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 March 17, 2008) and reporting requirements *(Procedures for the Preparation and Distribution of Reports***, adopted June 27, 2007).

PROJECT TITLE: **Development of Culture Technology to Support Restoration of Herring in Prince William Sound: Use of *in vitro* Studies to Validate and Optimize Restoration Actions**

Printed Name of PI: Dr. Tim Linley

Signature of PI: _____ Date 9/5/08

Printed Name of co-PI: Howard Ferren

Signature of co-PI: _____ Date 9/5/08

Printed Name of co-PI: _____

Signature of co-PI: _____ Date _____

* Available at www.evostc.state.ak.us/Policies/data.htm
** Available at www.evostc.state.ak.us/Policies/guidelines.htm

Trustee Council Use Only
Project No: ____
Date Received: ____

PROPOSAL SUMMARY PAGE
(To be filled in by proposer)

Project Title: Development of Culture Technology to Support Restoration of Herring in Prince William Sound: Use of in-vitro Studies to Validate and Optimize Restoration Actions

Project Period: October 1, 2008 – December 31- 2008

Proposer(s):

Dr. Tim Linley, MariCal, 400 Commercial Street, Portland, ME 04101. tlinley@marical.biz

Howard Ferren, Alaska SeaLife Center, PO Box 1329, Seward, AK 99664-1329. howard_ferren@alaskaSealife.org.

Study Location: Prince William Sound and Seward, Alaska

Abstract: This project will supplement work accomplished with FY2008 funding that supported travel and collaboration with Japanese herring scientists, and investigation of factors affecting egg quality in herring. The supplemental budget will support the translation and synthesis of the Japanese technical manual on herring culture, and permit coordination with other EVOS TC principal investigators to coordinate the inclusion of stock supplementation objectives and activities into the herring restoration actions. Work products include the herring culture technical manual translation, synthesis of this document into a report that will provide a template for evaluating culture methods for use in PWS supplementation, and integration of the proposed methods with supporting science and herring management investigations and actions. The work will be accomplished in Seward and Anchorage, Alaska, and Portland, Maine.

Funding:

EVOS Funding Requested: FY09 $ 43,200
(must include 9%GA)

TOTAL: $43,200

Non-EVOS Funds to be Used: FY09 $ 0

TOTAL: $0

Date: September 5, 2008

(NOT TO EXCEED ONE PAGE)

PROJECT PLAN

I. NEED FOR THE PROJECT

A. Statement of Problem

Pacific herring are an important resource in marine ecosystems, as they support commercial fisheries in the Gulf of Alaska and along the Pacific Ocean continental shelf in North America. The species exhibits wide variation in abundance and its year class strength is often synchronous among widely separate populations (Williams and Quinn 2000). In Prince William Sound (PWS), Pacific herring abundance increased in synchrony along with other Alaskan herring stocks beginning in the late 1970s before peaking at more than 100,000 tons annually between 1989 and 1993 (Gray et al. 2002). Although biomass estimates differ, the herring population declined significantly thereafter and is presently at levels similar to those observed in the 1970s. Previous studies indicate that the *Exxon Valdez* oil spill impacted recruitment of the 1989 year class, but its effect on the longer term population decline is unclear (Carls et al. 1998, 2001). Rather, other stressors including a large population size, poor over-winter rearing conditions and disease within the herring population from viral hemorrhagic septicemia virus (VHSV) and *Ichthyophonus* (ICTH) also appear to have been important. These pathogens have reportedly caused massive and recurring mortality in herring (Marty et al. 2004, reviewed in McVicar 1999), and combined with marked variation in local food availability (Foy and Norcross 1999; Norcross et al. 2001) and predation (Stokesbury et al. 2002), may be acting as major pressures contributing to persistent low population abundance.

Regardless of the actual cause(s) of the decline, intervention in the form of stock supplementation has been proposed as a possible mechanism to restore PWS herring to levels that effectively support the marine food web and provide for a sustainable commercial fishery. Stock supplementation typically involves the mass releases of juvenile fish that feed and grow on natural prey in the marine environment and subsequently add biomass to the adult population (Salvanes 2001). The success of such projects depends on not only knowledge of the basic biology of the species being cultured, but also the environmental factors, wild conspecifics, and other species that interact with the released fish.

In 2006 Alaska SeaLife Center (ASLC) and MariCal collaborators proposed to the EVOS Trustee Council a three year investigation titled "*Development of Culture Technology to Support Restoration of Herring in Prince William Sound: Use of in vitro studies to validate and optimize restoration actions*. This proposal focused on intervention in the form of artificial propagation that may be needed to restore Prince William Sound herring to levels capable of supporting a healthy ecosystem as well as sustainable fisheries. Collaborators had proposed to test and refine propagation methods through laboratory and field studies over a three-year period to evaluate the likely benefits and costs of stock restoration. The overall goal was to obtain biological and economic benchmarks of stock enhancement strategies by integrating established techniques for laboratory rearing of herring with state of the art methods used in the culture of multiple marine species.

The specific objectives were:

1. Provide biological and economic benchmarks to develop large scale enhancement of herring in PWS.
2. Determine the effects of salinity on the survival, growth and time to metamorphosis in larval fish.
3. Determine the interaction between salinity conditions and weaning diet during larval rearing on the subsequent growth and over-winter survival of juvenile fish.
4. Determine the comparative performance of hatchery based rearing methods on growth, immune system function and survival during short-term cage culture in the natural marine environment.

This project provided a timeline to complete larval rearing through metamorphosis, the transfer of juveniles to a marine site, and short-term rear and release the fish by September 2009. The three-year, $1.342 million project was not funded as proposed, but rather a start-up year $85,000 project was awarded by the Trustee Council for FY07, with the initial three-year proposal moved to FY08-FY10 and with no further commitment to fund. The revised project provided support for Dr. Tim Linley to visit with Japanese herring scientists and tour herring culture facilities at the Akkeshi Bay Field Station in Hokkaido, and to establish a temporary experimental lab for preliminary herring culture investigation at the mariculture facility in Seward, Alaska. Herring gametes and fertilized eggs were collected in PWS and reared in the lab under varying conditions. Results were reported in the FY07 Final Report to the EVOS Trustee Council.

In response to the FY08 request for proposals, ASLC/MariCal submitted a revision of the FY07 proposal that reduced the project to two years and included development of a new herring culture lab at ASLC based on Akkeshi Bay facilities. The objectives of $1.985 million proposal, which included construction of culture facility, were:

1. Provide biological and economic benchmarks to develop large-scale enhancement of herring in PWS.
2. Determine the effects of salinity on the growth and survival of larval and juvenile herring.
3. Determine the interaction between salinity conditions and diet on the growth and survival of larval and juvenile herring.
4. Determine the effect of larval and juvenile rearing strategies on the over-winter survival and whole body energy content (WBEC) of post-release juvenile herring.
5. Determine the comparative performance of hatchery based rearing methods on growth, immune system function and survival during short-term cage culture in the natural marine environment.
6. Determine the effect of artificial propagation of larval and juvenile herring to produce a naturally occurring otolith mark to distinguish stock supplementation fish from wild fish in the adult population.
7. Integrate herring culture and ecological investigations to develop and implement a cooperative program on net pen site selection and post-release monitoring and evaluation.

The EVOS Trustee Council did not fund the project as proposed, but reduced the scope of work to two objectives:

1. Plan and coordinate travel for Dr. Takahiro Matsubara and an associate or designee to travel to Alaska and attend the Marine Science Symposium in January 2008, participate in an EVOS Trustee Council sponsored workshop on herring stock restoration, visit the fish culture facilities at ASLC, the Seward Shellfish Hatchery and U.S. Geological Survey (USGS) Marrowstone Field Laboratory (Nordland, Washington), tour potential stock rearing and release sites in Prince William Sound (PWS) (e.g. Tatitlek), and meet with scientists and interested parties involved in the Prince William Sound herring restoration effort.
2. Conduct an assessment (survey) of yolk proteins and products in female herring that affect gamete quality and potential larval recruitment during the spawning cycle in PWS during 2008.

This funding provided support for Dr. Takahiro Matsubara and Mr. Hiroyuki Ohkouchi of the Fisheries Research Agency of Japan to travel to the U.S. and meet with EVOS TC staff and Dr. Linley in Seattle. While there, the group toured the Marrowstone Research Laboratory and Herring Disease Research Program with Dr. Paul Hershberger, and the Western Fisheries Research Center with Dr. James Winton. The group also traveled to Alaska where the Japanese collaborators were able to visit ASLC, and the Seward and Tatitlek mariculture facilities. During their visit, Dr. Matsubara and Mr. Ohkouchi made multiple presentations describing the results of more than two decades of herring work in Japan. Herring gamete samples collected in PWS in 2008 are presently being analyzed for yolk vitellogenin products courtesy of antibodies generously provided by Dr. Matsubara in late August. We anticipate these analyses will be completed by late September.

The objectives identified in the proposals submitted in response to FY07 and FY08 were and remain consistent with restoration alternatives identified in the draft Integrated Herring Restoration Plan (IHRP). As part of the draft IHRP, the projects we previously proposed offer important steps in the sequence to test and validate herring culture protocols for stock supplementation as part of a broad strategy to restore PWS herring. Since many of the questions we identified in our FY07 and FY08 proposals have now been incorporated as priority needs in the draft IHRP, it is critical that during the intervening gap between FY08 and proposal decisions for FY10, the critical information obtained from the Japanese collaboration be made fully available to help formulate effective supplementation strategies.

B. Relevance to 1994 Restoration Plan Goals and Scientific Priorities

In our original FY2008 proposal we stated, “Previous work documenting the decline of Pacific herring in PWS and the role of forage limitation, predation and disease that are limiting recovery emphasize the importance of developing effective methods to rebuild the population and restore the ecological and commercial activities that depend on it. The Trustee Council has classified herring as ’non-recovered‘ and is committed to developing a long-term Herring Restoration Plan and implementing enhancement activities with the ultimate goal of assisting herring recovery. These activities include various forms of intervention ranging from protecting herring spawn to physically relocating eggs and

larval fish to favorable nursery areas. This project specifically addresses Project Category 8 (Intervention) listed in Appendix A of the EVOS Trustee Council FY2007 Invitation for Proposals. Data from the project will provide both technical and economic benchmarks for any future large-scale herring enhancement efforts."

Further, "*We anticipate that our pilot scale efforts to adopt herring culture methods developed in Japan will provide a technical framework to refine these techniques for application in PWS. Moreover, we expect that detailed studies of the ionic and nutritional requirements that influence early life history growth and development of herring will provide PWS stakeholders with improved understanding of the likely near-term performance of proposed stock restoration strategies* (emphasis added). This expectation is derived from previous work that has resulted in the development of ionic and nutrient-based culture methods to enhance early seawater growth and survival in salmonids, and from our preliminary herring studies conducted in the spring of 2007 (see Appendix A). Our findings confirmed previous reports that salinity has a direct effect upon fertilization and hatching success, and that even a modest delay in food availability (one week) has negative consequences for subsequent larval growth and survival.

For herring, we expect our 2008 studies will show how water chemistry conditions and nutrition during the embryonic and larval stages interact to shape subsequent salinity tolerance and G.I. tract development in juvenile (metamorphosed) fish. Once these conditions are established, we propose to optimize culture methods to increase assimilation efficiency, WBEC and over-winter survival of age-0 herring released into the wild. This work will form part of our proposal for FY2009. Additionally, previous work has shown that confinement of herring under conditions that increase stress results in increased prevalence of VHSV and ICTH (Hershberger et al. 1999). These results suggest that introduction of young herring into nursery areas to exploit natural prey or optimal environmental conditions might be problematic if the action leads to stress-related immune system suppression that causes increased susceptibility to pathogens such as VHSV and ICTH (Hershberger et al. 1999, Tierney et al. 2004). However, recent developments in the use of probiotics and other additives (e.g. fatty acids) in the diets of larval and juvenile marine fish have shown significant promise to reduce pathogens in cultured fish (Vine et al. 2006). As part of our effort, we will assess the utility of using commercially available forms of these nutritional supplements and probiotics to potentially enhance the overall immune function of cultured herring and thereby increase the likelihood for releasing healthy fish into the wild.

If funded, this project will provide an assessment of the technical feasibility for hatchery production of juvenile herring at the scale proposed by Hay (2007) as a reasonable starting objective. It will also provide capacity to conduct controlled studies on the environmental (e.g. temperature, salinity) and biological (e.g. forage) factors that affect herring productivity in the wild. Taken together, the benefits of this project will contribute to a highly improved understanding of the supplementation and management mechanisms that can be used to effectively rebuild the herring stock(s) in PWS."

Although the two objectives funded by the EVOS Trustee Council in 2008 were quite different from those initially proposed (see Statement of Problem above) and briefly described above, results from completing the two objectives will enhance our

understanding of herring culture potential and technical details for successful culture and herring supplementation. We will also gain greater knowledge about herring stress and possible linkage to gamete quality that may affect survival and potential recruitment into the spawning population.

II. PROJECT DESIGN

A. Objectives

The two objectives that were approved and funded by the EVOS Trustee Council for FY2008 were:

1. Plan and coordinate travel for Dr. Takahiro Matsubara and an associate or designee to travel to Alaska and attend the Marine Science Symposium in January 2008, participate in an EVOS Trustee Council sponsored workshop on herring stock restoration, visit the fish culture facilities at ASLC, the Seward Shellfish Hatchery and U.S. Geological Survey (USGS) Marrowstone Field Laboratory (Nordland, Washington), tour potential stock rearing and release sites in Prince William Sound (PWS) (e.g. Tatitlek) and meet with scientists and interested parties involved in the Prince William Sound herring restoration effort.
2. Conduct an assessment (survey) of yolk proteins and products in female herring that affect gamete quality and potential larval recruitment during the spawning cycle in PWS during 2008.

For the **"supplemental budget period October 1 – December 31, 2008"** we specifically propose to accomplish the following objectives:

1. Translate into English the Japanese herring culture technical manual currently in possession of the PI (Yamamoto, Y. 2001. Techniques for juvenile production of herring. Technical Report of Stock Enhancement. Vol. 7. 100 p. Japan Sea Farming Association).

2. Synthesize the translated report into an assessment document to evaluate supplementation alternatives based on actual data from the Japanese herring experience.

3. Formulate goals, objectives and strategies in collaboration with other EVOS funded scientists.

These objectives are critical to accomplish the intent of the draft IHRP for restoring PWS herring through supplementation actions that include land based, mobile (vessel transported), or spawn on kelp relocation techniques.

B. Procedural and Scientific Methods

1. *Translate the Japanese herring culture technical manual.* We will contract for translation of the document. The Japanese herring culture technical manual is 100 pages in length and currently in possession of the Principal Investigator. The

content covers over 20 years of research, development and stock supplementation of herring in Japan.

2. *Synthesize the translated report into an assessment document to evaluate supplementation alternatives based on actual data from the Japanese herring experience.* Limited information has been presented regarding the viability of stock supplementation methods for herring and their potential utility in PWS. Hay (2007) provides an overview of the Japanese experience, but details regarding specific culture methods are needed to guide supplementation actions and funding. We propose to condense the translated document into a best practices procedure manual for use in developing and implementing stock supplementation projects.

3. *Formulate goals, strategies and objectives in collaboration with other EVOS funded scientists to integrate scientific investigations with supplementation actions.* The draft Integrated Herring Restoration Plan (IHRP) suggests alignment and integration of herring supplementation actions with prioritized scientific investigations, technology, permit requirements and resource management. Staff time and travel will be required to work with other investigators to develop a proposal responsive to the *EVOS* Trustee Council. The complexity of the draft IHRP will require a herring coordinator as proposed for funding by EVOS Trustee Council staff. Although the proposed Herring Coordinator will facilitate project implementation to optimize resource use, the investigators will be responsible for laying out their scientific expertise as well as the detailed steps for project integration so that various investigations collectively support a common herring restoration strategy.

C. Data Analysis and Statistical Methods

No data will be collected during this supplemental budget phase.

D. Description of Study Area

No field studies will take place, although travel and coordination will be required among herring scientists working in Cordova, Anchorage, and Seward, Alaska.

E. Coordination and Collaboration with Other Efforts

Coordination and collaboration are critical for herring restoration actions in PWS. The draft IHRP is predicated on a multidisciplinary approach to herring restoration. Herring workshops convened during the summer of 2008 specifically captured the necessity to align and integrate investigations with restoration actions to provide the greatest potential for restoration success. Going from the "plan" to detailed and integrated but individually funded projects will require significant coordination and collaboration. For example, supplementation actions proposed in the draft IHRP will require mass marking, re-capture and mark identification, disease management, and predator assessment and management, among other critical path areas of science. Until the draft IHRP is completed it not possible to detail what specific projects and investigations we will have

to coordinate with to be responsive to the *EVOS* Trustee Council. Our current plans call for close coordination with Dr. Paul Hershberger on disease, Dr. Nate Bickford or others on mass marking technology, Dr. Vince Patrick and Ross Mullins (PWS Fisheries Research and Planning), ADF&G (fish resource permitting), investigators focused on predation (Dr. Jeep Rice), modeling (Dr. Evelyn Brown), and scientists focused on larval drift, larval and juvenile herring prey abundance, and near shore environmental conditions.

III. SCHEDULE

A. Project Milestones

Specific project objectives and associated tasks and timelines include the following:

Objective 1. Translate the Japanese herring culture technical manual currently in possession of the PI.

- Task 1. Contract service for technical manual translation by October 10, 2008.
- Task 2. Receive completed translation of the manual by November 7, 2008.

Objective 2. Synthesize and report on the Japanese herring experience and results of the EVOS Trustee Council funded herring culture investigations to date.

- Task 1. Assemble available documents, presentations and communications regarding Japanese herring culture and extract information relevant to proposed PWS herring supplementation by November 14, 2008.
- Task 2. Synthesize Japanese herring culture experience and prepare best practices report by December 15, 2008.

Objective 3. Formulate goals, objectives and strategies in collaboration with scientists integrating required science with supplementation actions.

- Task 1. Communicate with herring PIs regarding integrated strategy for herring restoration by December 12, 2008.
- Task 2. Draft herring culture and supplementation goals, objectives and strategies necessitated by integrated restoration plan priorities by December 31, 2008.

B. Measurable Project Tasks

Supplemental funding for the first quarter of FY09 is requested to complete the following tasks.

FY09, 1st quarter (October 1, 2008-December 31, 2008)

October: Supplemental funding approved by Trustee Council October 1, 2008.
Obj 1. Task 1. Contract service for technical manual translation by October 10, 2008.

November: Obj 1. Task 2. Receive completed translation of the manual by November **7**, 2008.
Obj 2. Task 1. Assemble available documents, presentations and communications regarding Japanese herring culture and extract information relevant to proposed PWS herring supplementation by November 14, 2008.
Obj 2. Task 2. Synthesize Japanese herring culture experience and prepare best practices report by December 15, 2008.

December: Obj 3. Task 1. Communicate with herring PIs regarding integrated strategy for herring restoration priorities by December 15, 2008.
Obj 3. Task 2. Draft herring culture and supplementation goals, objectives and strategies necessitated by integrated restoration plan priorities by December 31, 2008.

IV. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES

A. Community Involvement and Traditional Ecological Knowledge (TEK)

As proposed in response to EVOS TC FY2007 and FY2008 RFPs, the multi-year project offered the following:

> "This project represents a foundational development intended to support broader scale herring restoration in PWS. Due to complex biological and socio-economic factors underlying the herring debate, we intend to involve PWS community stakeholders at multiple levels of outreach and education. First we will inform stakeholders of the project objectives and methods with annual updates on project progress. We will also communicate with stakeholders and management agencies to integrate project developments with future restoration efforts other parties may implement in Prince William Sound. We will gather traditional knowledge that will guide the third year field trial. We will also provide education and outreach through the Alaska SeaLife Center's exhibits and distance education programs. We plan to disseminate the results using outreach strategies to target public interests on local, regional, and national levels.
>
> **Stakeholder meetings in Cordova.** We plan to hold public informational meetings in Cordova in spring 2007, followed by annual meetings in 2008, 2009 and 2010 to keep stakeholders current on project progress and to solicit stakeholder input on herring restoration. We will coordinate meetings in Cordova through the Native Village of Eyak (Bruce Cain, Executive Director) and Prince William Sound Fisheries Research Applications and Planning group (Ross Mullins). These organizations have cultural, economic, social and biological interest in the direction and success of this project and have already been contacted. Fact sheets describing the project will be produced and distributed at the Cordova meetings. Input will be shared and gathered to guide the future direction of the project for conducting Year 4 field trials. This will help build a framework upon the foundation research for larger scale restoration in PWS.

Integration with management agencies. We will implement a communication plan to inform agencies of progress. Field trials planned for Year 4 implementation will require coordination and permitting with management agencies.

Ecosystem-based education. This project provides a perfect context for teaching a broader view of the ecosystem. ASLC will use Pacific herring in PWS as a platform for understanding the inter-relatedness of system components and the importance of restoring herring to the system. This will allow ASLC to develop and deliver educational content to regional and national school districts about the importance of herring and herring restoration because of its key role in the ecosystem. ASLC will use its distance learning capabilities to reach a wide audience both within Alaska and throughout the nation. Individual classrooms can also participate in programs delivered onsite at ASLC and in their communities with an outreach educator. ASLC will collaborate with the Prince William Sound Science Center to serve local communities and maximize accessibility for schools. Support materials will be developed such as teacher guides, research fact sheets, and hands-on lesson plans. This component will be managed by Jessica Ryan, Education Manager and coordinated by Darin Trobaugh, Education Program Coordinator at the Alaska SeaLife Center.

Exhibitry and public displays. Signage and exhibits will be developed and displayed at ASLC. Exhibits may include live research on display. Signage will address herring as a resource, its cultural and economic value, and the herring life cycle.

Web access. ASLC and MariCal maintain public access web sites that are continually updated and expanded to provide the public with recent findings and developments related to their various research activities. ASLC and MariCal plan to crosslink web pages dedicated to herring research as a means to highlight their respective involvement in this project and broader efforts related to herring restoration.

Finally, our findings will also be made available to other scientists and resource management agencies at EVOS meetings and appropriate scientific conferences and through publication in peer reviewed scientific journals and news letters."

The Supplemental Proposal and Budget for the period October 1 – December 31, 2008 will not address these strategies. It is reassuring to see the EVOS TC and its staff engaged in community based planning, that stakeholders are now part of the process and that management agencies are integrated into the overall restoration plan as it emerges. We are pleased to see the direction of the outreach component and ongoing workshops in Cordova. What is now in motion is what we originally proposed be put into action.

B. Resource Management Applications

Not applicable.

V. PUBLICATIONS AND REPORTS

Not applicable.

For more information, see *Procedures for the Preparation and Distribution of Reports* at http://www.evostc.state.ak.us/Policies/reporting.cfm

VI. LITERATURE CITED

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2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2007 - September 30, 2008

Budget Category:	Authorized FY 2008	Proposed FY 2009
Personnel	$7.5	$9.0
Travel	$1.1	$1.2
Contractual	$54.8	$21.3
Commodities		$0.0
Equipment		$0.0
Subtotal	$63.4	$31.5
Indirect	$17.2	$8.1
Project Total (without GA)	$80.6	$39.6
General Administration (9%)		$3.6
Project Total (with GA)		$43.2
Full-time Equivalents (FTE)		0.1
Other Resources		

LONG RANGE FUNDING REQUIREMENTS

Dollar amounts are shown in thousands of dollars.

Comments: Budget justication below.

For this supplemental budget period we are requesting a total of $43,200.

Personnel

Mr. Ferren will allocate 40% of his time to this project (1.2 months @ $7,500/month = $9,000).

Travel

Mr. Ferren will make one trip from Seward to Anchorage, AK to meet with Dr. Linley and other EVOS principal investigators to detail integration of herring investigations ($400 airfare + 4 days @ $200/day = $1,200).

Contractual

MariCal, Inc. will be contracted for $21,300. Dr. Linley will allocate 50% of his time to this project (1.5 months @ $7,500/month = $11,300). He will make one trip from Portland, Maine to Anchorage, Alaska to meet with Mr. Ferren and other EVOS principal investigators ($1,500 airfare + 5 days per diem @ $200/day = $2,500). The MariCal contract will also include $7,500 to fund a subcontract for translation of the Japanese herring culture technical manual, which is 100 pages in length covers over 20 years of research, development and stock supplementation of herring in Japan.

FY09

Project Number:
Project Title: Development of Culture Technology to Support Restoration of Herring in Prince William Sound: Use of *in vitro* Studies to Validate and Optimize Restoration Actions
Name: Alaska SeaLife Center

Prepared:

Personnel Costs:			Months Budgeted	Monthly Costs	Overtime	Propos FY 20
	Name	Position Description				
	Howard Ferren	Co-Investigator	1.2	7.5	0.0	$

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

		Subtotal		1.2	7.5	0.0	
						Personnel Total	$9

Travel Costs:		Ticket	Round	Total	Daily	Propos
	Description	Price	Trips	Days	Per Diem	FY 20
	EVOS PI Collaboration Meeting (Ferren) Seward/Anchorage, AK	0.4	1	4	0.2	
					Travel Total	$1

FY09

Prepared:

Project Number:
Project Title: Development of Culture Technology to Support Restoration of Herring in Prince William Sound: Use of *in vitro* Studies to Validate and Optimize Restoration Actions
Name: Alaska SeaLife Center

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

Contractual Costs:				Propos
Description				FY 20
MariCal, Inc. (details below)				2:
Personnel Cost: Dr. Tim Linley, Principal Investigator	Qty	Rate	Subtotal	
1.5 months @ 7.5/mo	1.5	7.5	11.3	
Travel: EVOS PI Collaboration Meeting (Linley)				
Airfare: 1 trip from Portland, ME to Anchorage, AK	1	1.5	1.5	
Per diem: 5 days @ $200/day	5	0.2	1	
Contractual: Technical report translation (Japanese to English)			7.5	
		Contractual Total		$21

Commodities Costs:		Propos
Description		FY 2(
	Commodities Total	$0

FY09

Prepared:

Project Number:
Project Title: Development of Culture Technology to Support Restoration of Herring in Prince William Sound: Use of *in vitro* Studies to Validate and Optimize Restoration Actions
Name: Alaska SeaLife Center

2008 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET
October 1, 2007 - September 30, 2008

New Equipment Purchases:	Number	Unit	Propos
Description	of Units	Price	FY 20
			(
			(
			(
			(
			(
			(
			(
			(
			(
			(
			(
Those purchases associated with replacement equipment should be indicated by placement of an R.	**New Equipment Total**		$0

Existing Equipment Usage:	Number	
Description	of Units	

FY09

Prepared:

Project Number:
Project Title: Development of Culture Technology to Support Restoration of Herring in Prince William Sound: Use of *in vitro* Studies to Validate and Optimize Restoration Actions
Name: Alaska SeaLife Center