

Prince William Sound Isotope Ecology Synthesis, Submitted Under the BAA

Project Number: 030625

Restoration Category: Research

Proposer: Prince William Sound Science Center
Cordova, Alaska

Lead Trustee Agency: NOAA
Cooperating Agencies:

Alaska SeaLife Center:

Duration: One year project

Cost FY 03: \$ 25,500

Geographic Area: Prince William Sound

Injured Resource/Service: Fishes and their Injured Consumers, Fisheries:
Commercial, Recreational, and Subsistence

ABSTRACT

The proposed project will provide a 'big picture' synthesis of the present structure of the pelagic ecosystem of Prince William Sound through preparation of a scientific paper with the tentative title: "A stable isotope based trophic structure of the pelagic community of Prince William Sound, Alaska". The documentation of a 'before picture' will be of extreme high value because the recently documented regional change in species composition is likely to alter pelagic trophic structure during GEM.

INTRODUCTION

A crucial part of the scientific research process is synthesis and dissemination of the results to the scientific community. This comes in the form of papers given at meetings and through publication in the open literature. The process generally requires a protracted schedule. This occurs for several reasons. One being that the process of reviewing, revising, and publication of a paper often takes from two to three years. Secondly, publication of one article may need to follow the publication of another. This has been the case for the P.I.'s stable isotope restoration research that has resulted in a number of papers (see below). None of these papers however, is comprehensive, providing the big picture synthesis of the structure of the pelagic ecosystem. It is important to document the present status of ecosystem because as shown through analysis of the past marine ecosystem by Brodeur and Ware (1992) and Anderson et al. (1998), changes in zooplankton abundance and species composition are highly likely future events.

Accordingly, a paper with the tentative title: "A stable isotope based trophic structure of the pelagic community of Prince William Sound, Alaska" consisting of a synthesis of the EVOS stable isotope work conducted from 1994 to 2002 including data from the just completed project 393, the synthesis goal of which was terminated early. This will provide this much needed GEM-related synthesis, since it will describe the present state of the marine ecosystem using stable isotope reconstruction of the food web structure. The EVOS Trustee Council has requested that this project scope be reduced to year for a manuscript preparation. Accordingly, revisions and subsequent publication will necessarily occur after project completion based on the P.I.'s experience that it takes two to three years to write, to have reviewed, to revise, to have accepted (frequently with a second revision), and to have published a peer-reviewed scientific publication. Publication costs therefore will have to be deferred through no-cost extensions of this project.

Results from prior work

The manuscript, 'Pacific salmon (*Oncorhynchus* spp.) early marine trophic shifts based on $^{15}\text{N}/^{14}\text{N}$ and $^{13}\text{C}/^{12}\text{C}$ in Prince William Sound, Alaska' authored by Thomas C. Kline, Jr. and T. Mark Willette, funded under the EVOS project 541, the previous dissemination project, has gone through the peer review process and has been returned to the editor after minor revisions. A copy of which is attached in the form of an appendix to *hard copies* of this proposal. Electronic copies, however, are available from the P.I. in pdf format only via e-mail. Anticipated publication is late 2002.

The P.I.'s other contributions on stable isotope research to the scientific literature have included these EVOS-funded peer and non-peer-reviewed publications:

Peer-reviewed

- 2002 Kline, T.C., Jr. The Relative Trophic Position of *Cancer magister* Megalopae within the Planktonic Community of the Sub-Polar Northeastern Pacific Ocean. *In*: A.J. Paul, E.G. Dawe, R. Elner, G.S. Jamieson, G.H. Kruse, R.S.

Otto, B. Sainte-Marie, T.C. Shirley, and D. Woodby (eds.). Crabs in Cold Water Regions: Biology, Management, and Economics. University of Alaska Sea Grant, AK-SG-02-01, Fairbanks. IN PRESS.

- 2001 Cooney, R.T., J.R. Allen, M.A. Bishop, D.L. Eslinger, **T. Kline**, B.L. Norcross, C.P. McRoy, J. Milton, J. Olsen, V. Patrick, A.J. Paul, D. Salmon, D. Scheel, G.L. Thomas and S.L. Vaughan. Ecosystem control of pink salmon (*Oncorhynchus gorbuscha*) and Pacific herring (*Clupea pallasii*) populations in Prince William Sound, Alaska. . Fish. Oceanogr. 10 (Suppl. 1):1-13.
- 2001 Norcross, B.L., E.D. Brown, R.J. Foy, M. Frandsen, S. Gay, **T.C. Kline, Jr.**, D.M. Mason, E.V. Patrick, A.J. Paul, and K.D.E. Stokesbury. A synthesis of the early life history and ecology of juvenile Pacific herring in Prince William Sound, Alaska. Fish. Oceanogr. 10 (Suppl. 1):42-57.
- 2001 Eslinger, D.L., R.T. Cooney, C.P. McRoy, A. Ward, **T.C. Kline, Jr.**, E.P. Simpson, J. Wang, and J. R. Allen. Plankton dynamics: observed and modeled responses to physical conditions in Prince William Sound, Alaska. Fish. Oceanogr. 10 (Suppl. 1):81-96.
- 2001 Paul, A.J, J.M. Paul and **T.C. Kline, Jr.** Estimating whole body energy content for juvenile Pacific herring from condition factor, dry weight, and carbon/nitrogen ratio. *In:* F. Funk, J. Blackburn, D. Hay, A.J. Paul, R. Stephenson, R. Toresen, and D. Witherell (eds.), Herring: Expectations for a New Millennium. University of Alaska Sea Grant, AK-SG-01-04, Fairbanks. p. 121-133.
- 2001 Kline, T.C., Jr. The trophic position of Pacific herring in Prince William Sound Alaska based on their stable isotope abundance. *In:* F. Funk, J. Blackburn, D. Hay, A.J. Paul, R. Stephenson, R. Toresen, and D. Witherell (eds.), Herring: Expectations for a New Millennium. University of Alaska Sea Grant, AK-SG-01-04, Fairbanks. p. 69-80.
- 2001 Kline, T.C., Jr. Evidence of biophysical coupling from shifts in natural stable carbon and nitrogen isotopes in Prince William Sound, Alaska. *In:* Kruse, G.H., N. Bez, A. Booth, M.W. Dorn, S. Hills, R.N. Lipcius, D. Pelletier, C. Roy, S.J. Smith, and D. Witherell (eds.), Spatial Processes and Management of Marine Populations. University of Alaska Sea Grant, AK-SG-01-02, Fairbanks. p. 363-375.
- 1999 Kline, T.C., Jr. Temporal and Spatial Variability of $^{13}\text{C}/^{12}\text{C}$ and $^{15}\text{N}/^{14}\text{N}$ in pelagic biota of Prince William Sound, Alaska. Can. J. Fish. Aquat. Sci. 56 (Suppl. 1) 94-117.
- 1998 Kline, T.C., Jr. and D. Pauly. Cross-validation of trophic level estimates from a mass-balance model of Prince William Sound using $^{15}\text{N}/^{14}\text{N}$ data. *In:*

Funk, F., T.J. Quinn II, J. Heifetz, J.N. Ianelli, J.E. Powers, J.F. Schweigert, P.J. Sullivan, and C.-I. Zhang (eds.), *Fishery Stock Assessment Models*. Alaska Sea Grant College Program AK-SG-98-01. University of Alaska Fairbanks. p. 693-702.

Non-peer reviewed

- 1999 Kline, T.C., Jr. Monitoring changes in oceanographic forcing using the carbon and nitrogen isotopic composition of Prince William Sound pelagic biota. In: *Ecosystem Approaches for Fisheries Management*. University of Alaska Sea Grant, AK-SG-99-01, Fairbanks. p. 87-95.
- 1997 Kline, T.C., Jr. Confirming forage fish food web dependencies in the Prince William Sound ecosystem. *In: Forage Fishes in Marine Ecosystems*. Proceedings of the International Symposium on the Role of Forage Fishes in Marine Ecosystems. Alaska Sea Grant College Program Report No. 9701. University of Alaska Fairbanks. p. 257 - 269.

NEED FOR THE PROJECT

A. Statement of Problem

The documentation of a 'before picture' will be of extreme high value because the recently documented regional change in species composition is likely to alter pelagic trophic structure during GEM.

B. Rationale/Link to Restoration

The GEM process should be based on valid empirical observations and syntheses of these observations. The publication process facilitates communication of new synthetic results, while the review process provides the credibility. The Trustee Council also gains credibility for its science through publication.

C. Location

Prince William Sound

COMMUNITY INVOLVEMENT AND TRADITIONAL ECOLOGICAL KNOWLEDGE

Community involvement and traditional ecological knowledge was incorporated into the sampling used to generate the results that will be synthesized. In addition to the product itself, the data and information on which the report is based will be provided to the scientific and local community through the Prince William Sound Science Center's

website: www.pwssc.gen.ak.us. The P.I. will undertake a continuing program of outreach and communications. The objective will be to involve stakeholders in addressing these topics, and to translate scientific knowledge into a form that is readily understood by all interested parties. The P.I. is presently a member of a Cordova-based fisheries research planning group, a project funded to local fishers, K. Adams and R. Mullins, by the *Exxon Valdez* Oil Spill Trustee Council. The P.I. thus has connections facilitating community involvement of the project. Furthermore, the P.I. will participate in other symposia that bring together scientists and policy makers to review new knowledge related to the science questions above, and to identify research priorities for the future. Additional contact with local stakeholders will be met through outreach programs conducted at the Prince William Sound Science Center in Cordova and elsewhere, in particular, those in Alaska, such as through the P.I.'s connections as a P.I. in a U.S. GLOBEC project.

PROJECT DESIGN

A. Objectives

1. A peer-reviewed scientific paper providing a synthesis of the pelagic ecosystem based on stable isotope ratio data from PWS biota samples analyzed by the P.I. during 1994 to 2002. *The proposed paper title is: 'A stable isotope based trophic structure of the pelagic community of Prince William Sound, Alaska'. The author will be: Thomas C. Kline, Jr. Potential journals are: Ecology, C.J.F.A.S., & M.E.P.S.*

B. Methods

A draft manuscript will be sent to the journal for review during year 1 of project. Reviews expected back in 6-9 months from date of submission, which most likely will occur during the FY following the project. Revision expected to take one month. The revised paper will be reviewed within 3-6 months. Final revision will then. Publication will depend on the length of publication queue from date of final acceptance.

C. Cooperating Agencies, Contracts, and Other Agency Assistance

N/A

SCHEDULE

A. MEASURABLE PROJECT TASKS for FYI (October 1, 2002 - September 30, 2003)

Oct. 02 - Sept. 03: Prepare draft for submission to journal

B. Project Milestones and Endpoints

Sept. 2003: Paper submitted to journal

Jan. 2003, 2004: Attend Annual Restoration Workshops
Jan-April 2004: Draft Final Report preparation (to consist solely of a manuscript draft)
April 2004: Draft Final Report (to consist of solely of a manuscript draft)
September 2004: Final Report (to consist of solely of a manuscript draft)

C. Completion Date

September 2004 (Final Report)

PUBLICATIONS AND REPORTS

See objectives

PROFESSIONAL CONFERENCES

NORMAL AGENCY MANAGEMENT

N/A

COORDINATION AND INTEGRATION OF RESTORATION EFFORT

Collaboration with other EVOS investigators will continue; workshops and meetings will facilitate exchange.

PROPOSED PRINCIPAL INVESTIGATOR

Thomas C. Kline Jr., Ph.D.
Prince William Sound Science Center
P. O. Box 705
Cordova, AK 99574
907-424-5800 (t)
907-424-5820 (f)
tkline@grizzly.pwssc.gen.ak.us

PRINCIPAL INVESTIGATOR

T. Kline has been actively involved in stable isotope research since 1985. His has innovated applications of stable isotope analysis in fish ecology with emphasis on salmonid fishes in northern, western, south central and southeast Alaska. His techniques have enabled the quantification of the effect of salmon carcass nutrient input to juvenile sockeye salmon production. This research has been the first to provide direct evidence for the importance of salmon carcasses for juvenile salmon production. His stable isotope models also enable the quantification of different sources of production important in salmon ecosystems. Dr. Kline also led an investigation relating feeding strategies to growth forms in North Slope salmonids. His on-going efforts include collaborations with ADF&G, the North Slope Borough, and BPX. The results of these projects have been presented in numerous scientific papers as well as in public forums (speaking to local groups and classes). T. Kline initiated EVOS project 320I which has been the first comprehensive project using natural stable isotopes in Prince William Sound. Through this project he has developed new models and application of natural stable isotope abundance methods. He was the first to provide direct evidence of the importance of carbon from the Gulf of Alaska in Prince William Sound.

OTHER KEY PERSONNEL

LITERATURE CITED

Anderson, P.J., J.E. Blackburn, and W.R. Bechtol. 1996. APEX Project Component L - Synthesis and analysis of Gulf of Alaska small-mesh trawl data 1953 to 1995. Abstracts of 1996 Restoration Projects. *Exxon Valdez* Oil Spill Trustee Council. Anchorage, Alaska.

Brodeur, R.D. and D.M. Ware. 1992. Long-term variability in zooplankton biomass in the subarctic Pacific Ocean. *Fish. Oceanogr.* 1:32-38.

FY 03 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2002 - September 30, 2003

Budget Category:	Authorized FY 02	Proposed FY 03					
Personnel		\$15.191					
Travel		\$1.200					
Contractual		\$1.600					
Commodities		\$0.500					
Equipment		\$0.000	LONG RANGE FUNDING REQUIREMENTS				
Subtotal	\$0.0	\$18.491					
Indirect		\$4.891					
Project Total	\$0.0	\$23.382					
with agency overhead		\$25.5					
Full-time Equivalent (FTE)		0.1					
Dollar amounts are shown in thousands of dollars.							
Other Resources							
Comments:							
NOTE: Project includes NOAA GA (95) of \$2.1							

FY03

Project Number: 030625
 Project Title: Prince William Sound Isotope Ecology Synthesis,
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 Name: Prince William Sound Science Center

Prepared: 5 Jul. 02

FY 03 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2002 - September 30, 2003

Personnel Costs:				Months Budgeted	Monthly Costs	Overtime	Proj I
Name	Position Description						
Thomas Kline	P.I.			1.5	10.127		1
Subtotal				1.5	10.1	0.0	
Personnel Total							\$10.127
Travel Costs:			Ticket Price	Round Trips	Total Days	Daily Per Diem	Proj I
Description							
1 R/T to EVOS workshop, 1 day travel, 3 days workshop per diem amt includes car rental, hotel, food			0.35	1	4	0.2	
Travel Total							

FY03

Project Number: 03625
 Project Title: Prince William Sound Isotope Ecology Synthesis,
 Submitted Under the BAA
 Name: Prince William Sound Science Center

Prepared: 5 Jul. 02

FY 03 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2002 - September 30, 2003

Contractual Costs:		Proj
Description		I
photocopy network shipping phones page charges		
Contractual Total		§
Commodities Costs:		Proj
Description		
office and computer supplies		
Commodities Total		

FY03

Project Number: 03625
 Project Title: Prince William Sound Isotope Ecology Synthesis,
 Submitted Under the BAA
 Name: Prince William Sound Science Center

Prepared: 5 Jul. 02

FY 03 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET

October 1, 2002 - September 30, 2003

New Equipment Purchases:		Number of Units	Unit Price	Project
Description				
Those purchases associated with replacement equipment should be indicated by placement of an R.			New Equipment Total	
Existing Equipment Usage:		Number of Units	Project	
Description				

FY03

Project Number: 03625
 Project Title: Prince William Sound Isotope Ecology Synthesis,
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 Name: Prince William Sound Science Center

Prepared: 5 Jul. 02