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Oregon

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Executive Director

Northwest Power and Conservation Council

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VICE-CHAIR
Washington

Frank L. Cassidy Jr.
"Larry"
Washington

Ed Bartlett
Montana

John Hines
Montana

December 2, 2003

DECISION MEMORANDUM

To: **Council Members**
From: **Erik Merrill and Steve Waste**
Subject: **ISRP and ISAB Appointments**

Proposed Actions

Council staff requests Council actions and discussion pertaining to Independent Scientific Review Panel (ISRP) and Independent Scientific Advisory Board (ISAB) member terms and appointments.

Staff asks that the Council:
1) Appoint Dr. John Epifanio, Illinois Natural History Survey, as a member of the ISRP.
2) Approve extension of term limits for the current ISRP members through May 2005.
3) Initiate the process to rebuild the pool of potential ISRP and ISAB members for future appointments by reconvening the National Research Council nomination committee, and, with NOAA Fisheries and the Columbia River Indian Tribes, jointly sending a letter to the region requesting nominations for consideration by the NRC nomination committee.
4) Discuss ISAB member renewals and the appointment process for new ISAB members.

The ISRP and ISAB have different responsibilities in the Council's Fish and Wildlife Program, and the Council plays distinct roles in the administration of each group. To avoid confusion between the groups, this memo addresses decisions and background information related to each group separately, first the ISRP and then the ISAB.

Independent Scientific Review Panel

Background

The Independent Scientific Review Panel (ISRP) consists of eleven members assisted by a number of Peer Review Group (PRG) members. The ISRP was created by amendment to the Northwest Power Act in 1996. The Council was charged to create the ISRP to provide scientific review of projects funded by Bonneville under the Council's program. Congressional report language subsequently expanded the role of the Panel to include scientific review of projects

sponsored by the Corps and other federal agencies that are funded by Bonneville through reimbursement. The ISRP and the Council's review process have served to appreciably increase the level of scientific rigor in Bonneville projects and hopefully have increased the effectiveness of projects to meet the Council's vision. The primary tasks for the ISRP in 2004 are to review subbasin plans and to complete the review of the US Army Corps of Engineers' Anadromous Fish Evaluation Program that was initiated in 2003.

The Council appoints the eleven members of the ISRP. The amended Power Act language directs that the Council appoint members based on recommendations from the National Research Council. The language also provides for the panel to be assisted by Peer Review Groups. These groups provide specific expertise to the review process and augment the capabilities of the ISRP. While not members of the ISRP, the peer review groups are active and essential contributors to the review process.

The appointment process that has developed over the several years of operation of the ISRP is as follows: the Council, in cooperation with the ISAB Oversight Panel, invites the region to submit nominations to the ISRP and the ISAB. The National Research Council appoints a small group of senior scientists to review resumes and to develop a list of nominees to be appointed to the ISRP and the ISAB. The nomination committee consists of Dr. Kai Lee of Williams College in Massachusetts (ex-Council member), Dr. John Magnuson of the University of Wisconsin, and Dr. Lyle Calvin, emeritus professor at Oregon State University. David Policansky of the National Research Council assists the nomination committee. Based on the list of recommendations, the Council appoints members to the ISRP.

The National Research Council nomination committee last met on March 29, 2001 to review resumes and designate a pool of nominees for both the ISRP and the ISAB. The pool was intended to be comprehensive enough in terms of size and expertise to cover several rounds of appointments over several years. The nomination committee nominated thirteen scientists for the ISAB and ten for the ISRP. All the nominees are highly qualified. Staff has interviewed and reviewed the resumes of the nominees. Of the thirteen scientists nominated for the ISAB only two are currently available and do not have conflicts of interest. Of the ten nominated to the ISRP only one is available and does not have a conflict of interest. The nomination committee's report is appended to this decision memorandum (Attachment 2, page 9).

Recommended Action

Action 1: Appoint member to the ISRP. At present, the ISRP has one opening due to a member's resignation. Dr. Robert Bilby was appointed to the ISRP in June 2001 and shortly after was appointed to the ISAB in October 2001. He did not feel able to provide time to both groups and chose to serve on the ISAB. Consequently, the ISRP has operated with ten members since 2001, but this has not impacted the ability of the ISRP to complete tasks as the ISRP makes extensive use of Peer Review Group members.

To fill the current opening, staff recommends that Dr. John Epifanio be appointed to the ISRP. He is the Director and Associate Professional Scientist for the Center for Aquatic Ecology at the Illinois Natural History Survey. His primary expertise is in conservation genetics and molecular

ecology with focus on the examination of structure and function of genetic variation for aquatic resource management, conservation, and rehabilitation. He has worked extensively with species that are of great interest in the Columbia River Basin including chinook salmon and several species of resident trout. Of particular note, he has worked on the analyses of aquatic wildlife policies for state and federal agencies and the US Senate. His experience communicating scientific findings to policy makers should be very valuable to the ISRP and the Council.

He is the only NRC committee nominee for the ISRP that is currently available and does not have a conflict of interest. The Council could wait for the next round of NRC committee nominations to pick from a larger pool. However, the NRC committee will not likely be able to provide a pool of nominees until late Spring 2004. Dr. Epifanio has been on the short list of nominees before and is a highly regarded scientist that would immediately contribute to the ISRP. Dr. Epifanio's curriculum vitae (resume) is attached below (Attachment 4, page 15).

Action 2. Approve term extensions for current ISRP members. Nine of the current ten ISRP members do not have formally stated term limits. Staff recommends that official terms be established. The 1996 Amendment to the Power Act included a sunset clause for the year 2000 but did not include language on terms; consequently, ISRP member terms were renewed on an annual basis through contracting. Congress removed the sunset clause in 1999, and the Council's 2000 Fish and Wildlife Program established that ISRP members are eligible for two three-year terms. Term limits of members are to be staggered to ensure continuity of effort.

By the time the 2000 Fish and Wildlife Program was adopted in November 2000, seven of the original ISRP members, who began ISRP work in January 1997, had served for almost four years. At present, they have almost completed their seventh year of ISRP service -- one more year than the six years of two complete three-year terms. These seven original members are Drs. Charles Coutant, Susan Hanna, Nancy Huntly, Daniel Goodman, Lyman McDonald, Brian Riddell, and Richard Williams.

In January 1999, Drs. Dennis Lettenmaier, William Smoker and Richard Whitney replaced three original ISRP members Drs. Peter Bisson, Robert Francis, Jack Stanford, who each resigned due to workload considerations. Drs. Smoker and Whitney continue to serve on the ISRP and have almost completed their fifth year of ISRP service. Official term limits have not been established for these two members or the original seven members.

In 2001, Mr. Lichatowich (an original member) and Dr. Lettenmaier resigned from the ISRP to dedicate more time to the ISAB. They were replaced by Drs. William Liss and Robert Bilby. Dr. Liss continues to serve on the ISRP. His first term will expire in June 2004.

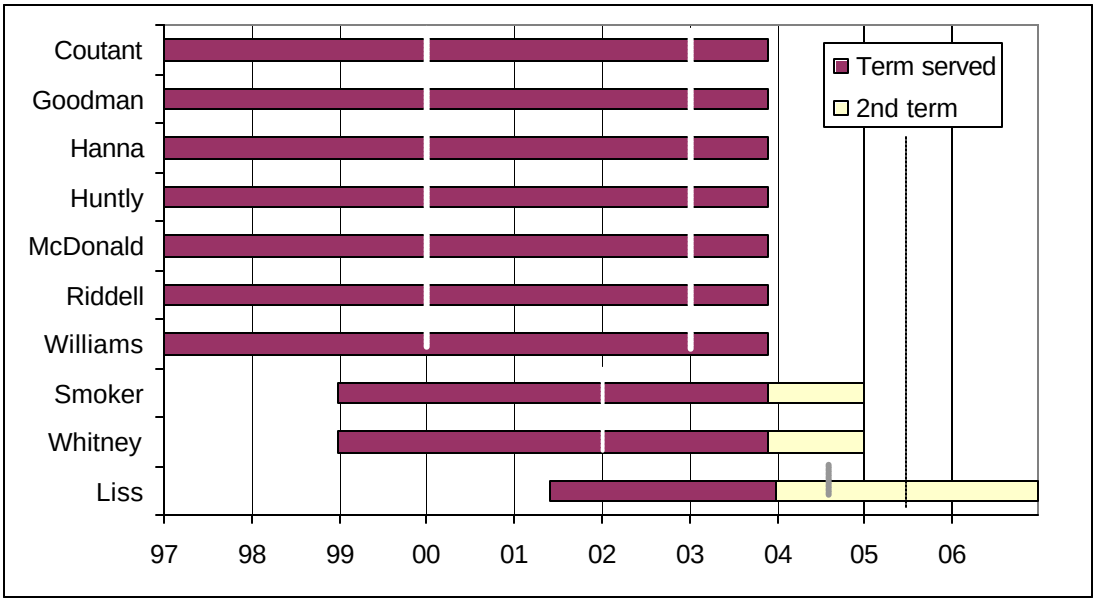
The current ISRP membership status is illustrated in the figure 1 below and brief descriptions of the ISRP members are provided in Attachment 1, page 8.

Council staff recommends that the current set of ongoing ISRP members' terms be established and extended through May 2005. Extending the terms through May 2005 translates to eight-and-a-half years of service on the ISRP for the original seven members, and six-and-a-half years of service for two of the members. Another member would also be in his first year of a potential

second term. Although the extensions would establish member terms that are longer than the two three-year terms stated in the 2000 Fish and Wildlife Program, the extended terms would ensure a continuity of effort through the Council's subbasin planning process. The current members' experience with the Provincial Review and earlier project selection processes will be of great benefit throughout the subbasin planning review process. A significant transition of ISRP membership before the subbasin planning review could be disruptive. In addition, the ISRP has experienced sufficient transition of members (five) and input from Peer Review Group members (30) to ensure that fresh ideas are regularly infused in the ISRP review process.

Well before May 2005, the Council in consultation with the NRC nomination committee and ISRP members should establish a staggered replacement schedule for the long-standing ISRP members. Replacement for a subset of members should begin shortly after May 2005. Staff expects that at least one ISRP member will resign and be replaced when additional nominees are provided by the NRC committee in Spring 2003.

Figure 1. Current ISRP member term status



Action 3. Rebuild the pool of potential ISRP and ISAB membe rs. This action pertains to the ISRP and the ISAB. As described above, the current pool of potential ISRP and ISAB members is no longer robust enough to provide choices in the appointment of members. Staff recommends that the Council initiate the process to rebuild the pool of potential ISRP and ISAB members for future appointments by: 1) reconvening the National Research Council nomination committee, and 2) with NOAA Fisheries and the Columbia River Indian Tribes, jointly sending a letter to the region requesting nominations for considerations by the nomination committee. A draft letter to the region is attached to this decision memo (see Attachment 3, page 11).

Future Actions: The pool of potential peer review group members needs to be periodically augmented. Depending on the needs for subbasin planning, staff may request appointment of several new Peer River Group members at the January 2004 Council meeting. The National

Research Council has indicated that they feel that they do not need to be involved in the appointment of the Peer Review Group members and that the Council should do this based on their own review. Currently, the Peer Review Group pool consists of over 100 potential reviewers that were appointed by the Council. Peer Review Group reviewers are contracted to serve a limited time and provide specific reviews when called on by the ISRP. Reviewers are selected based on expertise needed for the review at issue, past review of the projects submitted, lack of conflicts of interest, and availability. Over the seven-year operation of the ISRP, about 30 Peer Review Group members have contributed as reviewers. Many members of the current Peer Review Group pool have time commitments or conflict of interest issues that prevent them from participating in ISRP reviews.

Independent Scientific Advisory Board

Proposed Action

Council staff requests that the Council discuss several issues pertaining to ISAB member terms and appointments to guide the Council Chair in her deliberations with the ISAB's Scientific Oversight Panel. The ISAB is governed by a Scientific Oversight Panel that consists of the Council Chair, the NOAA Regional Administrator (D. Robert Lohn), and a representative from the Columbia River Basin Indian Tribes, currently the Executive Director of the Columbia River Inter-Tribal Fish Commission (Olney Patt, Jr.). The Oversight Panel appoints ISAB members by majority vote. The ISAB has several membership decisions that are pending. These include: 1) appointment of two members to fill vacancies, 2) renewal of second terms for two members, and 3) extensions of second terms for four members. In the past, the Council Chair has received advice from the rest of the Council on appointments following discussion of the nominees and the process. That is the purpose of this section of the memo.

Background

Unlike the ISRP that is solely under the Council's purview, the Independent Scientific Advisory Board (ISAB) is jointly sponsored by the Council, NOAA Fisheries, and the Columbia River Basin Indian Tribes. The ISAB provides general scientific advice on recovery efforts whereas the ISRP provides scientific review of specific project proposals. Primary review responsibilities of the ISAB in Fiscal Year 2004 include reviewing NOAA Fisheries' Technical Recovery Team products for the Columbia River Basin, reviewing the scientific underpinning of harvest management for Columbia River Basin salmon stocks, and assisting the ISRP in the review of subbasin plans.

The ISAB operates under a Terms of Reference developed and agreed to by the Council, NOAA Fisheries, and the Columbia Basin Inter-Tribal Fish Commission. These Terms of Reference describe the ISAB appointments process. The ISAB process follows the same first two steps of the ISRP appointments process: 1) invitation of nominations from the region, and 2) selection of a pool of ISRP and ISAB nominees by a NRC nomination committee. Council action for these two steps is requested under ISRP Action 3 above. The third step, the appointment procedure, varies for the ISAB and ISRP. While ISRP appointments are solely the responsibility of the

Council, appointments and re-appointments to the ISAB require majority vote of the ISAB Oversight Panel.

ISAB appointment issues will require further discussions with NOAA Fisheries and the Columbia Basin Indian Tribes; thus, the ISAB appointments process should take place over the next several months.

Issue 1: Appointment of two ISAB members. The ISAB has two open positions due to the resignation of Drs. Robert Gramling and Daniel Schindler. From the NRC nomination committee's pool of thirteen, two nominees are available and interested in serving on the ISAB, Drs. Nancy Huntly and Ramson Myers.

Dr. Huntly is a professor of wildlife biology at Idaho State University. She has been an outstanding member of the ISRP since its inception. Her knowledge of ecology, statistics, and experimental design has proved invaluable in the review of both fish and wildlife proposals. One of her greatest strengths has been to provide frank and constructive comments to project sponsors (and other ISRP members) to improve the scientific soundness of fish and wildlife program projects. She has extensive knowledge of the Fish and Wildlife Program and basin issues. She would immediately contribute to ISAB deliberations. As other long-standing ISAB members move off the ISAB, she would provide institutional continuity. She has time and interest to work on both the ISAB and ISRP. A description of Dr. Huntly's research work and publications is attached below (see Attachment 5, page 28).

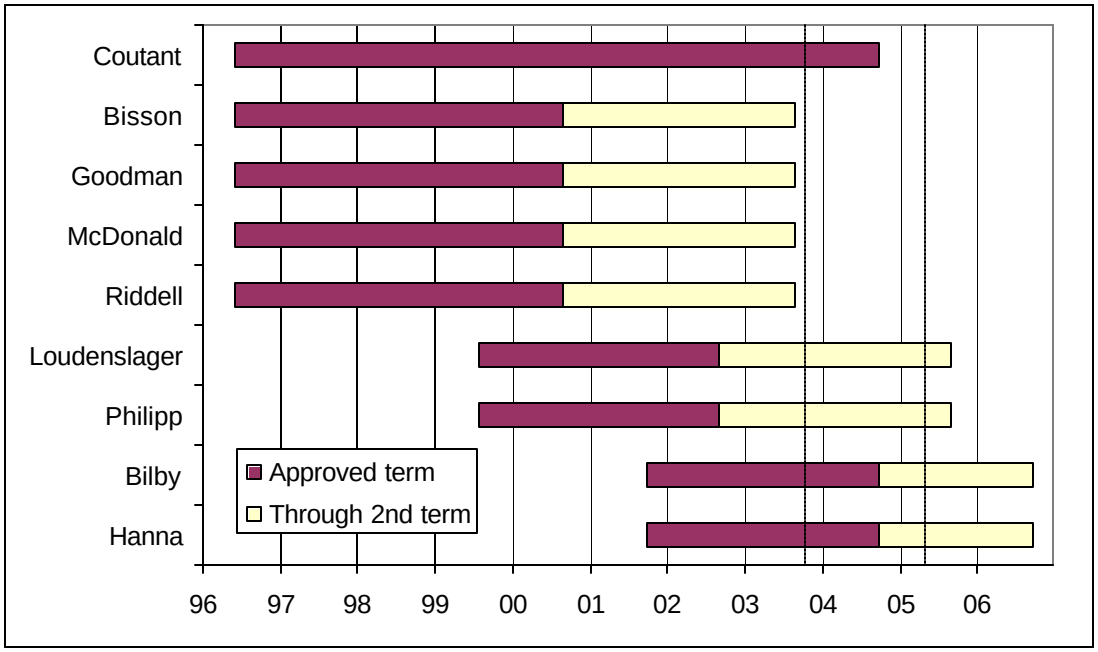
Dr. Myers is the Killam Chair in Ocean Studies at, Dalhousie University, Halifax, Nova Scotia, Canada. He has expertise in worldwide ocean fish stock status and the use of analytical tools (mathematical models) in resource management. He has recently published several highly visible articles with international importance in the periodicals Science and Nature. His curriculum vitae is attached below (Attachment 6, page 30). He is currently a member of NOAA Fisheries' Recovery Science Recovery Panel that was established to review the principles and products of the NOAA Fisheries' recovery planning process. Council staff thinks that having an overlap of Recovery Science Review Panel and ISAB membership would be beneficial to both groups. His ISAB participation would be limited; e.g., he would be able travel to approximately half of the ISAB meetings. Further discussion on his potential appointment is necessary not only amongst the Council and the ISAB Oversight Panel, but amongst the ISAB members and ex officios. (The ISAB ex officios are senior scientists from the Council, NOAA Fisheries, and Columbia River Inter-Tribal Fish Commission who work as scientific liaisons between their respective entities and the ISAB.)

Issue 2: ISAB member term renewals. ISAB members Drs. Eric Loudenslager and David Philipp's terms need to be officially renewed by the ISAB Oversight Board. Their first three-year terms expired in September 2002. Council staff recommends that their second three-year terms be approved through September 2005. Both members have actively participated in ISAB reviews, and Dr. Loudenslager served as an effective chair moving recent ISAB projects to completion in an efficient manner.

Issue 3: ISAB member term extensions. Four original ISAB members, Drs. Pete Bisson, Daniel Goodman, Lyman McDonald, and Brian Riddell completed their first ISAB term in September 2000. The NRC nomination committee and the ISAB ex officios agreed that these four members should be re-appointed to a second term. The Council Chair and Regional Administrator of NOAA Fisheries, however, did not formally renew the four members' terms. September 2003 would have been the official termination date for their second and final terms.

Council staff recommends that their terms be formally renewed and extended through May 2005. This would add over a year-and-half beyond the second three-year term specified in the ISAB Terms of Reference. From an operations perspective the ISAB currently needs the continuity and consistency provided by the original members. In 2002, the original ISAB ex officios from the Council, Dr. Chip McConnaha, and NOAA Fisheries, Dr. Mike Schiewe, left their long-time positions to become consultants. This was a significant loss of institutional and operational history on the ISAB. In addition, the ISAB original membership included several members whose service on Columbia River Basin independent science groups dated back to the earlier 1990s, most of these members resigned or terms expired. The ISAB membership now includes five original members, four of which need term extensions. These members possess a grasp of the scientific, historical, and institutional issues facing the Columbia River Basin that will be extremely valuable through the Council's subbasin plan adoption process and NOAA Fisheries' Technical Recovery Team recovery planning efforts.

Figure 2. Current ISAB member term status



Past Nine ISAB members: Robert Gramling, Dennis Lettenmaier, Jim Lichatowich, William Liss, Phillip Mundy, Daniel Schindler, Jack Stanford, Richard Whitney, and Richard Williams.

Attachment 1. List of Current ISRP and ISAB Members

Joint ISRP and ISAB Members

Charles C. Coutant, Ph.D., senior resource ecologist, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Daniel Goodman, Ph.D., an expert in ecological risk assessment at Montana State University in Bozeman.

Susan Hanna, Ph.D., professor of agriculture and resource economics at Oregon State University (also an IEAB member).

Lyman McDonald, Ph.D., consulting statistician at Western Ecosystems Tech., Inc., Cheyenne, Wyoming, formerly a professor at the University of Wyoming.

Brian Riddell, Ph.D., an expert in international fisheries management at the Department of Fisheries and Oceans Canada, Nanaimo, British Columbia.

ISRP Members

Nancy Huntly, Ph.D., professor of wildlife biology at Idaho State University.

William Liss, **Ph.D.,** professor of fisheries at Oregon State University.

William Smoker, Ph.D., professor of fisheries, aquaculture technology and genetics, at the University of Alaska Fairbanks, Juneau Center for Fisheries and Ocean Sciences.

Richard R. Whitney, Ph.D., consulting fisheries scientist, Wenatchee, Washington, formerly a professor in the School of Fisheries, University of Washington.

Richard Williams, Ph.D., ISRP Chair, population and evolutionary genetics, ecology. Graduate Affiliate Faculty, Aquaculture Research Institute, University of Idaho.

ISAB Members

Robert Bilby, Ph.D., an expert in riparian ecology at Weyerhaeuser Corporation.

Peter A. Bisson, Ph.D., a specialist on habitat issues at the Olympia (Washington) Forestry Sciences Laboratory of the U.S. Forest Service.

Eric J. Loudenslager, Ph.D., an expert in genetics and fish culture, and a hatchery manager at Humboldt State University, California.

David P. Philipp, Ph.D., an expert in conservation genetics and reproductive ecology at the Illinois Natural History Survey, University of Illinois.

Attachment 2. NRC Memo on Nominations of Candidates for the ISAB and ISRP

Northwest Power Planning Council
National Marine Fisheries Service

Independent Science Advisory Board
Nominations Committee

April 3, 2001

To: National Marine Fisheries Service Northwest Region and Northwest Power Planning Council

From: Nominations Committee for ISAB

Subject: Nomination of candidates for ISAB and ISRP

The nominations committee met through a telephone conference on March 29, 2001 with NRC, NWPPC, and NMFS staff to consider nominations for the ISAB and ISRP because the two groups are so closely connected. We were asked to nominate about 20 persons and indicate whether they would be most helpful to the ISAB, the ISRP, or both. Our recommendations reflect the deliberations of the March 29 conference call. The committee had vitae from all the persons that were considered. Overall, the NRC committee considered the entire set of nominees submitted for consideration to be of high quality and an improvement from past groups of possible nominees.

Topical areas of interest were indicated from the ISAB to be freshwater ecology with an emphasis on large systems and processes, estuarine ecology, and mathematical ecology or modeling. Topical areas of interest were indicated from the ISRP to be in descending order of need as fisheries, stream ecology, mainstream passage, artificial production, and estuarine and ocean ecology. In addition the nomination committee continued to stress the importance of the social sciences, diversity in membership, large system drivers, engineering, and statistics.

The NRC committee agreed that the three ISAB members currently up for term renewal (Chuck Coutant, Jim Lichatowich, and William Liss) and the four members up for re-appointment in September 2001 (Pete Bisson Dan Goodman, Lyman McDonald, Brian Riddell) should all be eligible for renewal. They have demonstrated the ability to make important contributions to the board in terms of expertise, effort, and experience.

However, the committee agreed that a certain amount of turnover is necessary to foster vitality and innovative thinking on the board. To maintain institutional knowledge and consistency while encouraging fresh thinking, the committee agreed that the Council and NMFS should develop a strategy of staggered term limits for members, adherence to two three-year terms, opportunities for reappointment after one to three year absences from the board (preferably three year), and a regular influx of new members. The Nominations Committee also recommends that a procedure also be developed for turnover of the Nominations committee for the ISAB.

The committee also agreed that the current vacancy on the ISAB should be filled. For the current vacancy and potential vacancies if current member's terms are not renewed, the committee recommended these people as worthy of appointment, to be chosen by NWPPC and NMFS based on availability and committee need.

We recommend the following list of people from which you could select new members of ISAB.

Robert Bilby, Weyerhaeuser
Nancy Grimm, Arizona State University
Susan Hanna, Oregon State University
Nancy Huntly, Idaho State University
Daniel Huppert, University of Washington
Ray Hilborn, University of Washington
James Kitchell, University of Wisconsin
Judith L. Meyer, University of Georgia, Institute of Ecology
Ransom Myers, Dalhousie University, Nova Scotia
Kathy Pringle, University of Georgia, Institute of Ecology
Thomas Quinn, University of Washington
Daniel Schindler, University of Washington
Charles Simenstad, University of Washington

We recommend the following list of people from which you could select new members of ISRP.

Bob Beschta, Oregon State University
Robert Bilby, Weyerhaeuser
Glen Cada, Oak Ridge National Laboratories
John Epifanio, US Forest Service
Nancy Grimm, Arizona State University
Judith L. Meyer, University of Georgia, Institute of Ecology
Kathy Pringle, University of Georgia, Institute of Ecology
Thomas Quinn, University of Washington
Daniel Schindler, University of Washington
Charles Simenstad, University of Washington

Individual vitae were discussed. Key points were:

1. Stream ecologists that would be helpful are J.L. Meyers, Grimm, and Pringle.
2. Huntly would be a useful addition to the ISAB but is presently on the ISRP and care should be taken not to overload individuals.
3. Hanna would be a useful addition to the ISAB.
4. Bilby had many skills of use to the groups and has similar background to Bisson.
5. Cada would be useful in the engineering area.
6. Epifanio would be helpful in the area of genetics.
7. Hilborn and Kitchell would be useful for modeling.
8. Quinn would bring knowledge of the biology and straying.
9. Schindler is a fish and fisheries ecologists with a strong limnological background and would be useful immediately for the ISRP.
10. Simenstad would bring broad knowledge and experience in the estuarine and wetland habitats.

Nominations Committee
Lyle Calvin, Kai Lee, John Magnuson *Chair*
David Policansky *Committee Staff*

Attachment 3. Draft Letter to Region Requesting Nominees for ISRP and ISAB

NORTHWEST POWER AND CONSERVATION COUNCIL
851 SW 6th Avenue, Suite 1100, Portland, OR 97204

NOAA FISHERIES
7600 Sandpoint Way NE, Seattle, WA 98115

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION
729 NE Oregon St., Ste. 200, Portland, Oregon 97232

December 2003

Dear Northwest Citizen:

The Northwest Power and Conservation Council and NOAA Fisheries invites nominations to establish a pool of candidates who are qualified and interested in potential appointment to the Independent Scientific Advisory Board (ISAB) and/or the Independent Scientific Review Panel (ISRP).

All nominations will be screened by an ad hoc panel to be established by the National Research Council. The selection panel will evaluate the credentials of the nominees, submit additional nominees if necessary, and recommend a pool of qualified candidates for potential appointment to the ISRP and ISAB. As vacancies arise on the ISAB or ISRP, new members will be selected from this pool. The Council will make final appointments to the ISRP. Final appointments to the ISAB will be made by the Council chair, NOAA Fisheries' Northwest Regional Administrator, and the Columbia River Inter-Tribal Fish Commission's executive director.

The Council and NOAA Fisheries established the ISAB to provide independent scientific advice and recommendations on issues related to regional fish and wildlife recovery programs under the Northwest Power Act and the Endangered Species Act. The ISAB is designed to foster a scientific approach to fish and wildlife recovery and ensure the use of sound scientific methods in the planning and implementation of research and recovery strategies related to these programs.

At the direction of Congress, the Council established the ISRP to review projects proposed for funding through the Bonneville Power Administration's annual fish and wildlife budget, including those in federal agency budgets that are reimbursed by BPA. The projects are reviewed for their scientific merit and consistency with the program. The ISRP analyzes the information gained from the review of projects and makes recommendations to the Council.

When making nominations, we ask that you provide contact information for the nominee. If possible, we greatly appreciate that nominators submit the resume of each nominee and a cover letter that describes how the nominee meets the criteria for membership specified below and confirms the candidate's interest in being a member of the ISAB or the ISRP.

The specific criteria each nominee must meet includes:

- high achievement in a relevant discipline, which may include Columbia River anadromous and resident fish ecology, statistics, wildlife ecology, genetics, fisheries,

fish passage/bioengineering, fish husbandry, ocean and estuary ecology, geomorphology, socio-economics, or other appropriate disciplines;

- a strong record of scientific accomplishment documented by contribution to peer-reviewed literature or other evidence of creative scientific accomplishment;
- high standards of scientific integrity, independence and objectivity;
- ability to forge creative solutions to complex problems;
- interest in and ability to work effectively in an interdisciplinary setting;
- ability to commit sufficient time to effectively participate in review activities, approximately 16 to 40 hours per month depending on assignments (members are compensated for their services and reimbursed for travel expenses);
- ability to comply with the ISAB/ISRP conflict of interest standards (attached) for the duration of their appointment.

All nominations must be received by February 14, 2004. Please submit your nominations preferably with cover letters and resumes via email to emerrill@nwcouncil.org, or mail to:

Northwest Power and Conservation Council
Attn: Erik Merrill
851 SW 6th Avenue, Suite 1100
Portland, Oregon 97204

If you have any questions please contact Erik Merrill of the Council at 503.222.5161, or toll free at 1.800.222.5161. For more information on the ISAB and ISRP including publications and a list of current members visit the Council's website at: www.nwcouncil.org/fw/science.htm.

Sincerely,

Judi Danielson, Chair
Northwest Power and Conservation Council

D. Robert Lohn, Regional Administrator
NOAA Fisheries

Olney Patt, Jr., Executive Director
Columbia River Inter-Tribal Fish Commission

Independent Scientific Advisory Board and Independent Scientific Review Panel Guidelines on Conflict of Interest

For the ISAB to function effectively, it must maintain its status and credibility as a deliberative scientific board. Members must not only avoid activities that create a conflict of interest, but those activities that may represent a significant appearance of conflict of interest or otherwise impair the credibility or status of the board. Given the controversial nature of many of the questions/issues that the ISAB must deal with, questionable professional or personal activities could easily undermine the effectiveness of the individual members and ultimately the ISAB as a whole. The goal of establishing these conflict of interest guidelines is to maintain the integrity of ISAB opinions. As a general principle, the ISAB will follow the guidelines for bias and conflict of interest outlined in, "The National Research Council Policy on Disclosure of Personal Involvements and Other Matters Potentially Affecting Committee Service"(November 1992)("the NRC Conflict of Interest Guidelines").

"Bias" and "Conflict of Interest"

"Bias" relates to views stated or positions taken that are largely intellectually motivated or that arise from the close identification or association with a particular point of view or the positions or perspectives of a particular group. Such potential sources of bias are not necessarily disqualifying for purposes of ISAB service. Indeed, membership of the ISAB is intended to include individuals with a variety of interests, backgrounds and expertise. However, where bias impairs a member's ability to view matters in a scientific manner and give fair consideration to new information it can jeopardize the member's usefulness to the board.

"Conflict of interest" means any financial or other interest which conflicts with the service of the individual because it 1) impairs the individual's objectivity or 2) could create an unfair competitive advantage for any person or organization.

Examples of Activities that Should Be Avoided

1) Members should avoid direct involvement in or public endorsement of projects or activities that will likely be subject to ISAB review such as those connected to the Fish and Wildlife Program of the Northwest Power and Conservation Council and NOAA Fisheries' Endangered Species Act recovery programs in the Columbia River Basin. Such an involvement would create a conflict of interest that would preclude participation of that member in the review of a project or activity, and could lead to questions regarding the ability of the ISAB as a whole to objectively judge the merits of the subject research or to provide objective scientific advice.

2) Members should avoid financial relationships with organizations receiving substantial economic benefit from the programs and activities connected to the Fish and Wildlife Program of the Northwest Power and Conservation Council and NOAA Fisheries' Endangered Species Act recovery programs in the Columbia River Basin. Such a

relationship could potentially create a conflict of interest, particularly if the ISAB is asked to review the scientific merits of a project being proposed or conducted by the employing organization. Even though a member may excuse him or herself from reviewing such projects, the mere association with such a member may unduly influence other members of the ISAB.

3) Members, as individuals, should avoid taking public positions on issues related to the Fish and Wildlife Program of the Northwest Power and Conservation Council and NOAA Fisheries' Endangered Species Act recovery programs in the Columbia River Basin. Members should be especially conscientious in ensuring that their opinions as individuals are not perceived or construed to be those of the board or to result from board activities. Whenever possible, members should refer the public to NOAA Fisheries, the Council or the ISAB Chair. The Council and NOAA Fisheries, through the coordinators, should be kept informed of all outside contacts.

4) Members should avoid to the extent practicable identification as a major advocate for particular scientific, intellectual, or social causes that provide the appearance of undue bias relative to matters likely to come before the board.

Attachment 4. John M. Epifanio - Curriculum Vitea

Center for Aquatic Ecology
Illinois Natural History Survey
607 E. Peabody Drive
Champaign, Illinois 61820

Phone: *(217) - 244 - 5059*
Fax: *(217) – 333 – 6294*
Internet: *epifanio@inhs.uiuc.edu*

EDUCATION

1992	*Ph.D.,* University of Illinois at Urbana-Champaign.
1986	*M.S.,* University of Wisconsin at Stevens Point.
1982	*B.S.,* University of Illinois at Urbana-Champaign.

RESEARCH AND ACADEMIC INTERESTS

Conservation Genetics & Molecular Ecology – Examination of structure & function of genetic variation for aquatic resource management, conservation, and rehabilitation; efficacy and effects of hybridization and non-native taxa.

Resource Conservation Policy – Analyses of state and federal aquatic wildlife policies.

POSITIONS

2001 - Present	*Director and Associate Professional Scientist*. Center for Aquatic Ecology, Illinois Natural History Survey (INHS).
2000 - 2001	*Assistant National Program Leader.* Fisheries and Aquatic Ecology Program, US Forest Service.
1997 - Present	*Adjunct Faculty.* Department of Biology, Virginia Commonwealth University (VCU).
1996 - 1999	*Resource Scientist-Conservation Geneticist.* Trout Unlimited (TU).
1994 - 1996	*Assistant Professor*. Ecology & Evolutionary Biology Program and the Department of Fisheries & Wildlife, Michigan State University (MSU).
1992 - 1994	*Post-doctoral Research Associate.* Department of Biology, VCU.
1985 - 1992	*Assistant Research Biologist*. Illinois Fish Genetics Laboratory, INHS.
1990 - 1991	*Policy Fellow & Legislative Aide*. U. S. Senator John H. Glenn.
1983 - 1985	*Research Assistant.* Wisconsin Cooperative Fishery Research Unit.

HONORS AND AWARDS

2001	Spot Award for Exceptional Performance, USDA-Forest Service.
2000	Spot Award for Outstanding Performance, USDA-Forest Service.
2000	Robert L. Kendall Award for Best Published Paper (TAFS).

1993 AAAS Science and Diplomacy Fellowship.
1991 John E. Skinner Student Award (AFS).
1990 Congressional and Policy Fellowship (Sea Grant).
1985 Salmon Unlimited, Inc. Scholarship, (UWSP).
1984 Best Paper Award (Illinois Chapter of AFS).
1978-1982 State of Illinois General Assembly Scholarship (University of Illinois).
1978-1979 Edmund James Scholar, University of Illinois.

PROFESSIONAL SERVICE IN SCIENCE COMMUNICATIONS

Editorial: Associate Editor, Transactions of the American Fisheries Society; Assistant Editor, Proceedings of the First World Fisheries Congress.

Peer Review (Journals): Canadian Journal of Fisheries and Aquatic Sciences; Conservation Biology; Conservation Genetics; Environmental Biology of Fishes; Fisheries; Journal of Great Lakes Research; Journal of Marine Biology; Marine Ecology-Progress Series; North American Journal of Fisheries Management; Physiological Zoology; Reviews in Fish Biology and Fisheries; Southeastern Association of Fish and Wildlife Agencies; Transactions of the American Fisheries Society.

Peer Review (for Symposia Proceedings): Genetics of Sub-polar Fishes and Invertebrates; Black Bass 2000; Crappie Biology Symposium; World Fisheries Congress I; Uses and Effects of Cultured Fishes in Aquatic Ecosystems; Proceedings of the Maryland Conservation of Biological Diversity Conference; Proceedings of the VII International Symposium on the Biology and Management of Coregonid Fishes; Propagated Fishes in Resource Management – Proceedings.

Peer Review (Book Chapters): Strategies for Restoring River Ecosystems: Sources of Variability and Uncertainty in Natural and Managed Systems (AFS Publication); Genetic Principles and Practices for Fisheries Scientists (AFS Publication).

Peer Review (Other): Office of Technology Assessment (U. S. Congress); Maryland Sea Grant College Program; Michigan Sea Grant College Program; Atlantic Salmon Genetics Project (National Marine Fisheries Service); Bring Back the Natives Grants Program (US Forest Service / National Fish & Wildlife Foundation); Michigan State University AURIG Program; National Fish and Wildlife Foundation; Utah Agricultural Experiment Station; Menominee Tribal Fisheries Commission; Great Lakes Fishery Trust; University of Illinois Campus Research Board.

Reviews of Popular/Outreach Literature or Media: *Water: a Natural History*, by Alice Outwater. © 1996. Basic Books. New York, NY. Book Review In Trout Magazine, Summer 1997. *Salmon, Trout, Lakes and Streams.* © 1995, 1996. Jere Mossier Productions. Hayden, ID. Video Review In Trout Magazine, Summer 1997. *Life of the Lakes.* Michigan Sea Grant Program. *Great Lakes Fisheries Leadership Institute Curriculum.* Great Lakes Sea Grant Network.

UNIVERSITY & PROFESSIONAL SERVICE/LEADERSHIP/CONTINUING EDUCATION

2003-2004 Member. Fish Endangered Species Technical Advisory Committee. IDNR.
2002-2005 *Co-Chair.* AFS Support Committee to establish a Fisheries Conservation Foundation.

2002-2003 *Committee Member.* Stephan A. Forbes Award for Outstanding Achievement. INHS.
2002-2003 *Steering Committee & Program Committee.* Propagated Fish in Resource Management. American Fisheries Society Special Conference & Symposium.
2002-2003 *Chair.* R. Weldon Larimore/ Jordan Creek Research Award Committee.
2002 *Scientific Expert Witness*. Principles and practice: environmental lawyering. University of Virginia Law School.
2001-2003 *Liason.* Ron Ward Memorial Scholarship. Champaign-Urbana Bass Club.
2001-2003 *Judge.* Stevan R. Phelps Award for Best Published Paper in Genetics (AFS).
2001 *Ichthyologist Search Committee.* Center for Biodiversity. INHS.
2001 *Board Member.* National Fishing and Boating Week. Recreational Boating and Fishing Foundation.
2001 *Judge.* Robert L. Kendall Award for Best Published Paper (TAFS).
2001 *Facilitator*. Watersheds, Fish, and Wildlife Program Partnership Workshop. USDA-Forest Service.
2000-2001 *Coordinator/Liaison*. Bring Back the Natives grants program for US Forest Service & National Fish and Wildlife Foundation
2000 *Facilitator.* Wildlife, Fish, and Rare Plants Program Meeting. Northeast Region of the USDA-Forest Service.
2000 *Issues-Panel Moderator.* Black Bass 2000 Conference (AFS).
2000 *Genetics Technical Team*. Lower Clark Fork River Bull Trout Recovery and Management Team (Montana & Idaho).
1997-2002 *External College Advisory Committee*. College of Natural Resources. Virginia Polytechnic Institute and State University.
2000 *Co-organizer & Instructor*. Vermont Fish Genetics Workshop, VDF&G and USGS/BRD.
1998-2000 *President.* Genetics Section. AFS.
1998-2000 *Governing Board.* AFS.
1998-1999 *Co-chair, Steering Committee.* Symposium on hybridization in fishes, AFS.
1998-1999 *Co-chair, Steering Committee.* Symposium on the ecological and genetic effects of aquaculture, AFS.
1999 *Genetics technical consultant*. Robust Redhorse Conservation Committee (Georgia).
1997-2002 *Associate Editor for molecular and ecological genetics.* Editorial Board, Transactions of the American Fisheries Society.
1997-1998 *Vice-President.* Genetics Section, AFS.
1997-1998 *Secretary.* Potomac Chapter, AFS.
1997-98, '02 *Student Paper Referee.* Annual meetings of AFS.
1996-1998 *Chair.* Conservation Genetics Review Committee, Genetics Section, AFS.
1996 *Invited Participant*. Workshop on Ethics in the Environment, Agriculture, and Biotechnology. National Science Foundation.
1995-1996 *Co-Organizer.* Interdepartmental Molecular and Quantitative Genetics Workshop. Michigan State University (MSU).
1995-1996 D*epartment Representative.* College of Agriculture and Natural Resources Biotechnology Program. MSU.
1995-1997 *Lake Sturgeon Recovery Team.* Michigan DNR.

1994-1996 *Chair*. Genetics and Biodiversity Tech. Committee. North Central Div., AFS.
1995-1996 *Seminar Steering and Arrangements Committee*. Ecology & Evolutionary Biology Program. MSU.
1995-1996 *University Faculty Grievance Board*. MSU.
1993-1994 *Co-Chair, Steering Committee*. Point/Counterpoint Debate Series on Conservation Genetics and Hatcheries, AFS.
1993 *Ecological Effects Working Group.* Performance Standards for Safely Conducting Research with Genetically Modified Fish, USDA.
1992 *Natural Populations Working Group*. Expert Consultation on Conservation of Aquatic Genetic Resources, FAO/UN.

GRADUATE STUDENT COMMITTEES

Major Professor & Advisor

2003-Present *Kyle Hansen*. Fine-scale movements of bass in northern lakes. Natural Resource and Environmental Sciences. UI. Co-advisor.
2003-Present *Tasha Silich.* A test of kin selection theory in colonial breeding bluegill. Natural Resource and Environmental Sciences. UI. Co-advisor.
1994-1997 *Julie Weeder*. Effective population size of Michigan's chinook salmon. Degree conferred May, 1997. Ecology & Evolutionary Biology Program, MSU. Major Advisor.
1994-1997 *Sima Pandya*. Systematics and morphological variation in the common caiman with conservation and legal implications. Degree conferred August, 1997. Ecology & Evolutionary Biology Program, MSU. Major advisor.

Graduate Student Committees, 1995-Present

Ph.D. Dissertation Committees

Vaughn Cooper, MSU
Daniel Villeneuve, MSU
Joe Parkos, UI
Jim Ludden, NIU

MS. Thesis Committees

Dean Franklin, VCU
Debbie Thomas, VCU
David Taylor, VCU
Becky Fuller, MSU
Brandon Barthel, UI
Kate Inendino, UI
Emily Grant, UI
David Glover, UI
Diana Kercher, VCU

TEACHING EXPERIENCE

Springs 2002& 2003 Aquatic Ecology Discussion. Co-organizer, graduate level discussion course. UI.

Fall 1999 *Ecological Genetics.* Co-instructor, graduate level lecture and discussion course. VCU.

Fall 1999 *Conservation Biology*. Co-instructor, advanced undergraduate level lecture and discussion course. VCU.

Spring 1996 *Advanced Concepts in Evolutionary Biology.* Co-instructor, graduate level literature and discussion course. MSU.

Fall 1995 *Conservation and Genetics*. Instructor, graduate level lecture, literature, and discussion course. MSU.

Spring 1995 *Population and Evolutionary Genetics*. Co-instructor, graduate level seminar and discussion course. MSU.

Fall 1993 *Topics in Conservation Biology*. Co-instructor, graduate level seminar, VCU.

Spring 1993 *Topics in Fish Reproductive Behavior*. Co-instructor, graduate level seminar, VCU.

1993-present Guest lecturer for multiple undergraduate courses including, Professional Ethics in Natural Resource Management; Conservation Biology; Introduction to Fisheries and Wildlife Management; Evolutionary Ecology; Resource Ecology.

GRANT SUPPORT

2003-2007 Principal Investigator. The Saline Branch Ammonia Spill: an omnibus proposal to monitor and study the spill's effects on the aquatic community and remediation efforts. Submitted to IDNR/IEPA/IAG. $303K.

2003-2008 Co-Principal Investigator. Urban Community Development To Enhance Nearshore Lake Michigan Fisheries Habitat And Sustainable Fisheries-Based Industries. Submitted to National Sea Grant Program. $500K.

2003 Principal Investigator. A genetic test of kin selection theory in colonially breeding sunfish. Submitted to the University of Illinois Campus Research Board. $32K.

2002-2006 Principal Investigator. The Saline Branch Ammonia Spill: effects on the resident smallmouth, largemouth, and spotted bass populations and patterns of recolonization. Submitted to University of Illinois Office of the Vice Chancellor for Research. $141K.

2002-2003 Co-investigator. Multi-disciplinary approaches to diseases of aquatic animals. UI-CVM Venture Technology Program. $18K

2002-2005 Co-Investigator. Establishment of an Upper Mississippi River Cooperative Ecosystem Studies Unit. US Department of Interior.

2002-2004 Co-Investigator. Great Lakes Fisheries Outreach Enhancement. Illinois-Indiana Sea Grant Program. $68K.

2002-2005 Co-Principle Investigator. Database Management and Analysis of Fisheries in Illinois. Illinois Department of Natural Resources. F-69-R. $1,437K.

2001-2002 Co-Principle Investigator. Critical evaluation of conservation success in restoring James River Shad. *Submitted* to US Fish and Wildlife Service. $76K.

2000-2001 Co-Principal Investigator. Symposium on hybridization in fishes. National Fish and Wildlife Foundation, Trout Unlimited, VCU Center for Environmental Studies, and the American Fisheries Society. $16K.

2000-2001 Co-Principal Investigator. Construction of a microsatellite DNA library for bluegill ecological studies. VCU Grant-in-Aid Program. $5K.

1998-2000 Co-Principal Investigator. Conservation genetics of blackbanded sunfish in Virginia. VA Department of Game and Inland Fish. $24K.

1998-1999 Co-Principal Investigator. Critical tests for the restoration of American shad in James River, Virginia. NOAA. $165K.

1996-1999 Principal Investigator. National assessment on artificial propagation and biodiversity. Packard, Education, and Weedon Foundations. $180K.

1996 Co-Principal Investigator. Single and multi-locus probes for salmon fisheries management. MSU Biotechnology Research Board. $13K.

1995-1996 Principal Investigator. Chinook salmon population dynamics in Michigan's waters of the Great Lakes. Michigan Department of Natural Resources. $55K.

1994-1996 Principal Investigator. Stock identification and evaluation of genetic diversity in *Oncorhynchus* spp. in hatchery verses wild populations from Lake Michigan. Michigan Department of Natural Resources. $20K.

1993 Co-Investigator. A comparison of population-level variation among multiple 1993 genetic techniques. VCU Grant-in-Aid Program. $4K.

PUBLICATIONS

2003 EPIFANIO, J.M. with 7 co-authors. Genetic considerations for bull trout restoration in the lower Clark Fork River. Fisheries. 28(8):10-24.

2003 Hallerman, E.J. B.L. Brown, and J.M. EPIFANIO. Genetic variation: classical markers; Chapter 1. Pp. 3-22. *In* Hallerman, E.J. (ed.). Genetic Principles and Practices for Fisheries Scientists. American Fisheries Society, Bethesda, Maryland, USA.

2003 Brown, B.L. and J.M. EPIFANIO. Genetic variation: nuclear DNA; Chapter 5. Pp. 101-126. *In* Hallerman, E.J. (ed.). Genetic Principles and Practices for Fisheries Scientists. American Fisheries Society, Bethesda, Maryland, USA.

2003 Hallerman, E.J. and J.M. EPIFANIO. Mutation; Chapter 6. Pp. 127-140. *In* Hallerman, E.J. (ed.). Genetic Principles and Practices for Fisheries Scientists. American Fisheries Society, Bethesda, Maryland, USA.

2002 Philipp, D.P., J.E. Claussen, T.W. Kassler, and J.M. EPIFANIO. 2002. Mixing stocks of largemouth bass reduces fitness through outbreeding depression. Pages 349-364 in Philipp, D.P. and M.S. Ridgway, editors. Black Bass: Ecology, Conservation, and Management. American Fisheries Society Symposium 31, Bethesda, Maryland, USA.

2002 Utter, F. and J. EPIFANIO. Marine aquaculture: genetic pitfalls and potentialities. Reviews in Fish Biology and Fisheries 11:59-77.

2001 EPIFANIO, J. and J. Nielsen. The role of hybridization in the distribution, conservation, and management of aquatic species. Reviews in Fish Biology and Fisheries 10:245-251.

2001 EPIFANIO, J. and D. Philipp. Simulating a general model of genetic extinction: the effects of fitness, initial proportions of parental taxa, and mate choice. Reviews in Fish Biology and Fisheries 10:339-354.

2001 EPIFANIO, J., F. Utter, and D. Philipp. The effects of fish stocking on genetic level biodiversity. Pp. 23-64. *In* Nalbone, J. and E.L. Michael (ed.s). Taking Stock of Our Future. Great Lakes United Conference Proceedings. Great Lakes United, Buffalo, NY.

2000 EPIFANIO, J. A status report of coldwater fishery management in the U.S. – an overview of state programs. Fisheries. 25(7):13-27.

2000 Waters, J. M., J. M. EPIFANIO, T. Gunter, and B. L. Brown. Homing behaviour facilitates subtle genetic differentiation among river populations of *Alosa sapidissima*: microsatellite and mitochondrial DNA. Journal of Fish Biology. 56:622-636.

2000 Brown, B. L., J. M. Waters, T. Gunter, and. J. M. EPIFANIO. Restoration genetics of American shad in the James River, Virginia (USA): evaluation of captive release. Conservation Biology. 14(1):294-303.

1999 EPIFANIO, J. M., M. Hooe, D. H. Buck, and D. P. Philipp. Reproductive success and assortative mating among *Pomoxis* species and their hybrids. Transactions of the American Fisheries Society. 128:104-120.

1999 Brown, B., P. Smouse, J. EPIFANIO, and C. Kobak. 1999. MtDNA mixed stock analysis of American shad: coastal harvests are dynamic and variable. Transactions of the American Fisheries Society. 128:977-994.

1998 Brown, B., J. EPIFANIO, C. Kobak, and P. Smouse. Critical tests for variation indicate mtDNA characters are powerful for mixed stock analysis. Pages 396-404, *In* Hancock, D. A., D. C. Smith, A. Grant, and J. P. Beumer, editors. Developing and sustaining world fisheries resources: the state of science and management. Proceedings of the Second World Fisheries Congress. CSIRO Publishing, Collingwood, Victoria, Australia.

1997 EPIFANIO, J. M., and D. P. Philipp. Sources for misclassifying genealogical origin in mixed hybrid populations. Journal of Heredity 88:62-65.

1996 EPIFANIO, J. M., J. B. Koppelman, M. A. Nedbal, and D. P. Philipp. Genetic variation in paddlefish, *Polyodon spathula*. Transactions of the American Fisheries Society 125:546-561.

1996 Brown, B., J. EPIFANIO, C. Kobak, and P. Smouse. Assessing temporal stability in mitochondrial DNA variation in American shad. Canadian Journal of Fisheries and Aquatic Sciences 53:2274-83.

1995 EPIFANIO, J., P. Smouse, C. Kobak, and B. Brown. Assessing mitochondrial DNA variation in American shad: how much is enough for mixed stock analysis? Canadian Journal of Fisheries and Aquatic Sciences 52:1688-1702.

1995 Hallerman, E. and J. EPIFANIO. Human dimensions in biological diversity. Pages 199-212 in Philipp, D., J. EPIFANIO, and J. E. Marsden, J. E. Claussen,

and R. Wolotira, editors. Protection of Aquatic Biodiversity. Proceedings of the World Fisheries Congress. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

1995 Philipp, D., D. Burkett, J. EPIFANIO, and J.E. Marsden. Protecting aquatic biotic diversity: will we meet the challenge. Pages 1-10 in Philipp, D., J. Epifanio, and J. E. Marsden, J. E. Claussen, and R. Wolotira, Jr., editors. Protection of Aquatic Biodiversity. Proceedings of the World Fisheries Congress. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

1994 EPIFANIO, J. M. and D. P. Philipp. Gene regulation and expression in *Pomoxis* (Pisces: Centrarchidae). Developmental Genetics 15:119-128.

1993 EPIFANIO, J. M. and D. P. Philipp. Gene linkage analysis of ten loci in the genus *Pomoxis* (Pisces: Centrarchidae). Journal of Heredity 84:116-121.

1993 Philipp, D. P., J. M. EPIFANIO, and M. J. Jennings. Conservation genetics and current stocking practices – are they compatible? Fisheries 18:14-16.

1992 EPIFANIO, J. M. Gene linkage, ontogeny of gene expression, and reproductive isolation in *Pomoxis annularis*, *P. nigromaculatus*, and their hybrids. Doctoral Dissertation. University of Illinois.

1989 EPIFANIO, J. M. The Illinois Fisheries Genetics Program. Illinois Natural History Survey Reports 287:1-2.

1986 EPIFANIO, J. M. Genetic stock identification of bloater, *Coregonus hoyi*, from western Lake Michigan. M.S. Thesis. University of Wisconsin.

MANUSCRIPTS SUBMITTED

Weeder, JM, AR Marshall, and JM EPIFANIO. Assessment of population genetic variation in chinook salmon, *Oncorhynchus tshawytscha*, from seven Michigan rivers 30 years after introduction. Submitted to North American Journal of Fisheries Management.

TECHNICAL REPORTS

2003 EPIFANIO, J.M. Genetic analysis of Tennessee sport fisheries (2000-2003: largemouth bass, smallmouth bass, rainbow trout, and brown trout. Final report to Tennessee Wildlife Resources Agency. Nashville, TN.

2003 Stein, JA, RF Illyes, L Miller-Ishmael, B Carroll, J Claussen, J EPIFANIO, and DP Philipp. Database management and analysis of fisheries in Illinois. Aquatic Ecology Technical Report 03/03. Illinois Department of Natural Resources, Springfield, IL.

2002 Stein, JA, RF Illyes, B Carroll, L Miller-Ishmael, J Claussen, T Kassler, J EPIFANIO, and DP Philipp. Database management and analysis of fisheries in Illinois. Aquatic Ecology Technical Report 02/04. Illinois Department of Natural Resources, Springfield, IL.

2002 Brown, B. L., and J. M. EPIFANIO. Genetic Assessment of blackbanded sunfish in Virginia. DJ Project Completion Report. Virginia Department of Game and Inland Fisheries. Richmond, VA.

2001 Spruell, P., J. EPIFANIO, G. Haas, K. Pratt, B. Rieman, C. Stockwell, and F. Utter. Genetic considerations for bull trout restoration in the Lower Clark Fork drainage, Idaho and Montana. Idaho and Montana Bull Trout Management Team.

2000 Brown, B. L., J. M. EPIFANIO, T. Gunter, J. G. Travelstead, and J. M. Waters. Critical Evaluation of Conservation Success in Restoration of James River and Ocean Run American Shad. Final Report to NOAA (Saltonstall/Kennedy).

2000 Brown, B. L., and J. M. EPIFANIO. Conservation Genetics of the Blackbanded Sunfish in Virginia. Technical Report to Virginia Department of Game and Inland Fisheries.

1999 EPIFANIO, J. Status and trends of New Hampshire's coldwater fishery Resources. Trout Unlimited Technical Report.

1999 EPIFANIO, J. The scientific basis of Washington state's Wild Salmonid Policy. Trout Unlimited Technical Report.

1998 EPIFANIO, J. 1997 inland trout stocking data across the U.S. TU Technical Fact Sheet.

1998 EPIFANIO, J. M., E. Schnabel, and E. Stockinger. Genetic diversity and gene flow in feral and propagated Lake Michigan steelhead (*Oncorhynchus mykiss*) populations. DJ Project Completion Report to Michigan DNR.

1998 EPIFANIO, J. and W. Fosburgh. A status report of coldwater fishery management in the U.S. – an overview of state programs. Trout Unlimited Technical Report.

1998 EPIFANIO, J. and W. Lindloff. Status and trends of Wisconsin's coldwater fishery Resources. Trout Unlimited Technical Report.

1997 EPIFANIO and D. Nickum. Fishing for answers: status and trends in Colorado coldwater fishery management. Trout Unlimited Technical Report.

1997 Weeder. J. A. and J. EPIFANIO. Genetic drift, genetic variability and Lake Michigan chinook salmon. DJ Project Completion Report to Michigan DNR.

1994 EPIFANIO, J. Testing genetic hypotheses for EMS. Technical abstract for the Great Lakes Fishery Commission workshop on *Early Mortality Syndrome.*

1994 Brown, B. and J. EPIFANIO. Mixed-stock analysis of American shad in Virginia's and Maryland's coastal intercept fisheries. DJ Project Completion Report to Virginia Marine Resources Commission.

1992 EPIFANIO, J. and D. P. Philipp. Gene linkage of *PGM-1** and *FH-1** in sunfishes. Isozymes Bulletin. Vol. 26.

1992 EPIFANIO, J., G. S. Whitt, and D. P. Philipp. Quantitative variation of *GPI-B** expression in *Pomoxis* spp. Isozymes Bulletin. Vol. 26.

1989 EPIFANIO, J., Nedbal, M. and Philipp, D.P. (1989) A population genetic analysis of paddle-fish (*Polyodon spathula*). Illinois Nat. Hist. Surv. Aquat. Biol. Tech. Rep. 90/13, 48 pp.

1989 EPIFANIO J. M. and D. P. Philipp. Reproductive success of spawning lake trout on Julian's Reef, Lake Michigan. Aquatic Biology Section Technical Report, INHS.

1987 EPIFANIO, J. M. and D. P. Philipp. Tissue recycling of mtDNA preparations for use in isozyme studies. Isozymes Bulletin. Vol. 21.

1986 Philipp, D. P., G. S. Whitt, J. B. Koppelman, J. E. Claussen and J. M. EPIFANIO. The establishment of a state fisheries genetics program in Illinois. Aquatic Biology Section Technical Report, INHS.

1982 Skelly, T. M. and J. M. EPIFANIO. Kankakee River Fishes of the Braidwood Aquatic Monitoring Area. Aquatic Biology Section Technical Report, INHS.

1982 Skelly, T. M. and J. M. EPIFANIO. The second year fishery of the Braidwood cooling pond. In R. W. Larimore and T. M. Skelly, Eds. Environmental Studies of Braidwood Cooling Pond, 1982. Aquatic Biology Section Technical Report, INHS.

INVITED PRESENTATIONS

2002 Philipp, D. and J. Epifanio. Management of biodiversity below the species level: stock transfers result in fitness losses through outbreeding depression. Indiana AFS/TWS Annual Meeting.

2001 EPIFANIO, J., D. Philipp, and J. Claussen. Hybridization in Lepomis. Lepomis Symposium. Midwest Fish and Wildlife Conference.

2001 EPIFANIO, J. Genetic diversity and viability in the US Forest Service. Workshop on Advanced Topics in Aquatic Ecology. US Forest Service.

2001 Spruell, P., J. EPIFANIO, G. Haas, K. Pratt, B. Rieman, C. Stockwell, F. Utter, and W. Young. Population genetics and management of bull trout in the Lake Pend Oreille - lower Clark Fork River system. Montana AFS Annual Meeting.

2000 Philipp, D., J. Claussen, W. Persons, S. Morgensen, and J. EPIFANIO. Rainbow trout in the Grand Canyon: Part 1, distribution of genetic variation. Symposium on Ecology and Management of Tailwaters in the United States. Lake Powell, Arizona.

2000 EPIFANIO, J, J. Claussen, W. Persons, S. Morgensen, and D. Philipp. Rainbow trout in the Grand Canyon: Part 2, genetic approaches to understanding recruitment. Symposium on Ecology and Management of Tailwaters in the United States.

2000 EPIFANIO, J. Genetic approaches to evaluating American shad restoration in the Mid-Atlantic US. Center for Aquatic Ecology. Illinois Natural History Survey.

2000 EPIFANIO, J. Evaluation of genetic diversity associated with American shad restoration: a model for propagation-assisted recovery. Department of Biology. Florida Atlantic University.

2000 EPIFANIO, J. Evaluation of genetic diversity associated with American shad restoration: a model for propagation-assisted recovery. Wisconsin Cooperative Fishery Research Unit. University of Wisconsin at Stevens Point.

2000 Utter, F. and J. EPIFANIO. Defining the varied uses of fish culture is key to understanding risks and benefits. World Aquaculture Society, Nice, France.

2000 EPIFANIO, J. Evaluation of genetic diversity associated with American shad restoration: a model for propagation-assisted recovery. Department of Fisheries and Wildlife. Virginia Polytechnic Institute & State University.

2000 EPIFANIO, J. Genetic risks associated with captive breeding. Biology Department. Virginia Commonwealth University.

1999 EPIFANIO, J. Genetics and propagation. Taking Stock – a workshop on the uses of fish culture in the Great Lakes. Great Lakes United.

1999 EPIFANIO, J. Evaluation of genetic diversity associated with American shad restoration: a model for propagation-assisted recovery. Department of Fishery and Wildlife Biology, Colorado State University.

1999 EPIFANIO, J., and D. Philipp. Population heterogeneity within the hybrid swarm. AFS Annual Meeting. Hybrid Fishes Symposium.

1999 EPIFANIO, J. Mixed-stock fisheries and hybrid swarms – estimating the composition of complex populations. Marine Sciences Research Center, SUNY at Stony Brook.

1998 EPIFANIO, J. Genetic risks from mixing species and populations -- a review of concepts and evidence. Introduced Aquatic Species Workshop, Virginia AFS.

1997 EPIFANIO, J. and J. Weeder. Fecundity as a genetic trap: genetic drift and the effects of variable reproductive success associated with supportive breeding. symposium on incorporating genetic concepts into fisheries management. Midwest Fish and Wildlife Conference.

1997 EPIFANIO, J. East coast American shad: where do they come from, where do they go? Presentation to Maryland Department of Natural Resources.

1997 EPIFANIO, J. and D. Duff. Wilderness stocking: what are we trying to conserve? AFS Annual Meeting.

1997 EPIFANIO, J. Artificial propagation in Puget Sound: what are we restoring? Washington Council of Trout Unlimited.

1996 EPIFANIO, J. The National Fish Hatchery Review: artificial propagation and sustainable coldwater fisheries. Trout Unlimited Annual Convention.

1995 EPIFANIO, J. Burnham-Curtis, T. Todd, and J. Weeder. Workshop on Genetics in Fisheries Research and Management. Michigan Department of Natural Resources.

1995 EPIFANIO, J. Genetic applications to hatchery broodstock management. Wisconsin Department of Natural Resources Training Seminar Series.

1995 EPIFANIO, J. Estimating the origins of complex mixtures: a population genetics approach. Ecology and Evolutionary Biology Program (MSU) Seminar Series.

1994 Brown, B. and J. EPIFANIO. Uncovering American shad origins. AFS Annual Meeting. Genetics Section Symposium on Applying Mixed-Stock Analysis to East Coast Problems.

1994 EPIFANIO, J. Estimating population admixtures from genetic data. Queens University Biological Station Summer Seminar Series.

1994 EPIFANIO, J. Testing hereditary hypotheses for *Early Mortality Syndrome.* Early Mortality Syndrome Workshop, Great Lakes Fishery Commission.

1993 EPIFANIO, J. Uncovering the origins of ocean-run American shad. Illinois Natural History Survey.

1993 EPIFANIO, J. Uncovering the origins of ocean-run American shad with Genetic Markers. Department of Fisheries and Wildlife, MSU.

1992 EPIFANIO, J. Formation of a fish genetics information network. Food and Agriculture Organization Expert Consultation on Utilization and Conservation of Aquatic Genetic Resources, Grottaferrata, Italy.

1992 EPIFANIO, J. Hybridization in sunfishes. Department of Biology Seminar Series, VCU.
1992 EPIFANIO, J. and E. Hallerman. Human and biological dimensions in biological diversity. World Fisheries Congress, Athens, Greece.
1992 EPIFANIO, J. The Nonindigenous Aquatic Nuisance and Control Act of 1990: a legislative history. Illinois River Basin Zebra Mussel Workshop.
1991 EPIFANIO, J. A view from the "Hill": a legislative perspective on aquatic resources. Illinois AFS.
1989 EPIFANIO J., M. Nedbal, and D. Philipp. Population genetic analyses of the paddlefish: a tool for better management. AFS Annual Meeting.

PRESENTATIONS – CONTRIBUTED

2003 J. EPIFANIO. Hybridization in Fishes. UI/NRES 399.
2003 Dolan, C. and J. EPIFANIO. The Great Lakes Fisheries Outreach Enhancement Program. Illinois Chapter of the American Fisheries Society.
2002 Hanson, K., T. Kassler, J. Claussen, J. EPIFANIO, and D. Philipp. Genetic identification and assessment of genetic variation in *Oncorhynchus mykiss* and *Salmo trutta* within the Colorado River. Howard Hughes Undergraduate Research Fellows Poster Session.
2000 Burkett, D., M. Hudy, D. Cross, J. EPIFANIO, K. Russell, and M. Underwood. Action strategy: Integrating fisheries and aquatic ecology efforts with the USDA Forest Service Natural Resource Agenda. Midwest Fish and Wildlife Conference (Poster).
1999 EPIFANIO, J., B. Brown, J. Waters, T. Gunter. Restoration genetics of American shad in the James River, VA: evaluation of captive release. Midwest Fish and Wildlife Conference.
1996 Brown, B., J. EPIFANIO, C. Kobak, and P. Smouse. Critical tests for variation indicate mtDNA characters are powerful for mixed stock analysis. Second World Fisheries Congress.
1996 Weeder, J., J. Sapak, K. Smith, and J. EPIFANIO. Effective population estimates of Michigan chinook salmon. AFS Annual Meeting.
1996 Weeder, J., J. Sapak, K. Smith, and J. EPIFANIO. Effective population estimates of Michigan chinook salmon. International Association of Great Lakes Research Annual Meeting.
1993 EPIFANIO, J. M. and B. L. Brown. Composition analysis of east coast American shad, *Alosa sapidissima*. AFS Annual Meeting.
1993 EPIFANIO, J. M. and D. P. Philipp. Reproductive isolation in crappie (*Pomoxis* spp.). AFS Annual Meeting.
1993 EPIFANIO, J. M. and B. L. Brown. Genetic admixture analysis of east coast American shad, *Alosa sapidissima*. Northeast Fish and Wildlife Conference.
1993 EPIFANIO, J. M. and B. L. Brown. Composition analysis of east coast American shad. Tidewater Chapter AFS, Symposium on Alosid Biology.
1989 Hooe, M., D. H. Buck, and J. EPIFANIO. Production and recruitment potential of white crappie, black crappie, and their interspecific F_1 and F_2 hybrids. AFS Annual Meeting.

1989 EPIFANIO J. M., M. A. Nedbal, and D. P. Philipp. Biochemical and molecular genetics of the paddlefish, *Polyodon spathula*. Illinois AFS.
1987 EPIFANIO, J. M., R. S. Schrock, D. D. Post , W. H. LeGrande, and D. W. Coble. Biochemical genetics of the bloater, *Coregonus hoyi*, in Lake Michigan. Midwest Fish and Wildlife Conference, Symposium on Coregonid Biology.
1987 EPIFANIO, J. M. Hybridization in Centrarchids. Student Fisheries Colloquium.
1986 EPIFANIO, J. M. Application of genetic techniques in fisheries research. Student Fisheries Colloquium.
1985 EPIFANIO, J. M., R. S. Schrock, D. D. Post , W. H. LeGrande, and D. W. Coble. Isozyme characterization of the bloater, *Coregonus hoyi*, from western Lake Michigan. Wisconsin AFS.
1984 EPIFANIO, J. M., M. R. Gross, I. A. Fleming, J. B. Koppelman, and D. P. Philipp. Behavioral genetic studies of alternative reproductive strategies among male bluegill, *Lepomis macrochirus*. Illinois AFS.

DISCUSSION PANELS

2000 Issues and Opportunities for Managing and Conserving Black Basses. Panel Moderator at the Black Bass 2000 Symposium. AFS Annual Meeting.
1998 Native fish and trout hatchery programs. Trout Unlimited Annual Convention.
1998 The sciences in biodiversity programs. Maryland Conservation of Biological Diversity Conference.
1997 Integrating genetics and fisheries management. Midwest Fish and Wildlife Conference.
1997 Fish stocking in wilderness. AFS Annual Meeting.
1994 Conservation genetics and current hatchery practices: are they compatible? Northeast Fish and Wildlife Conference.
1994 Conservation genetics and current hatchery practices: are they compatible? Southern Division AFS.

Attachment 5. Nancy Huntly's Description of Research and Publications

NANCY HUNTLY
Professor
Ph.D., University of Arizona, 1985
Community Ecology,
Plant-Animal Interactions, Conservation
E-mail: huntnanc@isu.edu
Phone: 208-282-2149

My primary research interest is community ecology, in particular, the mechanisms involved in community dynamics and diversity. My lab studies these topics using techniques from both population biology and ecosystem ecology. We are studying (1) the interactions of plants, herbivores, and ecosystem processes, and, (2) patterns of environmental variability (e.g., spatial variation in soils or other habitat parameters, temporal variation in weather patterns within and among years) and their roles in community dynamics and diversity.

We study the distribution and foraging behavior of herbivores (especially small and medium-sized mammals such as pikas, jack rabbits, voles, pocket gophers, kangaroo rats, and woodrats, and some insects) and the effects these animals have on vegetation and ecosystem dynamics. We have pursued these questions in alpine, subalpine, montane, prairie, old-field, and desert ecosystems. This work involves testing models of food chain dynamics, habitat selection, and foraging, as well as of the mechanisms by which herbivory affects plant communities.

Our research on environmental variability and biodiversity has used desert annual plants as a test case. The goal of the work overall is to understand the nature of environmental variation experienced by populations and its contribution to species coexistence by generating what can be thought of as regeneration or other temporal niches. Our work with desert annuals involves understanding seed bank dynamics, plant germination and growth phenology, soil resource dynamics, and patterns of resource use and competition, all of which potentially vary according to environmental conditions. We are in the early stages of a parallel study of sage-steppe ecosystems. The theory and methods we are developing have broad application to the understanding and preservation of biodiversity.

Representative Work:

Roach, W.J., **N. Huntly**, and R.S. Inouye. In press. Talus fragmentation mitigates the effects of pikas on alpine meadow vegetation. *Oikos*

Sirotnak, J.M. and **N.J. Huntly**. 2000. Direct and indirect effects of herbivores on nitrogen dynamics: voles in riparian areas. Ecology 81:78-87.

Dale, V.H., S. Brown, R. Haeuber, N.T. Hobbs, **N. Huntly**, R. Naiman, W. Riebsame, M. Turner, and T.J. Valone. 2000. Ecological principles and guidelines for managing the use of land. Ecological Applications 10:639-670.

Lawson, D., R.S. Inouye, **N. Huntly**, and W.P. Carson. 1999. Patterns of woody plant abundance, recruitment, mortality and growth in a 65-year chronosequence of old-fields. Plant Ecology 145:267-279.

Aho, K., **N. Huntly**, J.P.G. Moen, and T. Oksanen. 1998. Pikas (*Ochotona princeps*) as allogenic ecosystem-engineers in alpine and subalpine ecosystems. Oecologia 114:405-409.

Chesson, P. and **N. Huntly**. 1997. The roles of harsh and fluctuating conditions in the dynamics of ecological communities. American Naturalist 150:519-553.

Huntly, N. 1995. How important are consumer species to ecosystem functioning? In, C.G. Jones and J.H. Lawton (eds.), *Linking Species and Ecosystems*. Chapman and Hall.

Chesson, P. and **N. Huntly**. 1994. Temporal hierarchies of variation and the maintenance of diversity. Plant Species Biology 8:195-206.

Frank, D.A., R.S. Inouye, **N. Huntly**, G.W. Minshall, and J.E. Anderson. 1994. Biogeochemistry of a north-temperate grassland with native grazers: nitrogen dynamics in Yellowstone National Park. Biogeochemistry 26:163-188.

Huntly, N. and O.J. Reichman. 1994. Effects of subterranean mammalian herbivores on vegetation. Journal of Mammalogy 75:852-859.

Huntly, N. 1991. Herbivores and the dynamics of communities and ecosystems. Annual Review of Ecology and Systematics 22:477503.

Chesson, P.L. and **N. Huntly**. 1989. Short-term instabilities and long-term community dynamics. Trends in Ecology and Evolution 4:293-298.

Huntly, N. and R.S. Inouye. 1988. Pocket gophers in ecosystems: patterns and mechanisms. BioScience 38:786-793

Huntly, N.J. 1987. Influence of refuging consumers (Pikas: *Ochotona princeps*) on subalpine vegetation. Ecology 68:274-283.

Huntly, N.J., A.T. Smith, and B.L. Ivins. 1986. Foraging behavior of a refuging herbivore, the pika (*Ochotona princeps*), with comparisons of grazing and haying. Journal of Mammalogy 67:139-148.

CURRICULUM VITAE OF RANSOM A. MYERS

Killam Chair in Ocean Studies

Dept. of Biology

Dalhousie University

Halifax, Nova Scotia, Canada

B3H 3J5

1-902-494-1755 (work)

1-902-494-3736 (fax)

Ransom.Myers@Dal.Ca

Education

- Doctor of Philosophy, 1984, Biology, Dalhousie University
- Master of Science, 1981, Mathematics, Dalhousie University
- Bachelor of Science, 1974, Physics, Rice University

Employment

- April 1, 1997: Killam Chair in Ocean Studies, Dalhousie University, Halifax, Nova Scotia, Canada
- 1983 - 1997: Research Scientist, Department of Fisheries and Oceans, St. Johns, NF, Canada
- 1977 - 1982: Graduate Student, Dalhousie University
- 1974 - 1976: Schlumberger Overseas, S.A.

Awards and Honours

- 2003: Science Advisory Board: Oceana
- 2003: National Science Advisory Board: Sierra Club of Canada
- 2003: Asked to testify at the US Senate Commerce Committee Hearing on Overfishing

- 2003: Asked to testify at the House of Commons (CANADA) Standing Committee on Fisheries and Oceans
- 2000: Board of Directors: The International Oceans Institute of Canada
- 2000: Advisory Board on Fisheries: Atlantic Policy Congress
- 1999: Board of Directors: Ocean Institute of Canada
- 1999: The Great Auk Lectureship
- 1998: Who's Who in Canada
- 1994-1999: Board of Directors, Natural Resource Modelling Association
- 1996: Awarded first Killam Chair in Ocean Studies, Dalhousie University
- 1996: Visiting Fellow, Centre for Population Biology, Silwood Park, Imperial College
- 1994: Wilfred Templeman Publication Award
- 1990: Adjunct Professor of Memorial University of Newfoundland

International Conferences Organized or Co-organized

- 1999: World Conference on Natural Resource Modelling, Halifax, Nova Scotia.
- 1993: Meeting of the Natural Resource Modelling Association in St. John's, Newfoundland.
- 1992: The Methods Working Group of the International Council for the Exploration of the Sea.

Financial Support

Killam Foundation
NSERC Operating Grant
NSERC Major Facilities Access Grant
NSERC Shiptime Grant
NSERC Equipment Grant
Canadian Foundation for Innovation
Great Lakes Indian Fish and Wildlife Commission
NS Links
US National Marine Fisheries Service
Canadian Dept. of Fisheries and Oceans
Environment Canada
Nova Scotia Power, Inc
Conservation Council of New Brunswick
World Wildlife Fund
Canada Trust-Friends of the Environment Foundation
Pew Charitable Trusts
George Cedric Metcalf Foundation
Sloan Foundation
Pelagic Fisheries Research Program
Wildlife Habitat Canada

Invited Presentations (from 1997)

- Meta-analytic approaches for estimating sustainable fishing strategies. Univ. of Miami. Nov. 2001.
- Myers, R.A. Limits to Exploitation. Univ. of Michigan. Oct. 2001.
- Myers, R.A. Meta-analysis in ecology. Michigan State University. Oct. 2001.
- Myers, R.A. Extinction in the Ocean. The Marince Conservation Biology Institute. June 2001
- Worm, B. and Myers, R.A. Meta-analysis of Marine Communities. The Marince Conservation Biology Institute. June 2001
- Myers, R.A. Meta-analysis of Population Dynamics. The Cary Conference. New York. May 2001
- Myers, R.A. Meta-analysis and The Limits of Fishing in Salmon. The Keynote Speech-7th Alaska Salmon Workshop. Anchorage. Feb. 2001
- Myers, R.A. Recent Advances in the Quantitative Ecology. The Univ. of Alaska, Juneau. Feb. 2001
- Myers, R.A. Why Fish Stocks Collapse. The Bevan Series on Sustainable Fisheries. Univ. of Washington. Jan. 2001
- Myers, R.A. Meta-analysis of fisheries data. Fisheries Centre, Univ. of British Columbia. Jan. 2001
- Myers, R.A. Meta-Analysis and Biological Reference Points. Mote International Symposium. Oct. 2000. Sarasota, Florida.

- Myers, R.A. Using Meta-analysis to Test Ecological Models. University of Rhode Island. Sept. 2000.
- Myers, R.A. A Meta-Analysis of Fish Productivity. West Coast Groundfish Productivity Workshop. Seattle, March 2000.
- Myers, R.A. Sustainable Hunting Principles: Some Lessons From the Sea. Norwegian University of Science and Technology, Feb. 2000.
- Myers, R.A. Ecological Perspective on the History of Fishing on the Grand Banks. Feb. 2000.
- Myers, R.A. A Meta-Analysis of Compensation in Marine, Freshwater, and Anadromous Fish. EPRI, Washington, D.C. Dec. 1999.
- Myers, R.A. The Crisis in Marine Fisheries. Yale University, Nov. 1999.
- Myers, R.A. The Collapse of Fisheries. Annual meeting of the Atlantic Schools of Business, Halifax, Oct. 1999
- Myers, R.A. Using Generalized Linear Mixed Models in the Meta-Analysis of Spectral Data, Statistics Dept. Dalhousie Univ. Oct. 1999.
- Myers, R.A. The Crisis in Canadian Fisheries, Yale University, Oct. 1999.
- Myers, R.A. Extinction in the Ocean, Trondheim University, Norway, Sept. 1999
- Myers, R.A. Sustainable Marine Fishing, The Norway/UN conference on the Ecosystem Approach for Sustainable Use of Biological Diversity, Trondheim, Norway, Sept. 1999.
- Myers, R.A. Recruitment in Freshwater, Anadromous, and Marine Fish, AFS annual meeting, Charlotte, North Carolina, Sept. 1999.
- Barrowman, N.A. and R.A. Myers. Meta-analysis of Population Dynamics Data: Hierarchical Modelling to Reduce Uncertainty. Statistics Canada Symposium 99: Combining Data from Different Sources, Ottawa, May, 1999.
- Myers, R.A. Extinction in the Ocean, The Great Auk Lecture. Memorial Univ. Newfoundland, May, 1997.
- Myers, R.A. The Near Extinction of the Barndoor Skate. New England Aquarium, March, 1999.
- Myers, R.A. Conservation of Skates in the Gulf of Maine. Marine Conservation Biology Institute, Boston, March 1999.
- Myers, R.A. The Collapse of Canadian Cod Stocks, Univ. of Alberta. Jan. 1999.
- Myers, R.A. Meta-analysis and Population Biology, Univ. of Alberta. Jan. 1999.
- Myers, R.A. Ocean Research at Dalhousie, Pacem in Maribus XXVI, Halifax. Dec. 1998.
- Myers, R.A. Meta-analysis of Population Dynamics Data, Pacific Salmon Comm. Vancouver, Nov. 1998.
- Myers, R.A. A Skeptical Review of Climate Variation on Fish Populations, North Atlantic Climate Workshop, Icelandic Research Council, Sept. , 1998.
- Myers, R.A. The Collapse of Cod, Institute of Marine Science, Iceland, Sept. 1998.
- Myers, R.A. Can Meta-analysis Solve all Problems in Population Dynamics? Marine Institute. Copenhagen, Oct. 1999.
- Myers, R.A. Four Lectures on Evolution and Sustainable Fishing, University of Bergen, Sept. 1998.

- Myers, R.A. The Collapse of Cod, Institute of Marine Science, Bergen, Sept. 1998.
- Myers, R.A. Mismanagement in the Ocean, Woods Hole Oceanographic Institution, Aug. 1998.
- Myers, R.A. Cyclic Population Dynamics, Society of Industrial and Applied Mathematics, Toronto, July, 1998.
- Myers, R.A. Local Extinction in the Ocean, Univ. of Maine, Oct. 1997.
- Myers, R.A. Extinction Models for Large Pelagic Fishes, Marine Conservation Society, Florida, Oct. 1997.
- Myers, R.A. What We Really Know about Stock and Recruitment. ICES International Symposium on Recruitment, Johns Hopkins Univ. Maryland, Sept. 1997.
- Myers, R.A. Sockeye Salmon Population Cycles. International Conf. on Differential Equations. Halifax, June 1997.
- Myers, R.A. Reducing Uncertainty in Fisheries Management. Fisheries Management and Uncertainty Symposium, Bergen, Norway, June,1997.
- Myers, R.A. Meta-analysis, Univ. of Oslo, Norway, June, 1997.
- Myers, R.A. Science, Conservation and Public Policy, Society for Conservation Biology, Victoria, B.C. , July, 1997.
- Myers, R.A. Meta-analysis of Long Time-series of Fish Abundance, Society for Conservation Biology, Victoria, B.C , July, 1997.
- Myers, R.A. Coho Salmon Extinction Dynamics. National Center for Ecological Analysis and Synthesis, Santa Barbara, Sept. 1997.

Journal Articles

Baum, J. K., R. A. Myers, D. Kehler, B. Worm, S. Harley and P. Doherty. 2003. Collapse and Conservation of Sharks in the Northwest Atlantic. **Science** 299:389-392.

Vanderzwaag, D., S. D. Fuller, and R. A. Myers. 2003. Canada and the Precautionary Principle\Approach in Ocean and Coastal Management: Wading and Wandering in Tricky Currents. **Ottawa Law Review** 34:in press.

Barrowman, N. J., R. A. Myers, R. Hilborn, D. G. Kehler and C. A. Field. 2003. The Variability among Populations of Coho Salmon in the Maximum Reproductive Rate and Depensation, **Ecol. App.** 13:784-793.

Worm, B. and R. A. Myers. 2003. Meta-analysis of cod-shrimp interactions reveals top-down control in oceanic food webs. **Ecology**. 84:162-173.

Myers, R.A. and T. J. Quinn II. 2002. Estimating and testing non-additivity in fishing mortality: implications for detecting a fisheries collapse. **Can. J. Fish. Aquat. Sci.** 59: 597-601.

MacKenzie, B. R., Myers, R.A. and K.G. Bowen. 2002. Stock-recruitment relationships and fish stock carrying capacity in aquatic ecosystems. **Mar. Eco. Prog. Ser.** in press.

Kehler, D.G., Myers, R.A. and C. A. Field. 2002. Measurement Error and Bias in the Maximum Reproductive Rate for the Ricker Model. **Can. J. Fish. Aquat. Sci.** 59: 854-864.

Rose, K. A., J. H. Cowan, K. O. Winemiller, R. A. Myers and R. Hilborn. 2002. Compensatory Density-Dependence in Fish Populations: Importance, Controversy, Understanding, and Prognosis. **Fish and Fisheries** 2:293-327.

Fromentin, J.M., R.A. Myers, O.N. Bjrnstad, N. C. Stenseth, J. Gjoseter, and H. Christie, 2001, Effects of density-dependent and stochastic processes on the regulation of cod populations. **Ecology** 82 (2): 567-579.

Cadigan, N.G. and R.A. Myers. 2001. A comparison of gamma and lognormal maximum likelihood estimators in a sequential population analysis. **Can. J. Fish. Aquat. Sci.** 58: 560-567.

Harley, S.J., R.A. Myers and A. Dunn. 2001. Is catch-per-unit-effort proportional to abundance? **Can. J. Fish. Aquat. Sci.** 58: 1705-1772.

Harley, S.J. and R. A Myers. 2001. Hierarchical Bayesian models of length-specific catchability of research trawl surveys. **Can. J. Fish. Aquat. Sci.** 58:1569-1584.

Stenson, G.B., M.O. Hammill, M.C.S. Kingsley, B. Sjare, W.G. Warren, and R.A. Myers, 2002. Has pup production of Northwest Atlantic harp seals, *Phoca groenlandica*, increased? **ICES J. Mar. Sci.** 59:81-92.

Myers, R.A., N.J. Barrowman, R. Hilborn, and D.G. Kehler. in press. Inferring the Bayes priors with limited direct data with applications for risk analysis and reference points. **N. Am. J. Fish. Manage.**. 22: 351-364.

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Myers, R.A., B.R. MacKenzie, K.G. Bowen, and N.J. Barrowman. 2001. What is the carrying capacity of fish in the ocean? A meta-analysis of population dynamics of North Atlantic cod. **Can. J. Fish. Aquat. Sci.** 58: 1464--1476.

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Gibson, A.J.F. and R.A. Myers. in press. A range extention of Meek's halfbeak (*Hyporhamphus meeki*). **Can. Field Nat.**

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Gibson, A.J.F. and R.A. Myers. 2003. A statistical, age-structured, life history based, stock assessment model for anadromous *Alosa* **Trans. Am. Fish. Soc.**.

Gibson, A.J.F. and R.A. Myers. in press. Effectiveness of a High-Frequency Sound Fish Diversion System at the Annapolis Tidal Hydroelectric Generating Station, Nova Scotia **N. Am. J. Fish. Manage**.

Barrowman, N.J. and R.A. Myers. in press. A new graphical display for meta-analysis: the Raindrop Plot. **Am. Stat.**

Barrowman, N.J. and R.A. Myers 2000. Still more spawner-recruitment curves: The hockey stick and its generalizations. **Can. J. Fish. Aquat. Sci.** 57:665-676. hydroelectric stations. **Trans. Am. Fish. Soc.**.

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Myers, R.A. 2001. Stock and recruitment: Generalizations about maximum reproductive rate, density dependence and variability. **ICES J. of Mar. Science**. 58:937-951.

Fogarty, M.J., R.A. Myers and K.G. Bowen 2001. A comparative analysis of recruitment in cod and haddock. **ICES J. of Mar. Science**. 58: 952-961.

Myers, R.A., K.G. Bowen, N.J. Barrowman. 1999. The maximum reproductive rate of fish at low population sizes. **Can. J. Fish. Aquat. Sci.** 56: 2404-2419.

Bradford, M.J., R.A. Myers and J.R. Irvine. 2000. Reference points for coho salmon harvest rates and escapement goals based on freshwater production **Can. J. Fish. Aquat. Sci.** 57: 677-686.

Casey, J.M. and R.A. Myers. 1998. Near extinction of a large, widely distributed fish. **Science**. 281: 690-692.

Myers, R.A., and G. Mertz. 1998. Reducing uncertainty in the biological basis of fisheries management by meta-analysis of data from many populations; A synthesis. **Fish. Res.** 37: 51-60.

Myers, R.A. 1998. When do environment-recruit correlations work? **Rev. Fish. Biol. Fisher.**. 8: 285-305.

Myers, R.A., M.J. Bradford, J.M. Bridson, and G. Mertz. 1998. Simple dynamics underlie sockeye salmon (*Oncorhynchus nerka*). **Can. J. Fish. Aquat. Sci.** 55: 2355-2364.

Myers, R.A., and G. Mertz. 1998. The limits of exploitation: a precautionary approach. **Ecol. Appl.** 8: s165-s169.

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Hammill, M.O., G.B. Stenson, R.A. Myers and W. Stobo. 1998. Pup production and population trends of the grey seal (*Halichoerus grypus*) in the Gulf of St. Lawrence. **Can. J. Fish. Aquat. Sci**. 55: 423-430.

Mertz, G., and R.A. Myers. 1998. A simplified formulation for fish production. **Can. J. Fish. Aquat. Sci**. 55: 478-484.

Fogarty, M.J. and R.A. Myers. 1998. Implications of localized stocks for analysis of fisheries catch and survey data. in Hunt von Herbing, I., I. Kornfield, M. Tupper, and

J. Wilson (eds.) 1998. The implications of localized fishery stocks. **NRAES**. 118: 144-148.

Myers, R.A. and G. Mertz. 1997. Maximum population growth rates and recovery times for Atlantic cod (*Gadus morhua*). **Fish. Bull.** 95: 762-772.

Myers, R.A. 1997. Comment and reanalysis: paradigms for recruitment studies. **Can. J. Fish. Aquat. Sci.** 54: 978-981.

Myers, R.A., M.J. Bradford, J.M. Bridson, and G. Mertz . 1997. Estimating delayed density-dependent mortality in sockeye salmon, *Oncorhynchus nerka*; a meta-analytic approach. **Can. J. Fish. Aquat. Sci.** 54: 2449-2463.

Myers, R.A., G. Mertz, J.M. Bridson. 1997. Spatial scales of interannual recruitment variations of marine, anadromous, and freshwater fish. **Can. J. Fish. Aquat. Sci.** 54: 1400-1407.

Myers, R.A., M.O. Hammill and G.B. Stenson. 1997. Using mark-recapture to estimate the numbers of a migrating stage-structured population. **Can. J. Fish. Aquat. Sci.** 54: 2097-2105.

Montevecchi, W.A., and R.A. Myers. 1997. Centurial and decadal oceanographic influences on changes in northern gannet populations and diets in the north-west Atlantic: Implications for climate change. **ICES J. Mar. Sci.** 54: 608-614.

Montevecchi, W.A., and R.A. Myers. 1997. Oceanographic influences on changing trophic interactions of marine birds in the northwest Atlantic. **ICES J. Mar. Sci.** In press.

Mertz, G., and R.A. Myers. 1997. Influence of errors in natural mortality estimates in cohort analysis. **Can. J. Fish. Aquat. Sci.** 54: 1608-1612.

Myers, R.A. and H. Hoenig. 1997. Direct estimates of gear selectivity from multiple tagging experiments. **Can. J. Fish. Aquat. Sci.** 54: 1-9.

Stenson, G.B., R.A. Myers, I-H. Ni, and W.G. Warren. 1997. Pup production and population growth of hooded seals (*Cystophora cristata*) near Newfoundland, Canada. **Can. J. Fish. Aquat. Sci.** 54 (Supplement 1): 209-216.

Myers, R.A., J.A. Hutchings, and N.J. Barrowman. 1997. Why do fish stocks collapse? The example of cod in eastern Canada. **Ecol. Appl.** 7: 91-106.

Myers, R.A., N.J. Barrowman, and J.A. Hutchings. 1997. Inshore exploitation of Newfoundland Atlantic cod (*Gadus morhua*) since 1948 as estimated from mark-recapture data. **Can. J. of Fish. Aquat. Sci.** 54 (supplement 1): 224-235.

Barrowman, N.J., and R.A. Myers. 1996. Estimating tag shedding rates for experiments with multiple tag types. **Biometrics** 52: 1410-1416.

Myers, R.A., N.J. Barrowman, J. Hoenig, and Z. Qu. 1996. The collapse of cod in eastern Canada: the evidence from tagging data. **ICES J. Mar. Sci.** 53: 629-640.

Mertz, G., and R.A. Myers. 1996. Influence of fecundity on recruitment variability of marine fish. **Can. J. Fish. Aquat. Sci.** 53: 1618-1625.

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Myers, R.A., and N.J. Barrowman. 1995. Time series bias in the estimation of density-dependent mortality in stock-recruitment models. **Can. J. Fish. Aquat. Sci.** 52: 223-232.

Myers, R.A. 1995. Recruitment of marine fish: the relative roles of density-dependent and density-independent mortality in the egg, larval, juvenile stages. **Mar. Ecol. Prog. Ser.** 128: 308-309.

Montevecchi, W.A., and R.A. Myers. 1995. Dietary changes of seabirds indicate shifts in pelagic food webs. **Sarsia** 80: 313-322.

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Myers, R.A., and N.G. Cadigan. 1995. Was an increase in natural mortality responsible for the collapse of northern cod? **Can. J. Fish. Aquat. Sci.** 52: 1274-1285.

Myers, R.A., and N.G. Cadigan. 1995. Statistical analysis of catch at age data with correlated errors. **Can. J. Fish. Aquat. Sci.** 52: 1265-1273.

Mertz, G., and R.A. Myers. 1995. Estimating the predictability of recruitment. **Fish. Bull.** 93: 657-665.

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Montevecchi, W.A., and R.A. Myers. 1995. Prey harvests of seabirds reflect pelagic fish and squid abundance on multiple spatial and temporal scales. **Mar. Ecol. Prog. Ser.** 117: 1-9.

Hutchings, J.A., and R.A. Myers. 1994. What can be learned from the collapse of a renewable resource? Atlantic cod, *Gadus morhua*, of Newfoundland and Labrador. **Can. J. Fish. Aquat. Sci.** 51: 2126-2146.

Mertz, G., and R.A. Myers. 1994. The ecological impact of the Great Salinity Anomaly in the northern Northwest Atlantic. **Fish. Oceanogr.** 3: 1-14.

Mertz, G., and R.A. Myers. 1994. Match/mismatch predictions of spawning duration versus recruitment variability. **Fish. Oceanogr.** 3: 236-245.

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