# 2008 PCCRC Projects Funded

Project Title: Matt Myers Memorial Graduate Student Travel Fund

Principal Investigator: Shannon Atkinson

Award: $2,480 (year 1), $2,480 (year 2), $2.480 (year 3)

Estimated Completion: January 31, 2012

Abstract

This paper is being put forth to PCCRC to honor Matthew (Matt) Myers, a Ph.D. candidate in University of Alaska Fairbanks' (UAF) School of Fisheries and Ocean Sciences (SFOS), who died recently in the process of being trained for scientific diving certification. The proposal is to develop a travel fund in Matt's name, for graduate student travel. The Matt Myers Memorial Graduate Student Travel Fund would award two $1,000 travel awards annually to students, with a preference towards students in marine biology or fisheries. While it would be nice to create such an award with a legacy, this proposal is to develop the travel fund for an initial five year period.

---

Project Title: Combining genetics and population dynamics to improve management of Pacific ocean perch (Sebastes alutus).

Principal Investigator: A. J. Gharrett and T. J. Quinn

Award: $79,234 (year 2), $81,892 (year 3) - continuation

Estimated Completion: January 31, 2011

Abstract

In this PCCRC project, we propose to develop and apply quantitative models to examine the influence of population subdivision on population dynamics models that are used to evaluate sustained production of exploited resources. The project arose because an assumption made for many marine species, which have pelagic larvae and apparently mobile adults, is that their populations extend over very broad reaches, possibly including much of their natural ranges. However, this may often not be the case. Recently, our genetic studies of Pacific ocean perch (POP) population structure demonstrated that relatively strong divergence occurs between collections that were sampled at locations spaced about 400 km apart along the GOA and BS continental slopes. The degree of divergence that we observed indicates that, although population structure is not defined by geographic or oceanographic boundaries, the limited net dispersal of both pelagic

larvae and adults results in limiting the spatial scale of POP production. These limited areas are determined by the average distance moved between birth and reproduction; and are called “neighborhoods”. The spatial scale of neighborhoods (productivity units) is the geographic scale on which management should be focused.

From the results of research conducted in our laboratory, we will be able to estimate the maximum extent of substantial dispersal, and should be able to make preliminary estimates of neighborhood size. The questions that we will address are the effects that harvest patterns exert on the production and genetic structure of POP and, by extension, other species for which limited dispersal results in a neighborhood models for population structure, and for which the neighborhoods are much smaller than the management areas. To evaluate these effects, we will develop quantitative models that include information about dispersal, population dynamics, and exploitation and, with simulations, test the effects of different spatially-based harvesting strategies, which will range from harvesting over the entire management area to harvests in a few limited locations within the area.

Since the inception of the PCCRC project in July 2007, K. Palof has conducted a number of analyses of our POP data that we did not originally plan to include in her M.S. thesis. However, because those analyses were a necessary portion of this project and because they would enhance her thesis, we delayed completion of her program and included those analyses in her thesis, which was successfully defended on 4 December. We also have made the first steps toward developing our quantitative models by reexamine the quality of the data from which the parameters on population structure and dispersal are estimated. One of the potential challenges of microsatellite data is that biases may occur in their estimation as a result of the existence of so called “null” alleles. We have conducted a series of simulations to evaluate the potential effects and are conducting laboratory investigations to quantify the null allele incidence in our data. In this report we provide the background information for potential influences of null alleles on data interpretations, describe our simulations and their results, and present our approach to laboratory detection and estimation of null allele frequencies as well as preliminary results of the laboratory investigations.

We conclude from the results of our simulations and preliminary laboratory observations that microsatellite null alleles have very low frequencies at most of the loci that we apply and have had little influence on our analyses of population genetics structure or on the estimation of parameters derived from the data.

---

Project Title: Bering Sea temperatures and their relationship to walleye pollock fisheries: a feasibility study of year-round near-real time data acquisition.

Principal Investigator: Mark Johnson

Award: $68,900

Estimated Completion: January 31, 2010

Abstract

In 2005, fishery landings in Alaska were 5.7 billion pounds, or almost 60% of the total pounds landed in the U.S. (NMFS 2007). Approximately 40% of all U.S. fish and shellfish landings occurred in the eastern Bering Sea. The nation's top seafood port in 2005 was Dutch Harbor- Unalaska, accounting for 888 million pounds of landings worth $283 million before value-added processing. These numbers make fishing efficiency and long-term sustainability key elements to Alaska's economic growth. The purpose of this proposal is to conduct a feasibility test to determine the usefulness of near real-time temperature data from the Bering Sea to commercial fishers and fisheries managers. It is anticipated that knowledge of Bering Sea bottom temperatures and vertical profiles of temperature will help determine fishing locations more efficiently, and will be important to fisheries managers. Bottom and water column temperatures will be acquired using free-drifting profiling floats. For this feasibility test, and to keep costs down, we will deploy and acquire data from two floats with temperature data transmitted weekly to the PIs. Following transmission and receipt of data, we will post it as soon as possible on the Alaska Ocean Observing System web site. We will determine whether data maps faxed to commercial fishers is also useful, building on past positive AOOS experience. Following this study, the full data set of temperature can be used in fisheries models, and used to establish a baseline of modern temperature records from the fishing grounds of the Bering Sea.

---

Principal Investigator: Jo-Ann Mellish

Project Title: Making our mark: Assessment of the behavioral and physiological effects of long-term tracking methods in Steller sea lions (Eumetopias jubatus)

Award: $17,775

Estimated Completion: January 31, 2010

Abstract

Marine mammal research often requires marking animals in order to collect important long-term ecological data. Various field research authorizations state that markings should not cause the animal pain or distress, nor should the marking impede the animal's ability to perform natural behaviors. The research proposed here will be the first to evaluate the combined behavioral and physiological responses to hot-iron branding and surgical implantation of Life History Transmitters (LHX tags) in juvenile Steller sea lions

(*Eumetopias jubatus*). Data collected will identify changes in behaviors key to the animals naturalistic functioning, and from that a set of handling recommendations for captive and field research can be made. These data will also be used to develop objective pain assessment methods for sea lions and to apply these methods in identifying and reducing pain during invasive marking procedures in field research.

---

Project Title: Purification of pollock oil using short path distillation

Principal Investigator: Alexandra Oliveira

Award: $84,266

Estimated Completion: January 21, 2010

Abstract

The beneficial health effects of a diet rich in long chain polyunsaturated omega-3 fatty acids (LC-ω3-PUFA's) have been fully described in recent years. Marine oils are an important dietary source of LC-ω3-PUFA's, being especially rich in two of the most important fatty acids of this class namely, EPA (eicosapentaenoic acid; 20:5ω3) and DHA (docosahexaenoic acid; 22:6ω3). Due to its nutritional value there is growing interest in refining fish oil for human consumption. In Alaska there are large quantities of fishery byproducts being used for the production of fish meal and fish oil. Most fish oil produced in Alaska is crude or unrefined, thus it may only serve as ingredient for animal feed unless further steps are taken to handle specific fishery byproduct components as raw materials for the production of food. In this case, unrefined human grade fish oil can be produced and may be further purified to meet market specifications for human grade oils. The main goal of this research is to investigate the applicability of short-path distillation for the purification of commercial pollock oil, and human grade pollock liver oil. Pollock oils will be subjected to short-path distillation for deodorization, and removal of free fatty acids and other impurities. The major advantages of using this technology, compared to traditional fish oil purification steps, are that it reduces the use of chemicals during processing, reduces the number of steps needed to refine fish oils, and reduces oil loss during purification improving processing yields.

---

Project Title: Deployment of an acoustic data logger on commercial fishing vessels to evaluate the potential of fishing-induced declines in local pollock abundance

Principal Investigator: Terrance Quinn II

Award: $36,931

Estimated Completion: January 31, 2010

Abstract:

Since 2001 the PCC Research Center has funded this project for a total of $251,528. This project has demonstrated the feasibility of installing acoustic data loggers on catcher/processors in the EBS pollock fishery to study localized depletion of pollock. We request $36,931 in new funds in FY08 to provide salary and tuition for PhD student Haixue Shen in April – December 2008. This will allow the analytical component of this project to be completed. In 2001, we developed a prototype data logger that interfaces with the ship's 38 kHz echo sounder and captures the acoustic backscatter returns. In 2002, we installed it on three catcher/processors (Island Enterprise, Kodiak Enterprise, and Alaska Ocean). The system works quite satisfactorily. The backscatter data is post-processed and integrated with observer and logbook data. Preliminary analysis showed that the hydroacoustic information is correlated with pollock catch. In 2003, an additional 4 vessels (American Dynasty, American Triumph, Ocean Rover, Starbound) were equipped with acoustic data logging systems, bringing the total number of PCC vessels equipped to 7, or nearly half the fleet. Work since 2005 has concentrated on the analysis phase of the project. This work includes classifying the searching behavior of the vessel, integrating the acoustic biomass, identifying pollock aggregations detected while searching, and evaluating what inferences, if any, can be made concerning the rate at which those aggregations are reduced in abundance. The project is moving forward in developing more sophisticated analytical tools for inferring the temporal dynamics of pollock spatial pattern using multiple data sources. This project is a cooperative program between the University of Alaska and the University of Washington and will result in two PhD dissertations: Haixue Shen at UAF and one by Steven Barbeaux at the University of Washington.

---

Project Title: Increasing experimental learning opportunities for undergraduate students in Fisheries at the University of Alaska Fairbanks

Principal Investigators: Amanda Rosenberger, Trent Sutton, and Nicola Hillgruber

Award: $56,474

Estimated Completion: January 31, 2010

Abstract:

The goal of this proposed project is to enhance and expand the active learning program in the Fisheries Division of the University of Alaska Fairbanks (UAF) School of Fisheries and Ocean Sciences (SFOS). Within Alaska's unique environment, this program will give

undergraduate students opportunities to participate in fisheries research and management in occupational and research settings, expand student's professional development through mentorship, encourage pursuit of graduate studies, and better prepare them for their future careers in fisheries. We propose: (1) to give undergraduate students occupational experience in fisheries management and research settings through cooperation with Alaska agencies, industry, and Alaska Native corporations; (2) to provide research and mentoring opportunities for undergraduate students within UAF SFOS Oceanography and Marine Biology programs; (3) create an undergraduate symposium that will highlight student research and hands-on learning experiences and provide opportunities for students to present their research results in professional settings (society meetings); and (4) facilitate involvement and recruitment of rural Alaskan students in the program through participation in an NSF-sponsored field course for Alaska high school students that applies towards undergraduate credit at UAF (Nunivak Island Science Camp). Recognizing that Alaska's resources and its fishing and seafood industries are the most vibrant, healthy, and sustainable in the world, it is critical that we provide students with the training to serve the health of these fisheries and meet the challenges of future environmental and institutional changes. The funding we request provides support for education and training of undergraduate students in fisheries, contributing to life-long learning of students whose work will play a vital role in the long term health of Alaska's precious fisheries resources.

---

Project Title: Fatty acid composition of forage species in the Bering Sea: Variability and its effect on estimating predator diets using quantitative fatty acid signature analysis

Principal Investigator: Alan Springer and Sara Iverson

Award: $51,025 (year 1), $22,064 (year 2), $3,980 (year 3)

Estimated Completion: January 31, 2012

Abstract

Knowing what animals eat is perhaps the single most important requirement for understanding relationships of predators to prey, how food webs, communities, and ecosystems are organized, and why populations fluctuate in abundance over time and space. The most powerful new approach for estimating predator diets in marine ecosystems employs fatty acids (FA), which are passed up the food chain in predictable ways and can be used to quantitatively estimate predator diets at each trophic level. For a given predator, this requires a catalog of the FA composition of all likely prey. The overall efficacy and accuracy of the FA method of diet analysis is well established, yet important questions remain of how potential spatial and temporal variability in FA composition of individual prey species affect diet estimates. Our goal is to evaluate the magnitude of variability among seasons, years, and locations in FA composition of

principal forage species supporting seabirds and marine mammals in the Bering Sea. We will build upon our recent studies of diets of seabirds and fur seals using FA, which have not had the resources to investigate these issues, and will fully exploit a large collection of forage species obtained in collaboration with the National Marine Fisheries Service. Products from this study— an extensive catalogue of FA signatures of the principal forage species in the Bering Sea, coupled to assessments of the magnitude of variability in FA and its significance to quantitative diet estimates—will be available to others wishing to employ FA analysis.