

## **A synthesis of the ecological findings from the EVOS Damage Assessment and Restoration Programs, 1989-2001**

**Project Period:** October 1, 2003-September 30, 2004  
(3rd year, 3-year project)

**Proposer:** Robert B. Spies, Ph.D, Applied Marine Sciences, and collaborators

**Study location:** Gulf of Alaska

**Abstract:** This project is synthesizing results from 12 years of study in the EVOS Damage Assessment and Restoration Programs in order to shed light on anthropogenic and natural factors causing change in the northern Gulf of Alaska ecosystem. The product will be an integrated synthesis book consisting of four major sections: 1. The basic structure and function of the ecosystem, 2. How the ecosystem changes over time and in response to disturbances, 3. The effect of the spill, and 4. Implications of ecosystem change. The book will be a major product of the EVOS Restoration Program and will help set the foundation for the Gulf Ecosystem Monitoring Program. Key words: ecosystem change; oil spill synthesis

**EVOS funds requested:** FY04: \$184.8K

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### **Activity To Date**

This effort is a synthesis of the main scientific findings from the EVOS Restoration Program. It draws mainly on the products of the EVOSTC post-spill scientific studies (1989-2001), with reference also to key pre-spill and non-EVOSTC literature, to integrate what has been learned about the effects of human and natural forcing in the spill-affected ecosystem.

Following is a brief summary of FY 2003 activities to date (6/1/03):

1. The second major meeting of the book authors was held at the annual EVOS meeting in Anchorage, January 18, 2003.
2. The writing assignments were finalized in January 2003.
3. The detailed outline was finalized in April 2003.
4. Writing is underway. Preliminary drafts of several chapters, as well as parts of chapters, are being circulated among authors.
5. An internal web site has been online since July 2002 and is maintained as a tool for exchanging information, ideas and news about the project.
6. Negotiations are underway with a publisher.
7. Several additional co-authors have volunteered to help with the book, e.g., Dr. Brenda Norcross, University of Alaska, Fairbanks and Dr. John Piatt, USGS, Anchorage.
8. Arrangements have been made for a July 2003 internal meeting of the chapter authors in the Anchorage area.

## **RESEARCH PLAN**

### **I. NEED FOR THE PROJECT**

#### **A. Statement of the problem**

The proposed long-term monitoring and research program for the northern Gulf of Alaska (GEM) should be built on a solid foundation from the previous intensive work in the spill-affected ecosystem. With over 300 separate research projects over 12 years that addressed all major ecosystem components, with many simultaneous studies that potentially captured large-scale variability in various ways, and with major ecosystem studies now completed, but with minimal interaction between them, the stage has been set, in the Damage Assessment and Restoration Programs, for a comprehensive synthesis. And, with at least some GEM activities due to start in FY 2003 and to expand slowly over the first 5 years of the program, the time for synthesis is in FY 2002-2004.

Since the occurrence of the spill, much has been learned about long-term ecological change in the north Pacific, both due to human activities and due to climate variability. The efforts to ascribe ecological change to particular causes over the last 12 years have been focused on various aspects of the ecosystem and have produced over 350 publications by Trustee Council scientists and an almost equal number from Exxon-sponsored studies. Recent analyses of multiple biological and physical data sets indicate that large-scale climate-induced shifts occurred in the North Pacific in 1977 and 1989 (Hare and Mantua, 2000). Another change may be underway starting in 1999 or 2000. These changes, particularly the change in mid-1970s, corresponded with profound changes in the production of some fish stocks (Francis et al., 1998) and with basic shifts in the composition of the dominant fauna (Piatt and Anderson, 1996). Both of these shifts likely had consequences that interacted in unique ways with the *Exxon Valdez* oil spill and especially recovery from the spill.

#### **B. Relevance to GEM**

One of the primary needs for this synthesis is for evaluation and possible update of the current conceptual model of ecosystem forcing that is contained in the Gulf Ecosystem Monitoring Program Plan; GEM 2001 ([www.oilspill.state.ak.us](http://www.oilspill.state.ak.us)).

The GEM Program, the newest phase of the Restoration process, calls for long-term monitoring in the Gulf of Alaska supported by funds from the Restoration Reserve. GEM has as one of its main goals detection of natural and anthropogenic change in the ecosystem. The program will be based on a conceptual model that describes how the ecosystem works and how it varies with external forcing factors, both natural and human. The program is being designed so that this model will change as our knowledge of the Gulf of Alaska matures and deepens. Ecological insight that can inform this conceptual model will be especially useful in the next several years. Further, the National Research Council (NRC) has conducted a review of the proposed program and plan and one of their main recommendations is to build GEM on a good understanding of what has been learned from the last 12 years. In order to do this, the NRC and many scientists familiar with the Restoration Program have suggested that a comprehensive scientific synthesis be performed, with special emphasis on what has been learned from EVOSTC research.

## II. PROJECT DESIGN

### A. Objectives

The objective of this project is to synthesize findings from the post-oil spill studies as they relate to the structure and function of the Gulf of Alaska marine ecosystem and how it may change in response to natural and anthropogenic forces.

The specific objectives for the remainder of FY 2003 are to:

1. Hold the third meeting of the writing team to discuss progress on component chapters and to integrate approaches for the book.
2. Formulate and begin to execute a plan for integrated graphics based on the outline, text and consultation with the chapter contributors.
3. Complete rough drafts of the component chapters of the synthesis.
4. Complete negotiations with a publisher.

The objectives for FY 2004 include:

1. Circulate drafts for internal review by the synthesis team, make recommendations for change and revise chapters.
2. Obtain outside peer review of the revised rough draft.
3. Finalize manuscript and illustrations.
4. Make a multimedia presentation for the public.
5. Submit synthesis to the publisher.

### B. Methods

The methods for conducting this synthesis are those employed in a large scholarly undertaking. They can conveniently be broken down into the following steps:

1. *Gathering the relevant information.* All of the EVOS final reports are in the office of Bob Spies, who will serve as Principal Investigator and editor. These reports are also available as PDF reports online at [www.dtlcrepository.downlegal.com/ARLIS-/PDF](http://www.dtlcrepository.downlegal.com/ARLIS-/PDF). Many of the publications from the scientific literature are also available in Spies's office, at ARLIS, or at the EVOS Restoration Office in Anchorage. Bibliographies of Trustee- and Exxon-sponsored studies is kept by the EVOS Restoration Office. Publications will be gathered and distributed by administrative staff at Applied Marine Sciences (AMS). ARLIS, the natural resources library in Anchorage, is available to support this phase of the project. AMS also subscribes to Cambridge Scientific Abstracts, an online service that provides literature searches returning full references for publications and their abstracts. Each of the contributing authors will be asked to keep a reference list using Endnote or another mutually agreed upon software package. These lists will be exchanged between authors and the editor to identify additional literature.

2. *Evaluation.* Each of the contributing authors will read the appropriate reports and publications, examine the relevant data sets, and then evaluate them with regard to anthropogenic and natural

forces in ecosystem change. Contributing authors will be asked to take notes on phenomena reported by the authors of the primary literature that may be the results of system forcing.

3. *Initial synthesis meeting*: Early in the project, in the spring of 2002 and before the initial evaluation of the literature takes place, all of the contributing authors will meet and discuss innovative ways to approach the synthesis. It is likely that some approach based strongly on ecosystem processes will emerge given the backgrounds and initial discussions among the team. Writing assignments will be made following this meeting. It is envisioned that each chapter in the synthesis will have a lead author and others that contribute in order to have the maximum degree of synthesis.

4. *Chapter outlines*. Following the meeting, an outline of each of the chapters will be produced and a reference list will be circulated among the entire synthesis team. These lists will be reviewed and revised in light of any comments provided. The outline for the integrated synthesis will then be finalized.

5. *Obtaining a publisher*. The leading potential book publishers will be contacted to determine their interest in the synthesis based on the outline. A publisher will be chosen and negotiations for publications will be undertaken.

6. *Manuscript preparation*. The individual authors will write their chapters based on the outline. The editor will hold periodic conference calls and at least one face-to-face meeting per year will be held.

7. *Initial review*. Draft manuscripts will be exchanged among authors and with the editor during the remainder of FY2003 for review.

8. *First revisions*. Review comments from authors and the editor will provide a basis for the first revision. The editor will monitor progress and encourage completion as the deadline for revisions of the drafts approaches.

9. *Independent review*. Outside reviewers will be enrolled to review the revised manuscripts and provide written comments.

10. *Final revision*. The final revisions will be incorporated and the manuscript submitted for publication.

### **C. Data Analysis**

There is no new data analysis component to this project.

### **D. Study area**

The study area is the northern Gulf of Alaska.

## **E. Coordination with other efforts**

Several of the authors in the book are participating in large scientific programs in the Gulf of Alaska and their involvement provides lines of communication to non-EVOS projects. There is no fieldwork, so coordination of field efforts is not an issue. There is no other effort to synthesize the findings from the broad range of studies in the EVOS Restoration Program.

## **III. SCHEDULE**

### **A & B. Measurable project tasks and milestones for remainder of FY2003 (informational) and FY2004 (proposed)**

|                |  |
|----------------|--|
| July 2003      | Preliminary chapters are due; Meeting of all authors in Alaska               |
| August 2003    | Illustration plan finalized  |
| September 2003 | Edited chapters returned to authors.   |
| November 2003  | Negotiations with a publisher completed. Internal reviews of draft chapters. |
| February 2004  | Fourth meeting of synthesis team for integration                             |
| June 2004      | External chapter reviews due, distribute to authors                          |
| August 2004    | Final revised chapters due   |
| September 2004 | Send entire manuscript to publisher  |

## **IV. RESPONSIVENESS TO KEY TRUSTEE COUNCIL STRATEGIES**

### **A. Community Involvement**

We will interact with regional communities and subsistence users in principal two ways. Firstly, community representatives such as EVOSTC Community Facilitators and the Chugach Regional Resource Commission will be contacted during the information gathering phase of the project. They will be invited to give input to the synthesis. Secondly, during the completion of the work a multimedia display will be developed to explain the findings of the study in understandable terms and presentations will be made at those communities that wish to participate.

### **B. Resource Management Applications**

The book outline calls for a full chapter devoted to discussion of resource management implications arising from results and conclusions of the synthesis.

## **V. PUBLICATIONS AND REPORTS**

The manuscript for the book will be produced at the end of the three-year period.

## **VI. PROFESSIONAL CONFERENCES**

The P.I. requests travel to one professional conference in FY2004 to share the results of the synthesis effort and travel expenses to one annual EVOS meeting for each of the authors.

## **LITERATURE CITED**

Francis, R.C., S.R. Hare, A.B. Hallowed and W.S. Wooster. 1998. Effects of interdecadal climate variability on the oceanic ecosystems of the NE Pacific. *Fisheries and Oceanography* 7, 1-21.

Hare, S.R. and N.J. Mantua. 2000. Empirical evidence for North Pacific regime shifts in 1997 and 1989. *Prog. Oceanogr.* 47, 103-145.

Peterson, C. 2001. The *Exxon Valdez* oil spill in Alaska: Acute, indirect and chronic effects on the ecosystem. *Advances in Mar. Biol.* 39, 1-103.

Piatt, J. F, and P. Anderson. 1996. Response of common murrelets to the *Exxon Valdez* oil spill and long-term changes in the Gulf of Alaska ecosystem. *American Fisheries Soc.. Symposium* 18: 720-737.

## **PROJECT PERSONNEL**

The following are the members of the core writing and editorial team. Resumes follow.

Robert Spies, Ph.D. (Principal Investigator and Editor)

Gordon Kruse, Ph.D.

Tom Weingartner, Ph.D.

Ted Cooney, Ph.D.

Alan Springer, Ph.D.

Stanley Rice, Ph.D.

Jennifer Allen, B.V.Sc. (coordination and illustration)

## **ROBERT B. SPIES, Ph.D. Principal Investigator and Editor**

President, Applied Marine Sciences  
P.O. Box 315, Little River, CA 95456  
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### **Recent Professional Experience**

|              |  |
|--------------|--|
| 1989-present | President, Applied Marine Sciences, Livermore, CA  |
| 2002-present | Editor, <i>Marine Environmental Research</i>   |
| 1990-2002    | Chief Scientist, <i>Exxon Valdez</i> Trustee Council   |
| 1973-1994    | Senior Marine Scientist, Lawrence Livermore National Laboratory, University of California, Livermore, CA |

### **Education**

|                           |                                   |      |
|---------------------------|-----------------------------------|------|
| Ph.D. Biological Sciences | University of Southern California | 1971 |
| M.S. Biology              | University of Pacific             | 1969 |
| B.S. Biology              | St. Mary's College                | 1965 |

### **Professional activities**

Member, Board of Directors, Alaska Sealife Center, 1994-present  
Member, National Research Council, Committee to revise "Oil in the Sea", 2000-2002  
Member, Independent Science Board, CALFED Restoration Program 1998-present  
Member, Public Advisory Committee, University of California Toxic Substances Research and Teaching Program, 2000-present.

### **Recent publications relevant to project**

National Research Council. 2003. Oil in the Sea. National Academy Press, Washington, D.C.

Spies, R. B., S. D. Rice, D. A. Wolfe and B. A. Wright. 1996. The effects of the *Exxon Valdez* Oil spill on the Alaskan Coastal environment, pp. 1-16, in: Rice, S.D., R.B. Spies, D.A. Wolfe, and B.A. Wright (Eds.) *Exxon Valdez Oil Spill Proceedings, Anchorage, Alaska, 2-5 February 1993*. American Fisheries Society Symposium No. 18.

Spies, R.B., J.J. Stegeman, D.E. Hinton, B. Woodin, M. Okihiro, R. Smolowitz and D. Shea. 1996. Biomarkers of hydrocarbon exposure and sublethal effects in embiotocid fishes from a natural petroleum seep in the Santa Barbara Channel. *Aquatic Toxicol.* 34: 195-219.

Bauer, J.E., R.B. Spies, J.S. Vogel, D.E. Nelson and J.R. Southon. 1990. Radiochemical evidence of fossil hydrocarbon cycling in sediments of a nearshore hydrocarbon seep. *Nature* 348:230-232.

Spies, R.B. and D.W. Rice, Jr. 1988. The effects of organic contaminants on reproduction of starry flounder, *Platichthys stellatus* (Pallas) in San Francisco Bay. Part II. Reproductive success of fish captured in San Francisco Bay and spawned in the laboratory. *Marine Biology* 98:191-202.

(Robert B. Spies, cont.)

### **Five other significant publications**

Spies, R.B. and P. Thomas. 1997. Reproductive and endocrine status of mature female kelp bass *Paralabrax clathratus* from a contaminated site in the Southern California Bight and estrogen receptor binding of DDTs, Chapter 9, in *Chemically-induced alterations in functional development and reproduction of fishes*, R.M. Rolland, M. Gilbertson and R.E. Peterson (Eds.) Society of Environmental Contamination and Toxicology, Technical Publication Series, SETAC Press, Pensacola, FL.

Rice, D.W. C.B. Seltenrich, R.B. Spies and M.L. Keller. 1993. Seasonal and annual distribution of organic contaminants in marine sediments from Elkhorn Slough, Moss Landing Harbor and nearshore Monterey Bay, California. *Environ. Pollution*, 82: 79-91.

Spies, R.B., J.E. Bauer and D. H. Hardin. 1989 A stable isotope study of sedimentary carbon utilization by *Capitella* spp.: effects of two carbon sources and geochemical conditions during their diagenesis *Marine Biology* 101: 68-74.

Spies, R. B. H. Kruger, R. Ireland and D.W. Rice, Jr. 1989 Stable isotope ratios and contaminant concentrations in a sewage-distorted food web. *Mar. Ecol. Prog. Ser.* 54, 157-170.

Spies, R. B., B. Andresen and D.W. Rice, Jr. 1987. Benzthiazoles in estuarine sediments as indicators of street runoff. *Nature* 327: 697-699.

### **Primary collaborators last four years**

Dr. Jennifer Allen, Alaska Digital Graphics

Dr. Marlo Atkinson, University of Hawaii

Dr. Shannon Atkinson, University of Alaska/Alaska SeaLife Center, Seward, AK

Dr. Paul Boehm, Battelle Laboratories, Duxbury, MA

Dr. Judy McDowell, Woods Hole Oceanographic Institution

Dr. Ted Cooney, Professor Emeritus, University of Alaska

Dr. George Hunt, University of California, Irvine

Dr. Chuck Kennicutt, Texas A&M University

Dr. Gordon Kruse, University of Alaska, Juneau

Dr. Sam Luoma, USGS, Menlo Park, CA

Dr. Jacqui Michele, RPI, South Carolina

Dr. Peter Moyle, University of California, Berkeley

Dr. Charles Peterson, University of North Carolina

Dr. Nancy Rabalais, University of Louisiana

Dr. George Rose, University of New Foundland

Dr. Stan Rice, NOAA Laboratories, Auke Bay, Alaska

Mr. Stan Senner, Alaska Audobon Society, Anchorage

Dr. Alan Springer, University of Alaska, Fairbanks

Dr. John Stegeman, Woods Hole Oceanographic Institution.

Dr. John Trefry, Florida Institute of Technology

Dr. Robert Twiss, University of California, Berkeley

Dr. Tom Weingartner, University of Alaska, Fairbanks



## **GORDON H. KRUSE, Ph. D.**

President's Professor of Fisheries

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### **Recent Professional Experience**

- 11/01 – Pres. President's Professor of Fisheries, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Juneau, Alaska.
- 8/85 – 11/01 Chief Marine Fisheries Scientist, Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau, Alaska.
- 1/83 – 6/85 Post-doctoral Fellow (National Sciences and Engineering Council), Department of Fisheries and Oceans, Northeast Fisheries Science Center, St. John's, Newfoundland.

### **Education**

|       |                       |                                     |      |
|-------|-----------------------|-------------------------------------|------|
| Ph.D. | <i>Fisheries</i>      | Oregon State University             | 1983 |
| M.S.  | <i>Fisheries</i>      | Oregon State University             | 1981 |
| B.A.  | <i>Biomathematics</i> | Rutgers College, Rutgers University | 1977 |

### **Major Current Professional Service Activities**

- 11/02 – pres. Member, Science Panel, North Pacific Marine Research Board.
- 10/02 – pres. Member, Scientific and Statistical Committee, North Pacific Fishery Management Council. (Also member 1/90-1/92)
- 8/02 – pres. Member, Scientific Technical Committee, AYK Sustainable Salmon Initiative.
- 11/00 – pres. Chair, Editorial Board, Alaska Fishery Research Bulletin, Alaska Department of Fish and Game. (Also member of Editorial Board since 1/94)
- 8/95 - pres. U.S. Delegate, Fishery Science Committee (FIS), North Pacific Marine Science Organization (PICES)

### **Five Most Recent Publications Most Closely Related to Proposed Project**

National Research Council. 2003. Decline of the Steller sea lion in Alaskan waters: untangling food webs and fishing nets. National Academy Press, Washington, D.C. 204 p.

National Research Council. 2002. Effects of trawling and dredging on seafloor habitat. National Academy Press, Washington, D.C. 126 p.

*(Gordon H. Kruse, cont.)*

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 (editors). 2001. Spatial processes and management of marine populations. University of Alaska Sea Grant, Report AK-SG-01-02, Fairbanks. 720 p.

Zheng, J., and G.H. Kruse. 2000. Recruitment patterns of Alaskan crabs and relationships to decadal shifts in climate and physical oceanography. *ICES Journal of Marine Science* 57: 438-451.

Zheng, J., G.H. Kruse, and D.R. Ackley. 2001. Spatial distribution and recruitment patterns of snow crabs in the eastern Bering Sea. Pages 233-255 in G.H. Kruse, N. Bez, A. Booth, M.W. Dorn, S. Hills, R.N. Lipcius, D. Pelletier, C. Roy, S.J. Smith, and D. Witherell (editors). Spatial processes and management of marine populations. University of Alaska Sea Grant, Report AK-SG-01-02, Fairbanks.

### **Five Other Significant Publications**

Zheng, J., and G.H. Kruse. 2003. Stock-recruitment relationships for Alaskan crab stocks. *Fisheries Research* 63, in press.

Rosenkranz, G.E., A.V. Tyler, and G.H. Kruse. 2001. Effects of water temperature and wind on recruitment of Tanner crabs in Bristol Bay, Alaska. *Fishery Oceanography* 10:1-12.

Kruse, G.H., L.C. Byrne, F.C. Funk, S.C. Matulich, and J. Zheng. 2000. Analysis of minimum size limit for the red king crab fishery in Bristol Bay, Alaska. *North American Journal of Fisheries Management* 20: 307-319.

Kruse, G.H., and J. Zheng. 1999. Are changes in Bering Sea crab and groundfish populations related? Pages 143-148 in *Ecosystem approaches for fisheries management*. University of Alaska Sea Grant Report 99-01, Fairbanks.

Kruse, G.H. 1998. Salmon run failures in 1997-1998: A link to anomalous ocean conditions? *Alaska Fishery Research Bulletin* 5(1): 55-63.

### **Primary Collaborators in the Last Four Years**

Dr. Jeremy Collie, University of Rhode Island, School of Oceanography, Narragansett, RI.

Dr. James Ianelli, National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle, WA.

Dr. Scott Matulich, Washington State University, Department of Agricultural Economics, Pullman, WA.

Dr. David Musgrave, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Fairbanks, AK.

Dr. Terrance Quinn, II, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Juneau, AK.

Dr. Thomas Shirley, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Juneau, AK.

Dr. Albert Tyler, University of Alaska Fairbanks, School of Fisheries and Ocean Sciences, Fairbanks, AK.

Dr. Jie Zheng, Alaska Department of Fish and Game, Division of Commercial Fisheries, Juneau, AK.

## **THOMAS J. WEINGARTNER**

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### **Education**

Ph.D. Physical Oceanography, 1990, North Carolina State University

M.S. Physical Oceanography, 1980, University of Alaska

B.S. Biology, 1974, Cornell University

### **Memberships**

American Geophysical Union; American Meteorological Society, Oceanography Society

### **Public Service**

Member, Science and Technology Advisory Committee, Gulf Ecosystem Monitoring Program, 2002 - 2004

Member, GLOBEC Northeast Pacific Executive Committee, 2000 - 2003

Member, Science Steering Committee, NSF - Arctic System Science-Ocean Atmosphere Ice Interaction (OAI) Shelf-Basin Interaction Project (term expired 2/03).

Member, Science Steering Committee, NSF - ARCSS-OAI Shelf-Basin Interactions (1995 -2002)

Past Member, Science Steering Committee, NSF - ARCSS-Human Dimensions of the Arctic component

Past Member, UNOLS - Fleet Improvement Committee

Co-chair, Institute of Marine Science Ship Committee, 1993-present

### **Professional Experience**

Associate Professor; Institute of Marine Science, School of Fisheries and Ocean Sciences, U. of Alaska Fairbanks, Alaska; 7/99 - present

Assistant Professor; Institute of Marine Science, School of Fisheries and Ocean Sciences, U. of Alaska Fairbanks, Alaska; 11/93 - present

Research Associate; Institute of Marine Science, School of Fisheries and Ocean Sciences, U. of Alaska Fairbanks, Alaska; 9/91 - 10/93

Postdoctoral Student; Institute of Marine Science, School of Fisheries and Ocean Sciences, U. of Alaska Fairbanks, Alaska; 7/88 - 8/91

Graduate Research Assistant; Department of Marine, Earth and Atmospheric Sciences, North Carolina State U.; Raleigh, North Carolina; and Department of Marine Science, U. of South Florida; St. Petersburg, Florida; 8/84 - 10/88

### **Five Recent Publications**

Weingartner, T.J., S. Danielson, and T. C. Royer, Freshwater Variability and Predictability in the Alaska Coastal Current (submitted to Deep-Sea Research)

Okkonen, S., Weingartner, T.J., S. Danielson, D. L. Musgrave, and G. M. Schmidt, Satellite and hydrographic observations of eddy-induced shelf-slope exchange in the northwestern Gulf of Alaska *J. Geophys. Res.* 108: 15 –1, 15 –10, 2003.

(Thomas J. Weingartner, cont.)

Weingartner, T.J., K. Coyle, B. Finney, R. Hopcroft, T. Whitlege, R. Brodeur, M. Dagg, E. Farley, D. Haidvogel, L. Haldorson, A. Hermann, S. Hinckley, J. Napp, P. Stabeno, T. Kline C. Lee, E. Lessard, T. Royer, S. Strom, The Northeast Pacific GLOBEC Program: Coastal Gulf of Alaska, *Oceanography*, 15: 48 – 63, 2002.

Weingartner, T. J., S. Danielson, Y. Sasaki, V. Pavlov, and M. Kulakov. The Siberian Coastal Current: a wind and buoyancy-forced arctic coastal current. *J. Geophys. Res.*, 104: 29697 – 29713, 1999.

Weingartner, T. J., D. J. Cavalieri, K. Aagaard, and Y. Sasaki. Circulation, dense water formation and outflow on the northeast Chukchi Sea shelf. *J. Geophys. Res.* 103: 7647-7662, 1998.

### **Other Recent Publications**

Münchow, A., T. J. Weingartner, and L. Cooper. On the subinertial summer surface circulation of the East Siberian Sea. *J. Phys. Oceanogr.*, 29: 2167 – 2182, 1999.

Gawarkiewicz, G., T. Weingartner, and D. Chapman. 1998. Sea Ice Processes and Water Mass Modification and Transport over Arctic Shelves. pp. 171-190 in K. H. Brink and A. R. Robinson, (eds.), *The Sea: Ideas and Observations on Progress in the Study of the Seas*, Vol. 10.

Cooper, L.W., J. Grebmeier, T. Whitlege, and T. Weingartner, The nutrient, salinity, and stable oxygen isotope composition of Bering and Chukchi Seas waters in and near the Bering Strait. . *J. Geophys. Res.* 102, 12563 - 12578, 1997.

Roach, A. T., K. Aagaard, C.H. Pease, S.A. Salo, T. Weingartner, V. Pavlov, and M. Kulakov. Direct measurements of transport and water properties through Bering Strait. *J. Geophys. Res.*, 100, 18443-18458, 1995.

Moore, S.E., J. C. George, K. O. Coyle, and T. J. Weingartner, Bowhead whales along the Chukotka coast in autumn, *Arctic*, 48, 155-160, 1995.

### **Scientists with whom I have had a long-term association or collaborated with within the last 48 months:**

K. Aagaard (U. Washington),

E. Carmack (Institute of Ocean Sciences)

D. Chapman (Woods Hole)

K. Falkner (Oregon State U.)

G. Gawarkiewicz (Woods Hole)

A. Hermann (NOAA-PMEL)

R. Macdonald (Institute of Ocean Sciences)

A. Münchow (U. Delaware)

P. Stabeno (NOAA-PMEL)

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## **THEODORE COONEY**

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### **Professional experience**

During his 29-year career, Dr. Cooney taught in the SFOS graduate program of Marine Science and Limnology. His courses included Biological Oceanography, Marine Ecology, Plankton Ecology, and graduate seminars in related topics.

Dr. Cooney's research focused on the ecology of Alaskan coastal, shelf and oceanic zooplankton communities. The work explored patterns of seasonal and year-to-year distributions, the role of large zooplankton (principally the large calanoid copepods) in coastal food webs, and factors influencing the survival of juvenile pink and chum salmon in Prince William Sound. From 1975 to 1999, Dr. Cooney conducted collaborative research with representatives of Alaska Department of Fish and Game and with personnel from the Prince William Sound Aquaculture Corporation. These investigations described the carrying capacity of the region for both wild and hatchery-reared juvenile pink and chum salmon, the use of nursery areas during early marine residence, and forage resources sustaining the young fish in Prince William Sound. Dr. Cooney concluded his academic research career as the Lead Scientist for the EVOS Trustee Council sponsored Sound Ecosystem Assessment (SEA) program, 1994-1999.

### **Selected publications**

Cooney, R. T., J. R. Allen, M. A. Bishop, D. L. Eslinger, T. Kline, B. L. Norcross, C. P. McRoy, J. Milton, J. Olson, V. Patrick, A. J. Paul, D. Salmon, D. Scheel, G. L. Thomas, S. L. Vaughan, and T. M. Willette. 2001. Ecosystem controls of juvenile pink salmon (*Oncorhynchus gorbuscha*) and Pacific herring (*Clupea pallasii*) populations in Prince William Sound, Alaska. *Fish. Oceanogr.* 10(Suppl. 1):1-13.

T. M. Willette, R. T. Cooney, V. Patrick, D. M. Mason, G. L. Thomas, and D. Scheel. 2001. Ecological processes influencing mortality of juvenile pink salmon (*Oncorhynchus gorbuscha*) in Prince William Sound, Alaska. *Fish. Oceanogr.* 10(suppl. 1):14-41.

David L. Eslinger, R. Ted Cooney, C. Peter McRoy, Alison Ward, Thomas C. Kline, Jr., E. Paul Simpson, Jia Wang, and Jennifer R. Allen. 2001. Plankton dynamics: observed and modeled responses to physical conditions in Prince William Sound, Alaska. *Fish. Oceanogr.* 10(Suppl. 1):81-96.

R. T. Cooney, K. O. Coyle, E. Stockmar, and C. Stark. 2001. Seasonality in surface-layer net zooplankton communities in Prince William Sound, Alaska. *Fish. Oceanogr.* 10(Suppl. 1):97-109.

Robert T. Cooney and Richard D. Brodeur. 1998. Carrying capacity and north Pacific salmon production: stock enhancement implications. *Bull. Mar. Sci.* 62(2):443-464.

*R. Ted Cooney (cont.)*

**Collaborators**

Jennifer R. Allen; Prince William Sound Science Center, Cordova, Alaska.

M. A. Bishop; Copper River Delta Institute, Cordova, Alaska

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S. L. Vaughan; Prince William Sound Science Center, Cordova, Alaska

T. M. Willette, Alaska Department of Fish and Game, Cordova, Alaska

## **ALAN M. SPRINGER, Ph.D.**

Research Associate Professor  
Institute of Marine Science  
University of Alaska Fairbanks,  
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### **Education**

Ph.D. Biological Oceanography, 1988, University of Alaska Fairbanks  
M.Sc. Biology, 1974, University of Alaska Fairbanks  
B.A. Zoology, 1969, The Colorado College

### **Relevant Appointments**

2002-present - Scientific Steering Committee, Center for Global Change, University of Alaska Fairbanks  
2002-present - Affiliate Professor, International Arctic Research Center, University of Alaska Fairbanks  
1999-2002 - Core Review Panel, *Exxon Valdez* Oil Spill Trustee Council.  
1998-present - Advisor to World Wildlife Fund  
1998-present - Steller Eider Recovery Team  
1997-present - Steller Sea Lion Recovery Team  
1996-present - Spectacled Eider Recovery Team  
1996-present - Editorial Board, *Fisheries Oceanography*  
1994-1996 - Peer reviewer, Exxon Valdez Oil Spill Trustees Council.

### **Five relevant publications**

Springer, A.M., J.F. Piatt, V.P. Shuntov, G.B. Van Vliet, V.L. Vladimirov, A.E. Kuzin, and A.S. Perlov. 1999. Marine birds and mammals of the Pacific subarctic gyres. *Prog. Oceanogr.* 43: 443-487.

Springer, A.M. 1999. Summary, conclusions, and recommendations. In: T. Loughlin and T. Ohtani (eds.), *The Bering Sea ecosystem: physical, chemical, and biological dynamics*. University of Alaska Sea Grant, pp. 777-799.

Springer, A.M. 1998. Is it all climate change? Why marine bird and mammal populations fluctuate in the North Pacific. In: G. Holloway, P. Muller, and D. Henderson (eds.), *Biotic impacts of extratropical climate variability in the Pacific*. 'Aha Huliko'a Proceedings Hawaiian Winter Workshop, University of Hawaii, pp 109-119.

Springer, A.M. and S.G. Speckman. 1997. A forage fish is what? Summary of the symposium. In: *Forage fishes in marine ecosystems*. University of Alaska Sea Grant Report 97-01, pp. 773-806.

Springer, A.M., C.P. McRoy, and M.L. Flint. 1996. The Bering Sea Green Belt: shelf edge processes and ecosystem production. *Fish. Oceanogr.* 5: 205-223.

### **Five additional publications**

Springer, A.M., J.F. Piatt, and G.B. Van Vliet. 1996. Seabirds as proxies of marine habitats and food webs in the western Aleutian Arc. *Fish. Oceanogr.* 5: 45-55.

(Alan M. Springer, cont.)

Springer, A.M. and C.P. McRoy. 1993. The paradox of pelagic food webs in the northern Bering Sea: III. Patterns of primary production. *Cont. Shelf Res.* 13: 575-599.

Springer, A.M., A. Yu. Kondratyev, H. Ogi, Yu. Shibaev and G.B. Van Vliet. 1993. Status, ecology, and conservation of *Synthliboramphus* murrelets and auklets. pp. 187-201 In: K. Vermeer, K.T. Briggs, K.H. Morgan, and D. Siegel-Causey (eds.), *The Status, Ecology, and Conservation of Marine Birds of the North Pacific*, Canadian Wildlife Service Special Publication, Ottawa.

Springer, A.M. 1992. A review: Walleye pollock in the N. Pacific: how much difference do they really make? *Fish. Oceanogr.* 1 (1): 80-96.

Springer, A.M. 1991. Seabird relations to marine food webs and the physical environment: examples from the North Pacific. pp. 39-48 In W.A. Montevecchi and A.J. Gaston (eds.), *Studies of high-latitude seabirds 1: behavioral, energetic and oceanographic aspects of seabird feeding ecology*. Occasional Paper No. 68, Canadian Wildlife Service.

### Collaborators

|                   |  |
|-------------------|--|
| J. Allen          | Alaska Digital Graphics                  |
| K. Bailey         | National Marine Fisheries Service        |
| S. Budge          | Dalhousie University                     |
| V. Byrd           | U.S. Fish and Wildlife Service           |
| T. Cooney         | University of Alaska Fairbanks, Emeritus |
| E. Danner         | University of California Santa Cruz      |
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| J. Estes          | U.S. Geological Survey                   |
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| J. Rice           | National Marine Fisheries Service        |
| G. Sheffield      | Alaska Department of Fish and Game       |
| S. Speckman       | University of Washington                 |
| B. Spies          | Applied Marine Sciences                  |
| A. Trites         | University of British Columbia           |
| G. van Vliet      | Auke Bay, AK                             |
| T. Weingartner    | University of Alaska Fairbanks           |
| T. Williams       | University of California Santa Cruz      |



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### **Education**

B.A., Chico State College, 1966, in Biological Science

California State Teaching Credential, Chico State College, 1967

M.A., Chico State College, 1968, in Biological Science

Thesis title: An electrophoretic study on the ancestry of Eagle Lake Trout.

Ph.D., Kent State University, 1971, in Comparative Physiology

### **Professional experience**

Program Manager - Habitat Investigations, 1986-present

Program Manager - *Exxon Valdez* Oil Spill invest., 1989-present

Principle Investigator, Auke Bay Lab, 1971 present

### **Most recent relevant publications**

Barron, M.G., M.G. Carls, J.W. Short, and S.D. Rice. 2003. Photoenhanced toxicity of aqueous phase and chemically dispersed weathered Alaska North Slope crude oil to Pacific herring eggs and larvae. *Environ. Toxicol. Chem.* 22(3): 650-660.

Carls, M.G., R.E. Thomas, M.R. Lilly, and S.D. Rice. 2003. Mechanism for transport of oil-contaminated groundwater into pink salmon redds. *Mar. Ecol. Prog. Ser.* 248: 245-255.

Short, Jeffrey W., Margo R. Lindeberg, Patricia M. Harris, Jacek Maselko, and Stanley D. Rice. 2002. Vertical oil distribution within the intertidal zone 12 years after the *Exxon Valdez* oil spill in Prince William Sound, Alaska. Pp. 57-72 In: *Proceedings of the Twenty-fifth Arctic and Marine Oilspill Program (AMOP) Technical Seminar*. Environment Canada, Ottawa, Ontario.

Stanley D. Rice, Jeff W. Short, Ron A. Heintz, Adam Moles, Robert E. Thomas. 2001. Oil and gas issues in Alaska: lessons learned about long-term toxicity following the *Exxon Valdez* oil spill. Pp. 91-97 In: *Exploring the Future of Offshore Oil and Gas Development in BC: Lessons from the Atlantic*. Continuing Studies in Science at Simon Fraser University, Burnaby, British Columbia.

(Stanley M. Rice, cont.)

Carls, M.G., Babcock, M.M. P.M. Harris, G.V. Irvine, J.A. Cusick, and S.D. Rice. 2001. Persistence of Oiling in Mussel Beds after the *Exxon Valdez* Oil Spill. *Mar. Environ. Res.* 51:167-190

### **Other relevant publications**

Rice, Stanley D. , Robert E. Thomas, Ronald A. Heintz, Alex C. Wertheimer, Michael L. Murphy, Mark G. Carls, Jeffrey W. Short, and Adam Moles. 2001. Impacts to pink salmon following the *Exxon Valdez* oil spill: persistence, toxicity, sensitivity, and controversy. *Reviews in Fishery Science* 9 (3): 165-211.

Carls, M. G., J. E. Hose, R. E. Thomas, and S.D. Rice. 2000. Exposure of Pacific herring to weathered crude oil: assessing effects on ova. *Environ.Toxicol. Chem.* 19:1649-1659.

Heintz, R.A., S.D. Rice, A.C. Wertheimer, R.F. Bradshaw, F.P. Thrower, J.E. Joyce, and J.W. Short. 2000. Delayed effects on growth and marine survival of pink salmon *Oncorhynchus gorbuscha* after exposure to crude oil during embryonic development. *Mar. Ecol. Prog. Ser.* 208: 205-216.

Rice, Stanley D., Jeffrey W. Short, Ron A. Heintz, Mark G. Carls, and Adam Moles. 2000. Life history consequences of oil pollution in fish natal habitat. Pp. 1210-1215 In: Peter Catania (ed.), *Energy 2000: The Beginning of a New Millennium*. Technomic Publishing

### **List of Collaborators in the last 4 years**

|                  |  |
|------------------|--|
| Malin Babcock    | Auke Bay Lab                             |
| Mace Barron      | private consultant                       |
| Mark Carls       | Auke Bay Lab                             |
| Pat Harris       | Auke Bay Lab                             |
| Ron Heintz       | Auke Bay Lab                             |
| Mandy Lindeberg  | Auke Bay Lab                             |
| Gary Marty       | Univ. Calif, Davis                       |
| Jacek Maselko    | Auke Bay Lab                             |
| Adam Moles       | Auke Bay Lab                             |
| Mike Murphy      | Auke Bay Lab                             |
| Charles Peterson | Univ of North Carolina at Moorehead City |
| Jeff Short       | Auke Bay Lab                             |
| Robert Thomas    | Calif State Univ., at Chico              |

## **JENNIFER R. ALLEN**

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### **Education**

- 1983 B.V.Sc. (Hons I), University of Sydney, Australia  
*[equivalent to the degree of DVM. in the Unites States]*
- 1985 Residency in Large Animal Medicine & Surgery, Washington State University
- 1990-93 Graduate coursework in statistics and advanced digital imaging techniques, WSU.

### **Employment**

- 1999-present President, Alaska Digital Graphics, Anchorage AK
- 1994-1999 Technical Project Manager for Information Systems and Communications, Sound Ecosystem Assessment (SEA) Program, Prince William Sound Science Center, Cordova AK
- 1989-93 Research Associate, Program in Statistics, Washington State University
- 1985-89 Research Associate, College of Veterinary Medicine, Washington State University

### **Specialty**

Application of advanced imaging techniques to scientific communication; translation of science concepts for multiple audiences; bringing ecosystem science to the public through visual media.

### **Expertise**

- DOS/Win, Unix, FORTRAN, Pascal, HTML, Java, CGI, PERL, AVS, Director, Premiere.
- Digital imaging, 2 and 3-D animations, computer simulations.
- Scientific illustration, video editing, multimedia production.
- Editing and scientific writing.

### **Selected Publications/presentations Related to this Proposal**

Cooney, R.T, Allen, J.R., Bishop, M.A., et al. (2001) Ecosystem controls of juvenile pink salmon (*Onchorynchus gorbuscha*) and Pacific herring (*Clupea pallasii*) populations in Prince William Sound, Alaska: A Sound Ecosystem Assessment synopsis. Fisheries Oceanography Vol. 10 Suppl. 1 pp.1-13.

Wang, J., Jin, M., Patrick, E.V., Allen, J.R., et al. (2001) Numerical simulations of the seasonal circulation patterns and thermohaline structures of Prince William Sound, Alaska. Fisheries Oceanography Vol. 10 Suppl. 1. pp. 132-148

Eslinger, D.L., Cooney, R.T., McRoy, C.P., et al. (2001) Plankton dynamics: Observed and modeled responses to physical conditions in Prince William Sound, Alaska. Fisheries Oceanography Vol. 10 Suppl. 1. pp. 81-96.

*Jennifer R. Allen (cont.)*

Cooney, R.T. and Allen, J.R. (1999) Sound Ecosystem Assessment: An interactive multimedia presentation. Presented at EVOS 10 Year Anniversary Symposium, Anchorage AK, March 1999.

Allen, J.R. and Patrick E.V. (1997) The SEA Intranet: Story of a long-distance science collaboration. Proceedings 48<sup>th</sup> AAAS Arctic Division Science Conference, Valdez Alaska, September, 1997.

### **Other Selected Publications**

Cooney, R.T., Willette, T.M. and Allen J.R. (2003) Dancing with Mother Nature. Searching for Mechanism in the Juvenile Pink Salmon Ecosystem. A 30-year retrospective on ecosystem research in Prince William Sound. Presented at EVOS-GEM Annual Workshop, Anchorage January, 2003.

Allen, J.R. (2002) Steller Sea Lion Decline. An interactive multimedia exhibit on permanent display, Alaska SeaLife Center, Seward AK.

Allen, J.R. (2002) Sustaining Alaska's Salmon: Alaska's Sustainable Fisheries Policy. Large format poster for public communication, commissioned by the Alaska Department of Fish and Game, Feb 2002.

Patrick, E.V., Mason, D., Kulkarni, R. and Allen, J.R. (1996) The SEA evolution equation model for pink salmon fry: Results and visualization of the subecosystem of northwest Prince William Sound. Proceedings AGU 1996 Spring Meeting, San Diego, February 1996

Allen, J.R., Kulkarni, R. and Patrick, E.V. (1995) Visualizing data and processes for a marine ecosystem. Presented at the 46th Arctic Division Science Conference, American Association for the Advancement of Science, Fairbanks, AK, September 1995.

### **Collaborators Within past 4 Years**

|                    |   |
|--------------------|---|
| Cooney, R.T.       | University of Alaska Fairbanks (emeritus)     |
| Funk, F.           | Alaska Department of Fish and Game            |
| Haddow, A.         | Alaska SeaLife Center                         |
| Kruse, G.          | University of Alaska Fairbanks                |
| Mecum, D.          | Alaska Department of Fish and Game            |
| Pfeiffenberger, J. | Alaska SeaLife Center / ADNR Div. State Parks |
| Rice, S.           | NMFS Auke Bay                                 |
| Spies, R.B.        | Applied Marine Sciences                       |
| Springer, A.       | University of Alaska Fairbanks                |
| Wang, J.           | International Arctic Research Center          |
| Weingartner, T.    | University of Alaska Fairbanks                |
| Willette, T.M.     | Alaska Department of Fish and Game            |