Jaffe, J., and P. Roberts. 2018. The PWS Plankton Cam: An In-situ Look Into the Zooplankton Ecosystem of Prince William Sound. Alaska Marine Science Symposium, Anchorage.

Kibler, S., Du, X., Campbell, R.W., Holderied, K., Hondolero, D., Powell Schuster, K., Robinson, R., Arimitsu, M. and J. Piatt. 2018. NPRB 1801: Prevalence of Paralytic Shellfish Toxins in the Marine Food Webs of Prince William Sound and Kachemak Bay, Alaska. Alaska Marine Science Symposium, Anchorage.

Campbell, R.W. 2018. A Profiling Observatory for High Resolution Oceanographic, Biogeochemical, and Plankton Observations in Prince William Sound. ASLO Ocean Sciences Meeting, Portland.

Campbell, R.W. 2017. Effects of the 2013-2016 warm anomaly in Prince William Sound, Alaska. Alaska Marine Science symposium, Anchorage.

Campbell, R.W. 2016. Surface layer and bloom dynamics observed with the Prince William Sound Autonomous Profiler. ASLO/AGO Ocean Sciences Meeting, New Orleans.

Campbell, R.W. 2016. Surface layer and bloom dynamics in Prince William Sound. Alaska Marine Science Symposium, Anchorage.

Campbell, R.W. 2016. Effects of the 2013-2015 warm anomaly in Prince William Sound, Alaska. Pacific Anomalies Workshop 2, Seattle.

STEVEN J. BAIRD

Kachemak Bay Research Reserve, 2181 Kachemak Dr., Homer, Alaska 99603 | 907.235.4793 | sjbaird@alaska.edu

· EXPERIENCE

December 2001-present	**Biologist / Research Analyst**. *Kachemak Bay National Estuarine Research Reserve (University of Alaska).* Research Coordinator, Stewardship Coordinator, GIS analyst, biologist on a wide range of research projects. Oversight of KBRR's long-term monitoring program for water-quality and weather. Lead on salt marsh plant community mapping and monitoring.
June-December 2001	**GIS Specialist.** *Cook Inletkeeper.*
April 2000-December 2002	**Land Manager.** *Kachemak Heritage Land Trust.*
Spring 1994	**Assistant Professor.** *Antioch New England.*
January 1994	**Expedition Ornithologist.** *Belize Zoo, Belize, Central America.* Member of an expedition into a previously unexplored mountainous region of Belize. Responsibilities included censusing bird community, general expedition support, data analysis, and report writing.

· EDUCATION

1989-1996	PhD candidate, *Dartmouth College, Department of Biological Sciences, Hanover, NH.* Graduate research assessing the importance of habitat selection and sexual segregation in determining over-winter survival of American redstarts on their winter grounds in Belize, Central America, 1990-1993. Voluntary withdrawal, 1996.
1980-1983	BA in Human Ecology, *College of the Atlantic, Bar Harbor, ME.*
1978-1980	Environmental Studies/Biology major. *Colby College, Waterville, ME.*

· AWARDS

Fulbright Scholar. September 1991-April 1992. Fulbright Scholarship for foreign study awarded by The Institute of International Education. Funding for work in Belize, Central America.

M.W. Vandersea, S.R. Kibler, P.A. Tester, K. Holdereid, D.E. Hondolero, K. Powell, **S. Baird**, A. Doroff, D. Dugan, and R.W. Litaker. 2018. Environmental factors influencing the distribution and abundance of *Alexandrium catenella* in Kachemak Bay and lower Cook Inlet, Alaska. Harmful Algae 77:81-92. DOI: 10.1016/j.hal.2018.06.008

D.F. Wigham, C.M. Walker, J. Maurer, R.S. King, W. Hauser, **S. Baird**, J.A.Keuskamp, and P.J. Neale. 2017. Watershed influences on the structure and function of riparian wetlands associated with headwater streams – Kenai Peninsula, Alaska Science of the Total Environment, 599-600, 124-134. DOI: 10.1016/j.scitotenv.2017.03.290

M.K. Callahan, D.F. Wigham, M.C Rains, K.C. Rains, R.S. King, C.M. Walker, J.R. Maurer, and **S.J. Baird**. 2017. Nitrogen subsidies from hillslope alder stands to streamside wetlands and headwater streams, Kenai Peninsula, Alaska. Journal of the American Water Resources Association, 1-15. DOI: 10.1111/1752-1688.12508

M.K. Callahan, M.C. Rains, J.C. Bellino, C.W. Walker, **S.J. Baird**, D.F. Wigham, and R.S. King. 2014. Controls on temperature in salmonid-bearing headwater streams in two common hydrogeologic settings, Kenai Peninsula, Alaska. Journal of the American Water Resources Association, 1-15. DOI: 10.1111/jawr.12235

Neher, T.D.H., A.E. Rosenberger, C E. Zimmerman , C.M. Walker and **S.J. Baird**. 2014. Use of glacier river-fed estuary channels by juvenile Coho Salmon: transitional or rearing habitats? Environmental Biology of Fishes, 97:7, 839-850.

Neher, T.D.H., A.E. Rosenberger, C.E. Zimmerman , C.M. Walker and **S.J. Baird**. 2013. Estuarine environments as rearing habitats for juvenile Coho Salmon in contrasting south-central Alaska watersheds. Transactions of the American Fisheries Society, 142:6, 1481-1494

King, R.S., C.M. Walker, D.F. Wigham, **S.J. Baird**, and J.A. Back, 2012. Catchment topography and wetland geomorphology drive macroinvertebrate community structure and juvenile salmonids distributions in south-central Alaskan headwater streams. Freshwater Science 31(2):341-364.

Walker, C.M., R.S. King, D.F. Wigham, and **S.J. Baird**, 2012. Landscape and wetland influences on headwater stream chemistry in the Kenai lowlands, Alaska. Wetlands, 32(2):301-310.

Whigham, D.F., C.M. Walker, R.S. King, and **S.J. Baird**. 2012. Multiple scales of influence on wetland vegetation associated with headwater streams in Alaska, USA. Wetlands, 32(3):411-422.