2008-2009 Report

Fisheries Centre
The University of British Columbia

restoring fisheries
conserving aquatic life
rebuilding ecosystems
researching the options
Table of Contents

Director’s Introduction 2
Fisheries Centre Mission and Activities 3

Research Units
Aboriginal Fisheries 4
Ministry of Environment 5
Quantitative Modeling Group 6
Fisheries Economics Research Unit 8
Marine Mammal Research Unit 10
Project Seahorse 12
Sea Around Us Project 14
Policy and Ecosystem Restoration in Fisheries 16

Graduate Studies 18
Graduate Students 19
Graduate Theses Completed 24

Fisheries Centre Members 26
Core Faculty 26
Associated UBC Faculty 26
Emeritus Members 26
Adjunct Professors 26
International Advisory Council 27
FC Office Staff 27

Publications
Articles in Refereed Journals 28
Books and Technical Reports 34
Fisheries Centre Research Reports 34
Chapters in Books and Technical Reports 35
Miscellaneous Publications 38

Fisheries Centre Visitors 41
Funding 42
Director’s Introduction

The years 2008 and 2009 have been exciting in a number of ways. First, we hired, jointly with the Department of Zoology, Dr. David Close to the position of Assistant Professor and Distinguished Science Professor of Aboriginal Fisheries. This appointment provided faculty-level leadership to our Aboriginal Fisheries Research Unit and increased the number of faculty at our Centre to 10, a critical mass that would allow us to do even more! Second, Dr. Daniel Pauly finished his term as director and I was appointed. Third, our Centre underwent the usual 5-year review of academic units at UBC, which came just in time to give the new director some great ideas on how to keep up and improve the good work of the Centre.

The Review Committee acknowledged our outstanding scholarly productivity while at the same time highlighting some of the areas that we, as a Centre, need to improve upon. The Review Committee report states “The scholarly productivity of the Fisheries Centre (FC) is exceptional and internationally recognized. However, the FC does not function as a unit with a common mission. All the indicators of scholarly productivity for FC faculty, scientific staff and students are very strong”.

We recognize that we could work more as a unit with a common mission and we have, since the review, put in place initiatives that will help us address this and other concerns of the Review Committee. The strategy has been to create avenues, both social and academic, where members of the centre can interact, with the hope that this will lead to more collaboration. We have also created various committees, with membership drawn from students, staff and faculty, that allow as many of our members as possible to be involved in the running of the Centre.

We continue to make strong scholarly contributions to work on fish and fisheries both nationally and internationally through our prolific publication records, extensive teaching and training programs, and our wide-ranging outreach activities, as documented in the rest of this Report.

I wish to use this opportunity on behalf of the former director Dr. Daniel Pauly and myself to thank all our members for the outstanding performance of the last two years.

I look forward to many more promising years for the Fisheries Centre and all its members.

Dr. Rashid Sumaila
Director and Associate Professor
UBC Fisheries Centre
Fisheries Centre Mission and Activities

We recall the Fisheries Centre’s mission statement, which was developed in 1993, slightly modified since, and still relevant today:

*Our planet’s fisheries have reached their ecological limits. As benefits from traditional resources decrease, pressure grows to exploit other resources, a process not necessarily compatible with ecosystem health.*

*Policy and planning for ecosystem-based management must then be informed by knowledge of the interplay of human, biotic and environmental factors that affect ecosystem structure and function. Key requirements are sufficient time-depth to capture biodiversity, abundance and trophic structure prior to depletion, identification of the full range of benefits that healthy ecosystems provide to present and future generations and integration of the fine-scale knowledge of the maritime community with large-scale national and international fisheries management.*

*The Fisheries Centre promotes multidisciplinary study of aquatic ecosystems and broad-based collaboration with maritime communities, government, NGOs and other partners. We believe that the social capital developed through collaboration and the intellectual capital that increased knowledge of ecosystem function and values represents can lead to the re-investment in natural capital necessary to conserve and restore aquatic systems.*

As previously, this mission inspired, in 2008 and 2009, numerous research and outreach activities, both in-house and linked with outside organizations (see list of publications, p. 28-39). This research and these outreach activities included convening international and domestic conferences and workshops, drawing researchers and policy-makers from around the world and locally. However, our emphasis remained on the instructional supervision of master’s and doctoral students (see p. 18-25 or [www.fisheries.ubc.ca/students](http://www.fisheries.ubc.ca/students)).

To document these activities, in 2008-2009, the Fisheries Centre published 14 *Fisheries Centre Research Reports* ([www.fisheries.ubc.ca/publications/reports/fcrr.php](http://www.fisheries.ubc.ca/publications/reports/fcrr.php)) and 19 items in our *Working Paper Series* ([www.fisheries.ubc.ca/publications/working](http://www.fisheries.ubc.ca/publications/working)), both often serving as basis for subsequent submission to peer-reviewed literature. Also, we continued to publish *FishBytes* ([www.fisheries.ubc.ca/publications/fishbytes](http://www.fisheries.ubc.ca/publications/fishbytes)), the Centre’s bimonthly newsletter, which has been produced and distributed internationally since 1995.

The Centre continued to host a weekly seminar from September to April, funded in part by the Province of British Columbia Ministry of Environment. The seminar allows the Centre to bring speakers from Canada and abroad, while providing our students with a forum for peer review of their work in progress (see box). The Centre also hosted dozens of short and long-term Canadian and international visitors, who shared their expertise with the members (see p. 41). The Fisheries Centre also hosts a prestigious lecture series, the Larkin Lectures ([www.fisheries.ubc.ca/events/lectures](http://www.fisheries.ubc.ca/events/lectures)), held in memory of the late Professor Peter Larkin and funded through an endowment established by his colleagues, family, and friends. The Larkin Lecture for the 2008-2009 period was by Dr Ana Parma (2009; *Sustainability in small-scale fisheries: no recipe but one - play with the full deck*).

We are gratified by the increased recognition of our activities, detailed in the next pages.

---

The Fisheries Centre Friday seminars:
Stimulating minds, stomachs and community

The Fisheries Centre seminars, held Fridays from 11am-12pm during the winter session, are a weekly opportunity for the members of the Fisheries Centre to share in the latest aspects of fisheries research and to fuel the esprit de corps of the Centre (the donuts beforehand only fuel the corps). The lecture series, organized by a current graduate student, is also offered as a course (FISH 500) for incoming Fisheries Centre students intended to foster critical thinking about the presentations. Each student is also expected to take the stage and reveal his or her own plans for future research.

The diversity of speakers is wide; from quantitative modelers to NGO staff to the students themselves, the Fisheries Centre has benefited from the insights of a number of brilliant speakers. For instance, the 2008-2009 academic year began with David Close’s discussion of Pacific Lamprey and associated tribal restoration initiatives. The second term opened with Tom Reimchen’s talk: “Partitioning sources of fish mortality in an intact lake ecosystem.” In the fall of 2009, Tony Farrell discussed sea lice on juvenile pink salmon, and in the second term, Gordon Munro presented “Limits to the privatization of fishery resources.”

Fisheries Centre seminar coordinators:
Sarika Cullis-Suzuki (2007-2008) and Brooke Campbell (2009)
The Aboriginal Fisheries Research Unit (AFRU) conducts research to support more effective ecosystem and aquatic resource management, using a multi-disciplinary approach directed toward the maintenance of sustainable aquatic resources that support aboriginal communities. The AFRU focuses research in the areas of aquatic chemical ecology, fish physiology, and the human dimensions of fisheries. The approach is to assess biological questions that are required to improve aquatic resource management.

In 2008, the Fisheries Centre welcomed Dr. David Close, who has since led and developed the AFRU. He is a citizen of the Cayuse Nation located on the Confederated Tribes of the Umatilla Indian Reservation in Oregon.

AFRU reaches out to fisheries organizations and prospective students and two aboriginal students joined the unit during 2009 (see below). Outreach to policy makers within aboriginal communities and the public is also pursued through focused lectures and fisheries meetings, i.e.,

- Presentation entitled “Reintroduction of Pacific lamprey in the upper Umatilla River”, Western Division American Fisheries Society, May 4-9, 2008, Portland, Oregon.
- Presentation on “Tamaalwit, the Sacred Law”, First Nations Fisheries Council Meeting, 2009, Chehalis Band, Sto:lo Nation.

In addition, AFRU continues to develop collaboration and provide advice for First Nations/ Native American Tribes, for example:

- Sto:lo Nation: technical assistance on fisheries;
- Musqueam Nation: meetings on fisheries issues;
- Yakama Nation meeting on fisheries issues;
- Advice to Columbia River Inter-Tribal Fisheries.

The AFRU brought on two new students during 2009:

Brent Roberts - Campbell River Indian Band - is working on stress physiology in lamprey, and Wes Didier - BC Métis - is working on eulachon food web analysis. Both will be using the AFRU laboratory that Dr. Close, who is also affiliated with the Department of Zoology, established in 2008-2009.

In the coming years, the AFRU will continue to vigorously pursue funding from various sources, such that support will be available for more aboriginal graduate students and for postdoctoral fellows, thus turning the AFRU into a regional source of knowledge and initiatives on aboriginal fisheries.

www2.fisheries.com/archive/projects/aborig_new/
The Fisheries Centre houses 12 members of the BC Government, Ministry of Environment Fisheries Science Section. The section conducts research on freshwater fisheries management, fish habitat restoration, fish forestry interactions, and fish culture techniques. In addition, an active focus on conservation biology supports British Columbia’s goal of maintaining and enhancing the province’s fish and wildlife species and their habitats.

British Columbia has over 200,000 small (<1 ha) lakes, hundreds of larger lakes and wetlands, and thousands of kilometres of rivers and streams. This resource is the basis of a sport fishery for more than 400,000 anglers. In addition, abundant freshwater habitats provide spawning and rearing opportunities for British Columbia’s salmon, steelhead and several other fish species native to BC. The province’s complex geography and glaciation history produced a province rich in natural resources and biodiversity. Managing these resources in a sustainable manner requires the development of ecosystem-based management tools along with data and Geographic Information Systems that support government and industry decision-making systems.

Freshwater habitat restoration is an area of research where British Columbia has been a world leader. Defining the relationships between habitat structure, nutrient dynamics and growth and survival of juvenile fish populations has allowed for the development of realistic restoration options for several ‘at risk’ lake and stream-dwelling fish populations.

The partnership between the Province of BC and the Fisheries Centre and other units of the University of British Columbia has resulted in support for hundreds of graduate students as well as fostering a collaborative research environment between government scientists and university faculty for more than 50 years. This association will be of increasing importance as the stresses on our natural environment continue to increase, and the need for science-based decision-making assumes a greater role in government.

www.gov.bc.ca/env
The Quantitative Modeling Group develops innovative assessment methodologies and field programs intended to improve single species and ecosystem management. The group focuses on Bayesian statistical methods and dynamic population models focuses on fisheries risk assessment, estimation, decision analysis and management strategy evaluation. Dr. Villy Christensen (see SAUP pages) participates in this group working on ecosystem modeling and the further development of Ecopath with Ecosim. Partnerships with colleagues within and outside UBC have generated a continuum of projects ranging from factors affecting species composition in small B.C. lakes to ecosystem management in the Gulf of Mexico.

New and continuing projects in 2008-2009

- In collaboration with the Ecosystems Branch of the British Columbia Ministry of Environment individuals within the group are pursuing a number of field based projects which include investigating recruitment failure and restoration options for white sturgeon, angler effort dynamics in small lake systems as well as meta-population structure and factors affecting species composition within these mixed species small lake systems.
- The project with the Ecosystems Branch of the British Columbia Ministry of Environment continues to develop new mark-recapture models to estimate the abundance of Nechako River white sturgeon over the last decade taking into account also recapture effort data and micro-constituent based covariates for immigration and emigration.
- Members of the group continue to participate in the POST project (http://www.postcoml.org) exploring the critical issue of downstream migration and early ocean survival of salmonid smolts. Dr Mike Melnychuck recently defended his PhD thesis on estimating survival rates in juvenile salmonids.
- Projects in collaboration with the NMFS in Honolulu Hawaii explore assessment and management options for the data limited Hawaiian bottomfish fishery as well as the influence of meta-population structure on the assessment and management of the Hawaiian lobster fishery.
- Members collaborate with the Canadian department of Fisheries and Oceans on the joint statistical committee for Pacific hake assessment and have developed simulations to explore the potential effects on wild populations of introduced genetically modified salmonids.
- Ongoing studies of the Grand Canyon are aimed at understanding endangered species responses to ecosystem dynamics within regulated systems, improving stock assessments, as well as factors influencing recruitment dynamics, growth, survival, and ontogenetic habitat movement of salmonids.
- An ecosystem management project for the Gulf of Mexico utilizes Ecopath with Ecosim to explore tradeoffs between commercial and recreational fisheries and impacts of shrimp and menhaden fisheries on other fisheries.
- Individuals participate in a PEW and Lenfest funded program investigating the issue of dedicated access in global fisheries.
- NMFS and the PFRP sponsor a global scale analysis of the status of large pelagic predators and management options for reducing fishing mortality.
Recent collaboration with Barbara Block at the Hopkins Institute of Marine Science has resulted in the development of stock assessment methods for Atlantic bluefin tuna incorporating start and endpoint tag recovery data from conventional and PSAT tagging programs. A new project funded by the Lenfest Ocean Program extends this collaboration to develop stock, area, and seasonally-structured stock assessment models that are fitted to PSAT tag track and conventional tagging data records and genetic stock identification of individual tagged fish. Similar stock assessment models that are fitted to similar data for Pacific bluefin tuna are also to be developed.

In collaboration with University of Washington, University of Florida, and USGS scientists, improved methods for fitting bioenergetics models to growth data from size-age and tagging studies are being developed; these methods promise to provide better estimation of seasonal changes in metabolic and feeding rates of fish.

Funding from the UK Game and Wildlife Conservation Trust is directed towards developing Bayesian assessment models to evaluate alternative management strategies for the control of red fox populations in the UK.

An Environmental Defense funded project aims to develop simulation models to evaluate the potential consequences of alternative harvest management policy options for Gulf of Mexico shrimp fisheries. The models developed will account for several different shrimp species harvested and the seasonal and spatial aspects of shrimp population dynamics and fishery operations. Feed-back control policies that are based on annual and possibly in-season stock assessments of the main shrimp populations are also to be evaluated.

Carl Walters is now the Grand Canyon Senior Ecologist, providing stock assessment and ecosystem modeling advice.

Carl Walters is leading an advisory panel for the Billfish Foundation to develop approaches for improving fisheries management in the Golfo Dulce, Costa Rica.

A Netherlands Environmental Assessment Agency funded project on the Global Biodiversity Outlook.

Ecosystem modeling in the Baltic Sea funded by the Environmental Protection Agency, Sweden.

A Lenfest Ocean Program project on improving ecosystem-based management of the Peruvian anchovy fishery using Management Strategy Evaluation.

A project on the Gulf of Mexico Reef fishery examining delayed-density dependence in snapper and the multi-species grouper fishery.
The Fisheries Economics Research Unit (FERU) has been very busy over the last two years. The total number of students affiliated with FERU has increased to ten - eight of whom are full-time PhD students. As a testament to the quality of FERU graduates, two of our current PhD candidates have secured employment - one with the Department of Oceans and Fisheries Canada, the other with Hokkaido University, Japan - even before defending their theses. The research group has also had welcome increases in it’s full-time research staff with the addition of researcher Andrew Dyck and post-doctoral researchers Dr. Henrik Österblom and Dr. Ling Huang.

The Fisheries Economics Research Unit has been instrumental in shaping fisheries policy around the globe. Indeed, in the past two years FERU members have been involved in more than 20 journal papers, several book chapters and other publications. Some important contributions by FERU members over the past two years include:

1. Participated in “End of the Line” documentary, described by the Economist as the “inconvenient truth of fisheries” – Appearance by Rashid Sumaila
2. Omega 3 paper – co-authored by Rashid Sumaila
3. NAAFE Special Session on Global Ocean Economics Project – several of our members made presentations
4. Participation at a meeting at the British House of Commons on marine ecosystem management and conservation
5. Won a Leopold Leadership Fellowship
6. Won a Pew Fellowship for Marine Conservation
7. Visited the US Congress and made presentation to Congressman from Washington State and several congressional aides
8. Appears in a video with several notable celebrities including Leonardo DiCaprio and Prince Charles on the health of the earth’s oceans and climate change
9. Participated in a YouTube video with the WTO Boss, Pascal Lamy and the Executive Director of United Nations Environment Programme (UNEP), Achim Steinar.
10. Former Graduate (Ahmed Khan) co-authors paper on global seafood sustainability in Science magazine’s policy forum.

FERU members cover a diverse range of topics, in the past two years, in particular, these diverse interests have begun fleshing out the group’s global vision. Global databases of landed value, fishing costs, subsidies, employment and recreational fishing combined with micro-level studies in regions from British Columbia, Canada to Malaysia and Samoa display that the Fisheries Economics Research Unit’s collective understanding of the economics of world fisheries are unparalleled. The research interests of current FERU members are outlined on the adjacent page.
Ben: Valuation of direct uses of Fiji's coral reef ecosystems
Louise: Socio-economic factors that effect small-scale fishing activities
Nigel: Incorporating cultural and spiritual values into decision-making
Dale: Bioeconomic modeling of Fraser River sockeye salmon
Gaku: Bioeconomic and game theoretic model of Pacific sardine
Megan: Game-theoretic analysis of resource allocation with multiple objectives
Roseti: Spatial modeling of W. Central Pacific tuna
Andres: Estimation of global recreational fishing activity
Wilf: Mapping of international trade and consumption of fisheries products
Ling: Econometric fisheries applications
Andrew: Economic impact analysis of world fisheries
Liesbeth: Analysis of the retail trade of fisheries products
Henrik: IUU fishing
Gordon: Subsidies and access rights to fisheries
Rashid: All of the above and the study of discounting and natural resource sustainability

We wish to thank our collaborators and partners both in research and funding, especially, the Sea Around Us project, the Pew Charitable Trusts, Conservation International, SSHRC, WWF, Kingfisher Foundation.

www.feru.org
The Marine Mammal Research Unit (MMRU) is an integral component of the Fisheries Centre and works with other departments and institutions, combining specialties in a coordinated effort to provide independent research and advice on matters related to marine mammals. Members investigate interactions between humans and marine mammals, marine mammals as indicators of ecosystem change, and the natural history, biology and conservation of marine mammals. MMRU research focuses on five areas: population dynamics, energetics and physiology, dietary analyses, behaviour and ecology, and simulation modeling. The multi-disciplinary research program addresses these questions through captive and field studies, data and laboratory analyses, and publications and outreach.

Captive animal studies. Four Steller sea lions and six northern fur seals housed at the Vancouver Aquarium participated in studies to investigate a number of hypotheses explaining their population declines in the wild. Controlled feeding experiments with the Steller sea lions examined different diet regimes (through changes in food intake or food quality) on aspects of health, hormone balance and reproduction. Experiments also tested and refined a number of techniques to estimate energy expenditure in wild sea lions (e.g., accelerometers and heart rates), and to detect prey composition (e.g., via DNA analysis and changes in tissue biochemistry). Studies with the young northern fur seals determined how these animals survive in the cold North Pacific in their first years of life. Five additional sea lions swam and dove freely while accompanying scientists in the field at the Open Water Research Station in Port Moody. The Open Water studies investigated diving physiology, energetics, and swimming biomechanics, with the ultimate aim of determining foraging decisions and food requirements of the wild population. The animals also tested and validated a number of technologies that can be used to study the foraging behaviour of sea lions in the wild. Collectively, the captive animal studies are resolving questions concerning the nutritional and energetic consequences for marine mammals facing changes in their environment, including changes in prey availability. The animals are a valuable scientific resource, and are being studied in collaboration with renowned international scientists.
Field studies. Field work was undertaken in Alaska and British Columbia in 2008 and 2009. Research in Alaska focused on killer whale predation, fur seal foraging behaviour, fur seal growth, and sea lion diets. Field studies in British Columbia focused on sea lion diets, incidence of entanglement, harbour porpoise feeding behaviour, and humpback whale abundance and foraging ecology.

Data analysis. Mathematical models are increasingly used to understand the dynamics of Steller sea lions and their interaction with fisheries. Models were used to identify Steller sea lion critical habitat, as well as the distribution of key fish species consumed by sea lions — with the ultimate goal of estimating the extent of competition between fisheries and sea lions. Other models estimated seasonal patterns of sea lion growth and food consumption, the economic cost to fisheries of marine mammal critical habitat designations, and compared trends in pinniped populations in the eastern North Pacific to determine the relative importance of bottom-up versus top-down factors.

Laboratory analysis. Other studies undertaken in 2008 and 2009 included developing a DNA technique to identify prey from sea lion scats, and assessing whether a relationship exists between diet, stress and population trends and distribution of Steller sea lions. We also continued a collaborative study with the Faculty of Engineering to develop an implantable tag to track sea lions.

Publications and Outreach. MMRU researchers published 34 papers during the past two years. Administratively, MMRU continued to oversee the North Pacific Universities Marine Mammal Research Consortium, which unites marine mammal research at the Universities of Alaska, British Columbia, Washington, and Oregon State. MMRU also continued to host an annual Symposium on B.C. Marine Mammals, which provides a forum for local researchers, members of the fishing industry, ecotourism operators, and the public to meet and discuss current issues and research related to marine mammals in British Columbia. MMRU graduate students also participated in the annual symposium of The Society for Marine Mammalogy’s Student Chapter, Northwest Region, which includes students from universities in Washington, Oregon, B.C., and Alaska.

www.marinemammal.org/MMRU2
Project Seahorse is an interdisciplinary and international organization committed to conservation and sustainable use of the world’s coastal marine ecosystems. Our vision is a world in which marine ecosystems are healthy and well-managed. We cooperate with many stakeholders, collaborators and partners, using seahorses as a focus of our work to find marine conservation solutions. We have active projects in seven countries, but particularly in the Philippines, through our in-country colleagues at the Project Seahorse Foundation for Marine Conservation. We also work locally, documenting, for example, the extent of human impact on British Columbia’s marine environment.

The diversity and quality of Project Seahorse management and research has resulted in international recognition including, in 2008, an award for ‘Best Field Conservation Project’ from the British and Irish Association of Zoos and Aquariums (BIAZA).

Part of our success comes from our appreciation of the interdependencies between marine life and human communities. We begin with biological research and work outwards through concentric rings of pressure on marine populations, actively engaged with ecosystems, fishing and other human impacts, trade in marine products, policy development and public outreach.

Seahorses: Project Seahorse is considered the foremost authority in the world on the family of fish that includes about 300 species of seahorse, pipefish, seadragon and pipehorse (Syngathidae). Project Seahorse Director, Amanda Vincent, was the first biologist to study seahorses underwater, the first to discover their huge trade, the first to identify the threatened status of seahorses, and the first to launch seahorse conservation measures. Most recently, we have been investigating the life history, genetic flow, ecology (specifically movement and spatial use) and conservation of European and Philippines seahorses. In particular, a PhD student completed a thesis showing (among other things) that seahorses, which have extensive parental care, still disperse in the plankton. Another team member produced research identifying five new seahorse species from Indonesian waters and the Red Sea. One of these pygmy species is so small, at 11mm, that it is a contender for the smallest fish species in the world.

Ecosystems: Marine Protected Areas (MPAs) are an important conservation tool for protecting marine ecosystems from overfishing and habitat loss. Project Seahorse has been on the cutting edge of MPA research for over a decade in implementing no-take reserves (more than 33 to date) and testing their effectiveness (using long-term data sets). Our research productivity in this domain continues to grow with the completion of four more PhDs relating to MPAs, one in collaboration with First Nation communities in Canada and three representing a suite of anthropological, ecological and resource management studies.
from the central Philippines. The Philippines’ long cultural experience with marine tenure, identified in the anthropological study, may explain that nation’s advanced engagement with MPAs. We have, further, completed a set of papers that explore the interface between societal and scientific placement of MPAs, recognizing that the former can produce an ecologically valid array of MPAs.

F isheries Assessment: Project Seahorse’s fisheries management efforts are directed at promoting fishing practices that consider impacts on both ecosystems and human communities. Finding a balance requires biological and socio-economic knowledge and integration of research initiatives with marine management. Among other projects, one of our PhD students just defended a thesis investigating bycatch in tropical shrimp fisheries (Mexico) which retains a large number of small species, including seahorses. Another PhD student is evaluating the social and economic impacts of a small-scale fishery involving a threatened seahorse species (Philippines).

C ommunities: Engagement of human communities who depend on marine resources is a critical part of marine conservation. Project Seahorse assists people living in coastal villages in the Philippines, from organizing and empowering local stakeholders to generating action for sustainable management. In particular, Project Seahorse initiated and has fostered an alliance of 1000 small-scale fishing families who have developed the capacity to insist on media and political attention for their management concerns.

T rade: Seahorses are valuable globally and are traded around the world for use in traditional Chinese medicine (TCM), aquaria, and for curiosities. Project Seahorse has long been active in Hong Kong – the world’s largest entrepôt for TCM products - where we have catalyzed the creation of an advisory council comprising the TCM industry, academia, government, public institutions and non-governmental organizations. We have been supporting national agencies responsible for ensuring that exports do not exceed sustainable levels. To this end, we developed a web resource (www.hippocampusinfo.org) for CITES officials, researchers and resource managers.

P olicy: Project Seahorse works with governments and non-governmental organizations to help develop policies with marine conservation benefits. Our technical advice led 172 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) signatory nations to begin, for the first time, regulating international trade in some marine fishes of commercial importance, and catalyzed development of innovative international management measures that serve multiple species simultaneously.

W e are very grateful to all our partner organisations and donors, and particularly to the Zoological Society of London (UK), John G. Shedd Aquarium (USA), and Guylian Chocolates (Belgium) for their extraordinary support.

www.projectseahorse.org
The Sea Around Us is a collaboration between the University of British Columbia in Vancouver, Canada, and the Pew Environment Group, Washington, D.C., USA, devoted to assessing the impact of fisheries on the world’s marine ecosystems, and proposing policies to mitigate these impacts.

The project started in mid 1999, and thus celebrated its tenth anniversary in July 2009. In early 2005, we issued a five-year retrospective which emphasized the wide scope of our work, and our productivity. We recently issued a similar ten-year retrospective, emphasizing that our scope has become even wider, more focused on fisheries economics and public policy, and that our productivity has increased more that threefold – at least as measured by the number of peer-reviewed contributions authored and co-authored by our members. The reason for this massive increase is obvious: it took us several years to create the complex of global databases (and/or GIS ‘layers’) that allow inferences on the global ocean. Now that this complex is in place, it has become more straightforward to see global patterns and/or trends that were previously not visible, to assess them, and to develop policies to deal with them.

Thus, as a first example, we can now deal with global catches not only in term of the ‘official’ global landings assembled and disseminated by the Food and Agriculture Organization of the United Nations, but in terms of their Illegal Unreported and Unregulated (IUU) components, which add to the global catch, and with the fishing effort, the gears and the costs (including subsidies) required to generate that catch, along with its economic value and its disposition through international trade. Also, we can infer long-term trends, because most of our databases start in 1950, and thus span over half a century. Moreover, in some cases where the science allows this, we project these trends into the future.
This applies specially to the studies we performed in 2008-2009 on the potential effects of global warming on biodiversity and fisheries, our second example. The key results we obtained here was that the effects of global warming on marine biodiversity will be major in the Arctic, along the Antarctic Convergence and throughout the intertropical belt, where numerous species will be extirpated in the next half century. For fisheries, we predicted a near constancy of global catches (other things being equal), with increased catches in high northern latitudes, and declining catches in the tropics. However, those results did not yet account for a number of factors, notably reduced oxygen concentrations and acidification, thus providing reasons for more comprehensive analyses in 2010 and beyond.

Illustrating the scope of the Sea Around Us through global ‘layers’, each representing a type of data used and/or contributed to, and which, when jointly analyzed, represent the entire range of ocean issues.

Overall, the availability of the Sea Around Us databases not only allows for more, deeper work by project members, including a host of productive graduate students, but has also generated a flurry of offers of collaboration, resulting in a spectrum ranging from the very fruitful (e.g., with National Geographic) to the sensitive, requiring diplomacy (“No, you can’t have ALL our data, but we can talk about what you actually need, and which you can use given that you give proper credit”). They establish that the Sea Around Us has become an internationally respected player in both the scientific and policy arenas of global fisheries. Not too bad for a ten-year old!

www.seaaroundus.org
Policy and Ecosystem Restoration in Fisheries

Policy and Ecosystem Restoration in Fisheries (PERF) is a research group dedicated to restoring aquatic ecosystems and ensuring sustainable fisheries. By developing integrative research tools for historically-based restoration and ecosystem-based management, PERF aims to devise and evaluate sustainable fisheries policies. The group also explores the human dimensions of fisheries by examining social-economic factors, cultural values, institutions, ethics and governance. Tony Pitcher and his team evaluate the trade-offs associated with policy options using ecosystem simulations, ecological economics, biodiversity and cultural indicators, historical and traditional knowledge, cognitive science and participatory workshops. The group pioneers interdisciplinary research in the theory and practice of restoration ecology for marine and freshwater ecosystems from around the globe and close to home.

We highlight six accomplishments for PERF in 2008-2009: (1) An Exploratory Workshop grant was awarded by the UBC Peter Wall Institute for Advanced Studies, bringing over 50 international participants to discuss the Strait of Georgia. “The Sea Ahead” comprises a new approach to policy that maximizes sustainable future benefits in the face of risks from climate change, while “The Sea Before Us” incorporates historically-based reconstruction research; (2) Two major papers contributing to the development of historically-based restoration theory (Optimal Restorable Biomass and a cost/benefit analysis of restoration) were published in Ecological Modeling with former PERF member Dr Cameron Ainsworth. A comparative analysis of resilience in two coastal communities (BC and Indonesia) using the concept of the Maximum Dexterity Fleet was presented at a conference held at FAO in Rome and later published in Marine Policy; (3) Jamie Slogan organized a 5-day international workshop on Primer 6, a Multivariate Statistics tool for Ecologists and Environmental Scientists.

The next three items extend ‘Rapfish’, a rapid appraisal method invented in the PERF group: (4) Four years of research with Dr Daniela Kalikoski and Pramod Ganapathiraju culminated in an evaluation of compliance by 53 countries with the UN Code of Conduct for Responsible Fisheries published in Nature and detailed in a report published by WWF. In allied work, evaluations of progress in implementing ecosystem-based management were published in Marine Policy; (5) Working with Dr David Agnew and others at the Marine Resources Assessment Group, London, UK, a world-wide estimation of the amount of illegal and unreported fishing was published in PlosOne; (6) The “anchor points/influence factors” semi-Bayesian method, pioneered by PERF, uncovered over 1.5 million tonnes per year of previously unreported catch in the Arafura Sea, Indonesia. Six workshops in the region were led by former member Dr Tonny Wagey, working with an international team of scientists, fishers and FAO.

Robyn Forrest (Australia) successfully completed her PhD thesis on New South Wales shark fisheries and is now a stock assessment scientist with DFO. Megan Moody (Nuxalk Nation and Canada) completed her MSc on eulachon in Pacific coastal marine ecosystems and is now taking up consultancy work on eulachon. Dr Mimi E. Lam joined the PERF group as a Research Associate in 2009. She leads an initiative in the human dimensions of fisheries using theoretical insights from ecology and cognitive science. She organized 3 AAAS symposia and currently chairs the Traditional Ecological Knowledge Section of the Ecological Society of America (ESA) and is profiled in ESA's Focus on Ecologists series. Dr Lam is Guest Editor of an Ecology and Society Special Feature, “The Privilege to Fish”, and gave two invited presentations at the Ocean.
Management Research Network 2009 conference in Ottawa. Her recent grants are from the Gordon and Betty Moore Foundation, UBC, the BC Ministry of Advanced Education and ESA.

Eny Buchary (PhD student: Indonesia) completed her thesis on a traditional sardine fishery in the Bali Strait, Indonesia. The work identified policy options for responsible use of sardine resources by exploring issues in multiple domains: biological, ecological, socio-cultural, economic and institutional. Part of the work was presented at a conference at FAO, Rome. She gained travel awards from GLOBEC and SSHRC.

Dawit Tesfamichael (PhD student: Eritrea) researches the past, present and future of Red Sea fisheries. He uses evaluation and modeling techniques from Rapfish, ecosystem simulation, and the estimation of illegal, unreported and unregulated (IUU) catch, informed by his extensive fieldwork and interview data from coastal communities throughout the region.

Divya Varkey (PhD student: India) works on modeling and ecosystem-based management of coral reef fisheries, sponsored by a Packard EBFM project in Raja Ampat, West Papua, Indonesia. She helped to organize “Oceans Past II”, an international conference on the history (and future) of marine animal populations (HMAP); “The Sea Ahead”, a workshop using history to plan the future of fisheries in the Strait of Georgia; and “Ecopath 25 years”, an international conference. She published an analysis of IUU in Raja Ampat and was awarded a UBC Scholarship and the John R Grace Fellowship.

Carie Hoover (PhD student: USA) researches the ecosystem effects of climate change in the Antarctic Peninsula and Hudson Bay. Global climate forecasts are integrated with ecosystem simulations showing how top predators may be impacted. The Hudson Bay research is in collaboration with DFO, Winnipeg as part of an International Polar Year project: Global Warming and Arctic Marine Mammals. She has also expanded her research to include an economic analysis of whale hunts in Nunavut to show its importance to regional communities.

Pramod Ganapathiraju (PhD student: India) works on illegal fishing and factors contributing to compliance with the UN Code of Conduct for Responsible Fishing. Pramod spent 11 months performing fieldwork in India, sponsored by the 2007 Cosmos International Travel Award, MRAG Ltd. and the UK Government. Interviews and estimates of IUU were made in all of the maritime coastal states of India, including the remote Andaman Islands, where illegal fishing appears to be rife. Final estimates of total catches identify over a million tonnes per annum of unreported catch.

Rajeev Kumar (PhD student: India) built and fitted a detailed ecosystem model for Mille Lacs Lake, Minnesota. During field trips to the site, he liaised with the Department of Natural Resources, the sponsor for this research, on the choice of model parameters and practical research questions to be addressed. Rajeev also presented new software to display the diet matrix in ecosystem modelling at a software conference in Portland, Oregon.

Lydia Teh (PhD student: Canada/Malaysia) continued her fieldwork tracking habitat and fishing grounds use by small-scale fishers in the Semporna Islands and Pulau Banggi, Sabah, Malaysia. She is using the data to develop a fuzzy logic approach to the establishment of MPAs. Lydia’s fieldwork is sponsored by the 2008 UBC Cosmos International Travel Award.

Lingbo Li (PhD student: China) works on modeling the lower trophic levels in the Strait of Georgia ecosystem and was awarded an NSERC Postgraduate Scholarship. She attended the 17th Annual BC Marine Mammal Symposium in Vancouver, a GLOBEC meeting in Victoria, the Puget Sound Georgia Basin Ecosystem Conference in Seattle, and the Canadian Conference for Fisheries Research in Halifax.

Jamie Slogan (PhD student: Canada) joined the PERF group to research the long-term community dynamics of intertidal and sub-tidal marine species on fish compensation habitat in Burrard Inlet. Jamie dives and works with EBA Engineering Consultants Ltd, a company responsible for the restoration of the shoreline at the Vancouver Convention Centre. He has been awarded an NSERC Industrial Post-Graduate Scholarship and an Al MacDonald Life-long Learning Award.
Graduate Studies

Fisheries Centre students come from all over the world. The 48 PhD and 25 MSc students at the FC during 2008 and 2009 came from at least 25 countries: Australia, Brazil, Canada, Chile, China, Eritrea, France, Germany, Hong Kong, India, Indonesia, Italy, Japan, Kuwait, Malaysia, Mexico, New Zealand, Northern Ireland, Philippines, Peru, Samoa, Singapore, South Africa, the United Kingdom, and the USA. Since the Fisheries Centre is not an admitting unit at UBC, our students are supervised or co-supervised by a FC faculty member, and admitted to UBC Graduate Studies through other departments, primarily Resource Management and Environmental Studies (RMES) and Zoology, but also Geography and Oceanography. Over the past two years, RMES and Zoology have provided a second home to 37% and 58% of FC students, respectively, with the rest finding second homes at other departments.

Students’ research covers a wide range of topics related to the FC Mission: Restoring fisheries, conserving aquatic life, rebuilding ecosystems: Researching the options. Student research topics usually comprise knowledge from a variety of disciplines. Thesis topics include understanding species life history and population dynamics of key resource species; fisheries, ecosystem and bioeconomic modeling; quantifying the impacts of overfishing, non-selective fisheries and climate change; evaluating possible mitigation tools and policy options; historical reconstructions and future projections of populations and catches; and economic valuations.

During 2008 and 2009, 15 doctoral and 10 master’s students completed their thesis research. A list of these graduates and their thesis titles is on pages 24-25. Thesis abstracts can be seen at www.fisheries.ubc.ca/graduated.php. Since 2008, all UBC PhD graduates have prepared short lay-language summaries describing their doctoral research. Fisheries Centre summaries are at www.fisheries.ubc.ca/FCdoctoralcitations.

In addition to their research efforts, students play an important role in the day to day life of the Fisheries Centre. A student representative participates in faculty meetings thereby ensuring that students’ interests are considered in all decision making. Students organize the weekly FC Seminar Series and coffee breaks, help out with events such as the biennial Larkin Lecture and holiday celebrations, coordinate building-wide composting, edit FishBytes and the newsletters of various groups, and coordinate fora for discussion.

Fisheries Centre students are known to tackle rather ambitious projects that often involve travel to far parts of the globe. In the field, students gain hands-on experience with the fauna, markets, fishery systems, etc., that are the focus of their research. Our students are gaining an increased understanding of the implications of their work for all stakeholders involved. Engaging in diverse projects spanning the globe has allowed our students to make strong connections with their global peers, working alongside NGOs, local communities, fishing industry associations and scientists. Despite the diversity of students’ research and field sites, the overarching perspective echoes the Fisheries Centre’s goal to reconcile fisheries and conservation.

To achieve its goal, the Fisheries Centre promotes the multidisciplinary study of fisheries, and aims to provide its graduate students with a strong background in quantitative aspects of fishery science and in all aspects of aquatic conservation biology. Analytical tools developed in a broad spectrum of parent subjects, including biology, oceanography, economics, engineering, mathematics, sociology, planning and policy are employed in order to assess, appraise and forecast the impacts of both human and natural processes on fishery resources. Fisheries policy and management problems under study include assessment and management of artisanal and commercial food capture fisheries, recreational fisheries, coastal and watershed management, aquaculture biology and engineering, conflict resolution and the co-management of shared fishery resources, and the conservation of endangered exploited species in both marine and freshwater environments. Faculty members teach a number of graduate credit courses, on such topics as quantitative analysis and modeling, economics, and aquatic policy. These FISH courses are detailed on the graduate program web page www.fisheries.ubc.ca/grad.
**Graduate Students**

Robert Ahrens (Canada)
PhD Zoology (start 2004*)
**Project:** Global analysis of apparent trends in abundance and recruitment of tunas and billfish vulnerable to pelagic longline gear.
**Supervisors:** Dr Carl Walters and Dr Villy Christensen

Dalal Al-Abdulrazzak (Kuwait)
MSc Zoology (start 2009)
**Project:** Historical ecology of Persian Gulf fisheries
**Supervisor:** Dr Daniel Pauly

Pamela Allen (Canada)
MSc Zoology (start 2006*)
**Project:** Quantifying seasonal changes in growth and consumption of Steller sea lions from captive records
**Supervisor:** Dr Andrew Trites

Jonathan Anticamara (Philippines)
PhD RMES (start 2002*)
**Project:** Ecology and implications of recovering degraded reef communities within no-take marine reserves
**Supervisor:** Dr Amanda Vincent

Elizabeth Atwood (USA)
MSc Zoology (start 2008)
**Project:** Investigating nutritional stress in Northern Fur Seals
**Supervisor:** Dr Andrew Trites

Megan Bailey (Canada)
PhD RMES (start 2008)
**Project:** Economics of tuna fisheries in the western and central Pacific Ocean
**Supervisor:** Dr Rashid Sumaila
FishBytes Editor 2009

Natalie Ban (Canada)
PhD RMES (start 2003*)
**Project:** Multiple perspectives for envisioning marine protected areas
**Supervisor:** Dr Amanda Vincent

Brajgeet Bhathal (Canada)
PhD Zoology (start 2005)
**Project:** Analysis of fishing impacts on India’s marine ecosystems and exploration of possible policy scenario
**Supervisor:** Dr Daniel Pauly

Louise Blight (Canada)
PhD Zoology (start 2007)
**Project:** Using stable isotope analysis to compare ancient and modern change events in marine foodwebs [transferred to Forestry in 2008]
**Supervisor:** Dr Amanda Vincent

Ella Bowles (Canada)
MSc Zoology (start 2007*)
**Project:** Quantifying Steller sea lion diet using real-time PCR
**Supervisors:** Dr Andrew Trites and Dr Trish Schulte

Lucas Brotz (Canada)
MSc Oceanography (start 2007)
**Project:** Trends in global jellyfish populations
**Supervisors:** Dr Daniel Pauly and Dr Evgeny Pakhomov

Eny Buchary (Indonesia)
PhD RMES (start 2001*)
**Project:** In search of viable policy options for responsible use of marine resources in the Bali Strait, Indonesia
**Supervisor:** Dr Tony Pitcher

Iain Caldwell (Canada)
PhD Zoology (start 2006)
**Project:** Movement of a sedentary fish in response to environmental change
**Supervisor:** Dr Amanda Vincent

Brooke Campbell (Canada)
MSc RMES (start 2007)
**Project:** Clarifying historic trends in the marine aquaculture sector: a spatially-refined bottom-up reconstruction of global production
**Supervisor:** Dr Daniel Pauly

* Thesis completed December 2009
Luciano Dalla Rosa (Brazil)
PhD Zoology (start 2003*)
Project: Habitat modeling of humpback whales in British Columbia and the Antarctic
Supervisors: Dr John Ford and Dr Andrew Trites

Sarika Cullis-Suzuki (Canada)
MSc Zoology (start 2006*)
Project: Effectiveness of regional fisheries management organizations
Supervisor: Dr Daniel Pauly

Luciano Dalla Rosa (Brazil)
PhD Zoology (start 2003*)
Project: Habitat modeling of humpback whales in British Columbia and the Antarctic
Supervisors: Dr John Ford and Dr Andrew Trites

Meaghan Darcy (USA)
PhD Zoology (start 2005)
Project: Management strategy evaluation for a multi-species, multi-sector fishery in the Hawaiian Islands
Supervisor: Dr Steve Martell

Wes Didier (USA)
PhD Zoology (start 2005)
Project: Testing for stresses that may be affecting fecundity of eulachon
Supervisor: Dr David Close

Robyn Forrest (Australia)
PhD RMES (start 2002*)
Project: Simulation models for strategic E-B decision-making in the data-limited fisheries of New South Wales, Australia
Supervisor: Dr Tony Pitcher
Fishbytes Editor 2008

Sarah Foster (Canada/New Zealand)
PhD RMES (start 2004*)
Project: Assessing the impacts of shrimp trawling on small fish species
Supervisor: Dr Amanda Vincent

Pramod Ganapathiraju (India)
PhD RMES (start 2005)
Project: A global study on incentives and disincentives to IUU fishing and compliance with the FAO Code of Conduct
Supervisor: Dr Tony Pitcher

Rhona Govender (South Africa)
MSc Zoology (start 2008)
Project: A global estimate of the catch of small-scale fisheries
Supervisor: Dr Daniel Pauly

Eli Guieb (Philippines)
PhD McGill (start 2002*)
Project: Cultural issues behind marine protected areas
Supervisors: Dr Amanda Vincent, Dr Colin Scott and Dr Monica Mulrennan

Nigel Haggan (Northern Ireland)
PhD RMES (start 2006)
Project: Mapping cultural and spiritual values of coastal ecosystems
Supervisor: Dr Rashid Sumaila

Anna Hall (Canada)
PhD Zoology (start 2004)
Project: Effects of tidal mixing on porpoise distribution: Implications for foraging
Supervisor: Dr Andrew Trites

Mike Hawkshaw (Canada)
MSc Zoology (start 2008)
PhD Zoology (start 2005*)
Project: Inter-cohort density dependence and cyclic age zero survival of cyprinids
Supervisor: Dr Carl Walters

James Hehre (USA)
PhD Zoology (start 2009)
Project: Ecological impacts of seaweed farming on coral reefs in the central Philippines
Supervisor: Dr Amanda Vincent

Carie Hoover (USA)
PhD RMES (start 2006)
Project: Effects of climate change on polar ecosystems
Supervisor: Dr Tony Pitcher
Rajeev Kumar (India)
PhD RMES (start 2006)
Project: Simulation modeling of Mille Lacs Lake ecosystems in support of EBM
Supervisor: Dr Tony Pitcher

Megan Moody (Canada)
MSc RMES (start 2004*)
Project: Historical analysis of current and past Pacific Coast eulachon status and the possible reasons for its decline
Supervisor: Dr Tony Pitcher

Gakushi Ishimura (Japan)
PhD RMES (start 2004*)
Project: Economic analysis of Pacific sardine fisheries
Supervisor: Dr Rashid Sumaila

Jennifer Jacquet (USA)
PhD RMES (start 2005*)
Project: Fish as food in an age of globalization
Supervisor: Dr Daniel Pauly

Aaron Keech (USA)
MSc Zoology (start 2005*)
Project: Analyses of corticosterone and triiodothyronine hormones to assess nutritional stress in Steller sea lions
Supervisor: Dr Andrew Trites

Danika Kleiber (Canada/USA)
PhD RMES (start 2009)
Project: Gender, marine resource use and community conservation in the Danajon Bank, Central Philippines
Supervisor: Dr Amanda Vincent

Josh Korman (Canada)
PhD Zoology (start 2005*)
Project: Factors in influencing recruitment dynamics, growth, survival, and ontogenetic habitat movement of salmonids in large river systems
Supervisors: Dr Steve Martell and Dr Carl Walters

Vicky Wing Yee Lam (Hong Kong)
PhD RMES (start 2008)
Project: Global fisheries economics in the face of change in climate and energy prices
Supervisor: Dr Rashid Sumaila

Pamela Lestenkof (USA)
MSc Zoology (2004)
Project: Fine scale diving behaviour of lactating northern fur seals [withdrew in 2009]
Supervisor: Dr Andrew Trites

Lingbo Li (China)
PhD Zoology (start 2008)
Project: Examining climate change impacts on the Strait of Georgia marine ecosystem
Supervisor: Dr Tony Pitcher

Rachael Louton (USA)
PhD Zoology (start 2007)
Project: Evaluation of alternative management regimes for shrimp fisheries in the Gulf of Mexico
Supervisor: Dr Murdoch McAllister

Dale Marsden (Canada)
PhD RMES (start 2003)
Project: Bioeconomic analysis of Fraser River sockeye salmon fisheries management
Supervisor: Dr Carl Walters

Michael Melnychuk (Canada)
PhD Zoology (start 2004*)
Project: Examination of white sturgeon (Acipenser transmontanus) recruitment failure and identification of restoration options
Supervisor: Dr Carl Walters

Tabitha Hui (Singapore)
MSc Zoology (start 2007)
Project: Competition between fisheries and Steller sea lions
Supervisor: Dr Andrew Trites

Roseti Imo (Samoa)
PhD RMES (start 2006)
Project: Spatial policy analysis for albacore management in the western central Pacific
Supervisor: Dr Rashid Sumaila and Dr Carl Walters
Chad Nordstrom (Canada)
MSc Zoology (2008)
Project: Linking foraging northern fur seals with oceanographic features in the eastern Bering Sea
Supervisor: Dr Andrew Trites

Shannon Obradovich (Canada)
PhD Zoology (start 2008)
Project: Survey methodologies and management strategy evaluation for BC insshore rockfish
Supervisor: Dr Murdoch McAllister

Kerrie O’Donnell (USA)
PhD Zoology (start 2005)
Project: Evaluating recovery options for data-limited seahorse fisheries in the Philippines
Supervisor: Dr Amanda Vincent

Marivic Pajaro (Philippines)
PhD RMES (start 2002*)
Project: Biological, social and economic indicators of effectiveness in community-managed marine protected areas
Supervisor: Dr Amanda Vincent

Michelle Paleczny (Canada)
MSc Zoology (start 2008)
Project: The effect of commercial fisheries on global seabird populations
Supervisor: Dr Daniel Pauly

Chiara Piroddi (Italy)
MSc Zoology (start 2005*)
Project: The application of Ecopath with Ecosim to the study of two populations of dolphins in the Eastern Ionian Sea, Greece
Supervisor: Dr Villy Christensen

Tom Porteus (UK)
PhD Zoology (start 2006)
Project: Use of Bayesian methods to evaluate strategies for control of terrestrial vertebrate pest species
Supervisor: Dr Murdoch McAllister

Andrea Rambeau (Canada)
MSc Zoology (start 2006*)
Project: Defining parameters for a migrating, intermixing population of humpback whales in British Columbia
Supervisors: Dr Andrew Trites and Dr John Ford

Erin Rechisky (USA)
PhD Zoology (start 2004*)
Project: Early marine survival and migration of endangered Pacific salmon in the Columbia and Fraser Rivers
Supervisor: Dr Carl Walters

Brent Roberts (Canada)
MSc Zoology (start 2009)
Project: The physiological mechanism for response to stress in the sea lamprey, Petromyzon marinus
Supervisor: Dr David Close

Frances Robertson (UK/Canada)
PhD Zoology (start 2008)
Project: The effects of behaviour, age, status, environmental parameters and exposure to seismic operations on the observed distribution of bowhead whales in the Alaskan Arctic
Supervisor: Dr Andrew Trites

Jennifer Selgrath (USA)
PhD Zoology (start 2006)
Project: Ecosystem resilience in coastal fishing grounds
Supervisor: Dr Amanda Vincent

Jamie Slogan (Canada)
PhD Zoology (start 2008)
Project: Long-term community dynamics of marine fish compensation habitat in Burrard Inlet, BC.
Supervisor: Dr Amanda Vincent

Ben Starkhouse (USA)
MSc RMES (start 2006*)
Project: Quantifying and valuing extractive resources of Fiji’s coral reefs
Supervisor: Dr Rashid Sumaila

Max Thilo Stoeven (Germany)
Visiting PhD Student, Christian Albrechts Universität zu Kiel (2008 - 2009)
Project: Demand for renewable resource
Supervisor: Dr Rashid Sumaila

Wilf Swartz (Canada/Japan)
PhD RMES (start 2008)
Project: How does international trade affect marine fisheries
Supervisor: Dr Rashid Sumaila
**Beth Young (USA)**
MSc Zoology (start 2007)
**Project:** The ability of heart rate to predict metabolism in Steller sea lions
**Supervisor:** Dr David Rosen

**Lydia Teh (Malaysia)**
PhD RMES (start 2007)
**Project:** Zoning MPAs using a fuzzy logic system: case study of small-scale reef fisheries in Sabah, Malaysia
**Supervisor:** Dr Tony Pitcher

**Laura Tremblay-Boyer (Canada)**
MSc Zoology (start 2007)
**Project:** Impacts of global fisheries on the biomass of marine ecosystems since 1950
**Supervisor:** Dr Daniel Pauly

**Liesbeth van der Meer (Chile)**
MSc RMES (start 2009)
**Project:** Fish Retail contribution to the global economy
**Supervisor:** Dr Rashid Sumaila

**Brett van Poorten (Canada)**
PhD Zoology (start 2005)
**Project:** Effects of interspecific competition on recruitment processes in rainbow trout and Pygmy Pikeminnow
**Supervisor:** Dr Carl Walters

**Divya Varkey (India)**
PhD RMES (start 2005)
**Project:** Ecosystem modelling of coral reefs in Raja Ampat
**Supervisor:** Dr Tony Pitcher

**Colette Wabnitz (France/Germany)**
PhD Geography (start 2003*)
**Project:** The ecological role of green sea turtles and the mapping of their foraging grounds in the wider Caribbean region.
**Supervisors:** Dr Daniel Pauly and Dr Brian Klinkenberg

**Chad Wilkinson (Canada)**
MSc Zoology (start 2005*)
**Project:** Population study on west-slope cutthroat trout and bull trout in a closed river system of the southern BC Rockies
**Supervisor:** Dr Steve Martell

**Mandy Wong (Canada)**
MSc Zoology (start 2007)
**Project:** Do El Niño-southern oscillation events positively affect the diet of the Hawaiian monk seal
**Supervisors:** Dr Andrew Trites and Dr Dominic Tollit

**Divya Varkey (India)**
PhD RMES (start 2005)
**Project:** Ecosystem modelling of coral reefs in Raja Ampat
**Supervisor:** Dr Tony Pitcher

**Colette Wabnitz (France/Germany)**
PhD Geography (start 2003*)
**Project:** The ecological role of green sea turtles and the mapping of their foraging grounds in the wider Caribbean region.
**Supervisors:** Dr Daniel Pauly and Dr Brian Klinkenberg

**Chad Wilkinson (Canada)**
MSc Zoology (start 2005*)
**Project:** Population study on west-slope cutthroat trout and bull trout in a closed river system of the southern BC Rockies
**Supervisor:** Dr Steve Martell

**Mandy Wong (Canada)**
MSc Zoology (start 2007)
**Project:** Do El Niño-southern oscillation events positively affect the diet of the Hawaiian monk seal
**Supervisors:** Dr Andrew Trites and Dr Dominic Tollit

**Beth Young (USA)**
MSc Zoology (start 2007)
**Project:** The ability of heart rate to predict metabolism in Steller sea lions
**Supervisor:** Dr David Rosen
# Graduate Theses Completed*

## 2009

**Robert Ahrens (Canada)**  
PhD Zoology  
*Title:* A global analysis of apparent trends in abundance and recruitment of large tunas and billfishes inferred from Japanese longline catch and effort data  
**Supervisors:** Dr Carl Walters and Dr Villy Christensen

**Pamela Allen (Canada)**  
MSc Zoology  
*Title:* Seasonal oscillations in the mass and food intake of Steller sea lions  
**Supervisors:** Dr Andrew Trites

**Chiara Piroddi (Italy)**  
MSc Zoology  
*Title:* An ecosystem-based approach to study two dolphin populations around the island of Kalamos, Ionian Sea, Greece  
**Supervisor:** Dr Villy Christensen

**Jonathan Anticamara (Philippines)**  
PhD Resource Management and Environmental Studies  
*Title:* Ecology of recovering degraded reef communities within no-take marine reserves  
**Supervisor:** Dr Amanda Vincent

**Eny Buchary (Indonesia)**  
PhD Resource Management and Environmental Studies  
*Title:* In search of viable policy options for responsible use of sardine resources in the Bali Strait, Indonesia  
**Supervisor:** Dr Tony Pitcher

**Sarah Foster (Canada/New Zealand)**  
PhD Resource Management and Environmental Studies  
*Title:* Is bycatch a big problem for small fish? Assessing and addressing the impacts of tropical shrimp trawling on small fish species  
**Supervisor:** Dr Amanda Vincent

**Eli Guieb (Philippines)**  
PhD McGill  
*Title:* Community, marine rights, and sea tenure: a political ecology of marine conservation in two Bohol villages in central Philippines  
**Supervisors:** Dr Amanda Vincent and Dr Colin Scott and Dr Monica Mulrennan

**Ella Bowles (Canada)**  
MSc Zoology  
*Title:* Determining the relative amounts of prey in Steller sea lion (Eumetopias jubatus) diet using real-time PCR  
**Supervisors:** Dr Andrew Trites and Dr Trish Schulte

**Jonathan Anticamara (Philippines)**  
PhD Resource Management and Environmental Studies  
*Title:* Ecology of recovering degraded reef communities within no-take marine reserves  
**Supervisor:** Dr Amanda Vincent

**Eny Buchary (Indonesia)**  
PhD Resource Management and Environmental Studies  
*Title:* In search of viable policy options for responsible use of sardine resources in the Bali Strait, Indonesia  
**Supervisor:** Dr Tony Pitcher

**Sarika Cullis-Suzuki (Canada)**  
MSc Zoology  
*Title:* High seas, high risk: a global evaluation of the effectiveness of regional fisheries management organizations  
**Supervisor:** Dr Daniel Pauly

**Luciano Dalla Rosa (Brazil)**  
PhD Zoology  
*Title:* Modeling the foraging habitat of humpback whales  
**Supervisors:** Dr John Ford and Dr Andrew Trites

**Mike Melnychuk (Canada)**  
PhD Zoology  
*Title:* Mortality of migrating Pacific salmon smolts in southern British Columbia, Canada  
**Supervisors:** Dr Carl Walters and Dr Villy Christensen

**Gaku Ishimura (Japan)**  
PhD Resource Management and Environmental Studies  
*Title:* Transboundary management of a fish stock under climate variability: the case of Pacific sardine in the California current ecosystem  
**Supervisor:** Dr Rashid Sumaila

**Jennifer Jacquet (USA)**  
PhD Resource Management and Environmental Studies  
*Title:* Fish as food in an age of globalization  
**Supervisor:** Dr Daniel Pauly

**Josh Korman (Canada)**  
PhD Zoology  
*Title:* Early life history dynamics of rainbow trout in a large regulated river  
**Supervisors:** Dr Steve Martell and Dr Carl Walters

**Marcia Pajaro (Philippines)**  
PhD Resource Management and Environmental Studies  
*Title:* Indicators of effectiveness in community-based marine protected areas  
**Supervisor:** Dr Amanda Vincent

**Erin Rechisky (USA)**  
PhD Zoology  
*Title:* Migration and survival of juvenile Pacific salmon determined by a large-scale telemetry array and implications for their conservation  
**Supervisor:** Dr Carl Walters

**Ben Starkhouse (USA)**  
MSc Resource Management and Environmental Studies  
*Title:* What's the catch: uncovering the catch volume and value of Fiji’s coral reef-based artisanal and subsistence fisheries  
**Supervisor:** Dr Rashid Sumaila

**Chad Wilkinson (Canada)**  
MSc Zoology  
*Title:* Sportfish population dynamics in an intensively managed river system  
**Supervisor:** Dr Steve Martell

**Colette Wabnitz (France/Germany)**  
PhD Geography  
*Title:* Fish as food in an age of globalization  
**Supervisor:** Dr Daniel Pauly and Dr Brian Klinkenberg

**Sarah Foster (Canada/New Zealand)**  
PhD Resource Management and Environmental Studies  
*Title:* Is bycatch a big problem for small fish? Assessing and addressing the impacts of tropical shrimp trawling on small fish species  
**Supervisor:** Dr Amanda Vincent

**Eli Guieb (Philippines)**  
PhD McGill  
*Title:* Community, marine rights, and sea tenure: a political ecology of marine conservation in two Bohol villages in central Philippines  
**Supervisors:** Dr Amanda Vincent and Dr Colin Scott and Dr Monica Mulrennan

**Gaku Ishimura (Japan)**  
PhD Resource Management and Environmental Studies  
*Title:* Transboundary management of a fish stock under climate variability: the case of Pacific sardine in the California current ecosystem  
**Supervisor:** Dr Rashid Sumaila

**Jennifer Jacquet (USA)**  
PhD Resource Management and Environmental Studies  
*Title:* Fish as food in an age of globalization  
**Supervisor:** Dr Daniel Pauly

**Josh Korman (Canada)**  
PhD Zoology  
*Title:* Early life history dynamics of rainbow trout in a large regulated river  
**Supervisors:** Dr Steve Martell and Dr Carl Walters

**Mike Melnychuk (Canada)**  
PhD Zoology  
*Title:* Mortality of migrating Pacific salmon smolts in southern British Columbia, Canada  
**Supervisors:** Dr Carl Walters and Dr Villy Christensen

**Gaku Ishimura (Japan)**  
PhD Resource Management and Environmental Studies  
*Title:* Transboundary management of a fish stock under climate variability: the case of Pacific sardine in the California current ecosystem  
**Supervisor:** Dr Rashid Sumaila

**Jennifer Jacquet (USA)**  
PhD Resource Management and Environmental Studies  
*Title:* Fish as food in an age of globalization  
**Supervisor:** Dr Daniel Pauly

**Josh Korman (Canada)**  
PhD Zoology  
*Title:* Early life history dynamics of rainbow trout in a large regulated river  
**Supervisors:** Dr Steve Martell and Dr Carl Walters

**Mike Melnychuk (Canada)**  
PhD Zoology  
*Title:* Mortality of migrating Pacific salmon smolts in southern British Columbia, Canada  
**Supervisors:** Dr Carl Walters and Dr Villy Christensen

**Robert C. McCauley (Canada)**  
PhD Zoology  
*Title:* Development of an ecosystem-based predator-prey model for the North Pacific salmon–halibut fishery  
**Supervisors:** Dr Carl Walters and Dr Villy Christensen

**Sarah Foster (Canada/New Zealand)**  
PhD Resource Management and Environmental Studies  
*Title:* Is bycatch a big problem for small fish? Assessing and addressing the impacts of tropical shrimp trawling on small fish species  
**Supervisor:** Dr Amanda Vincent

**Eli Guieb (Philippines)**  
PhD McGill  
*Title:* Community, marine rights, and sea tenure: a political ecology of marine conservation in two Bohol villages in central Philippines  
**Supervisors:** Dr Amanda Vincent and Dr Colin Scott and Dr Monica Mulrennan

**Gaku Ishimura (Japan)**  
PhD Resource Management and Environmental Studies  
*Title:* Transboundary management of a fish stock under climate variability: the case of Pacific sardine in the California current ecosystem  
**Supervisor:** Dr Rashid Sumaila

**Jennifer Jacquet (USA)**  
PhD Resource Management and Environmental Studies  
*Title:* Fish as food in an age of globalization  
**Supervisor:** Dr Daniel Pauly

**Josh Korman (Canada)**  
PhD Zoology  
*Title:* Early life history dynamics of rainbow trout in a large regulated river  
**Supervisors:** Dr Steve Martell and Dr Carl Walters

**Mike Melnychuk (Canada)**  
PhD Zoology  
*Title:* Mortality of migrating Pacific salmon smolts in southern British Columbia, Canada  
**Supervisors:** Dr Carl Walters and Dr Villy Christensen

*Thesis abstracts are available online at www.fisheries.ubc.ca.*
2008

Natalie Ban (Canada)
PhD Resource Management and Environmental Studies
**Title:** Multiple perspectives for envisioning marine protected areas
**Supervisor:** Dr Amanda Vincent

Robyn Forrest (Australia)
PhD Resource Management and Environmental Studies
**Title:** Simulation models for estimating productivity and trade-offs in the data-limited fisheries of New South Wales, Australia
**Supervisor:** Dr Tony Pitcher

Aaron Keech (USA)
MSc Zoology
**Title:** Fecal triiodothyronine assay validation using captive Steller sea lions (Eumetopias Jubatus) and subsequent application to free-ranging populations to examine nutritional stress
**Supervisor:** Dr Andrew Trites

Mike Hawkshaw (Canada)
MSc Zoology
**Title:** Methods for estimation of cyclic recruitment variation in pygmy northern pikeminnow (Ptychocheilus oregonensis) of south central British Columbia
**Supervisor:** Dr Carl Walters

Megan Moody (Canada)
MSc Resource Management and Environmental Studies
**Title:** Eulachon past and present
**Supervisor:** Dr Tony Pitcher

Andrea Rambeau (Canada)
MSc Zoology
**Title:** Determining abundance and stock structure for a widespread migratory animal: The case of humpback whales (Megaptera Novaeangliae) in British Columbia, Canada
**Supervisors:** Dr Andrew Trites and Dr John Ford
Fisheries Centre Members

Faculty

Dr U. Rashid Sumaila, Director
Associate Professor, Fisheries Centre
Fisheries Economics

Dr Villy Christensen
Associate Professor, Fisheries Centre
Ecosystem Modeling

Dr David Close
Assistant Professor, Fisheries Centre & Zoology
Aboriginal Fisheries

Dr Steven Martell
Assistant Professor, Fisheries Centre
Quantitative Fisheries Stock Assessment

Dr Murdoch McAllister
Associate Professor, Fisheries Centre
Bayesian Statistical Methods

Dr Tony J. Pitcher
Professor, Fisheries Centre & Zoology
Ecosystems, Rapid Appraisal and Schooling

Dr Daniel Pauly
Professor, Fisheries Centre & Zoology
Tropical & Global Fisheries Issues

Dr Andrew Trites
Professor, Fisheries Centre
Marine Mammals and Fisheries

Dr Amanda Vincent
Associate Professor, Fisheries Centre
Canada Research Chair in Marine Conservation

Dr Carl Walters
Professor, Fisheries Centre & Zoology
Modeling, Assessment and Ecosystems

Emeritus Members

Dr Les Lavkulich
Fisheries Education

Dr Paul LeBlond
Fisheries Oceanography

Dr Don Ludwig
Fisheries Mathematics

Dr Patricia Marchak
Forests & Fisheries

Dr Gordon Munro
Fisheries Economics

Dr William Neill
Fisheries Limnology

Dr Tom Northcote
Fisheries Biology

Adjunct Professors & Associated Faculty Outside UBC

Dr Jackie Alder
Consultant
Coastal Zone Management

Dr Claire Armstrong
University of Tromsø
Fisheries Economics

Dr Martin Castonguay
DFO, Quebec
Fisheries Biology

Dr Ratana Chuenpagdee
Dalhousie University
Fisheries Economics

Dr John K. B. Ford
DFO, Nanaimo
Marine Mammals

Dr Martin Haulena
Vancouver Aquarium
Veterinarian

Dr Douglas E. Hay
DFO, Nanaimo
Pelagic Fisheries

Dr Glen Jamieson
DFO, Nanaimo
Invertebrate Fisheries

Dr. Jacquelynne King
DFO, Nanaimo
Fisheries Climatology

Dr Mimi Lam
Consultant
Aboriginal Fisheries

Dr Rosemary Ommer
University of Victoria
Fisheries Sociology

Dr Stephen Raverty
BC Agriculture and Lands
Pathologist - Fish & Mammals

Dr Jon Schnute
Fisheries Mathematician

Associated UBC Faculty

Dr Jo-Ann Archibald
First Nations House of Learning
Aboriginal Issues & Education

Dr Brian Elliot
Sociology
Environmental Sociology

Dr Douglas Harris
Law
Fisheries Law
Dr John Spence  
BC Science Council  
Industry and Fisheries

Dr Laura Richards  
DFO, Nanaimo  
Fisheries Assessment

Dr Jordan Rosenfeld  
BC Min. Environment  
Stream Ecology

Dr Max Stocker  
DFO, Nanaimo  
Fisheries Assessment

Dr Arthur Tautz  
BC Fisheries, Vancouver  
GIS, Sports Fisheries

Dr John Volpe  
University of Victoria  
Sustainable Aquaculture

Dr Scott Wallace  
David Suzuki Foundation,  
Vancouver  
Fisheries Conservation

Dr Jane Watson  
Malaspina College,  
Nanaimo  
Marine Mammals

International Advisory Council

Dr Philippe Cury  
CRH/IRD  
Sete, France

Dr Douglas DeMaster  
National Marine Fisheries Service  
Seattle, USA

Dr Cornelia Nauen  
European Union  
Brussels, Belgium

Dr Ana Parma  
Centro Nacional Patagónico  
Chubut, Argentina

Dr Yvonne Sadovy  
University of Hong Kong  
Hong Kong, China

Dr Anthony D. M. Smith  
CSIRO Marine & Atmospheric Research  
Hobart, Tasmania

FC Office Staff

Dr John Spence
Publications

ARTICLES IN REFEREED JOURNALS


Trites, A.W. and Calkins, D.G. (2008) Diets of mature male and female Steller sea lions differ and cannot be used as proxies for each other. Aquatic Mammals 34: 25-34.


BOOKS AND TECHNICAL REPORTS


**FISHERIES CENTRE RESEARCH REPORTS**


CHAPITERS IN BOOKS AND TECHNICAL REPORTS


**MISCELLANEOUS PUBLICATIONS**


Fisheries Centre Visitors

Listed below are some of the visitors to the UBC Fisheries Centre in 2008-2009. These and many other Canadian and international visitors came to present seminars, attend workshops and collaborate with FC researchers.

Ayaa K. Armah
University of Ghana, West Africa
Host: Rashid Sumaila

Mahamudu Bawumia
Former deputy governor of the Ghana Central Bank, West Africa
Host: Rashid Sumaila

Amado Blanco
Project Seahorse Foundation for Marine Conservation, Philippines
Host: Amanda Vincent

Christopher Brown
Ecology Centre, University of Queensland and CSIRO Marine and Atmospheric Research, Australia
Host: Villy Christensen

Marta Coll
Institute of Marine Sciences, Barcelona, Spain
Host: Villy Christensen

Ben Collen
Institute of Zoology, Zoological Society of London, UK
Host: Amanda Vincent

Marion Cuif
Fisheries and Aquatic Sciences, Rennes Agrocampus, France
Host: Murdoch McAllister

Tyler Eddy
University of Wellington, New Zealand
Hosts: Tony Pitcher and Villy Christensen

Marie-Pierre Etienne
AgroParisTech College, France
Host: Murdoch McAllister

Lou Frotté
Rennes University, France
Host: Daniel Pauly

Didier Gascuel
Departement Halieutique
Agrocampus Rennes - Ensar, France
Host: Daniel Pauly

Carlos Gaspar
Nature, Economy and Environmental Policy, Argentina
Host: Rashid Sumaila

Neil A. Gribble
Northern Fisheries Centre, Australia
Host: Villy Christensen

Mark Hepburn
CSIRO, Australia
Host: Villy Christensen

Cheng Heqin
State Key Laboratory of Estuarine and Coastal Research, East China Normal, University of Zongshan North
Host: FC

Nick Hill
Imperial College of London, UK
Host: Amanda Vincent

Les Kaufman
Boston University, USA
Host: Amanda Vincent

Paul G. Kinas
Laboratorio de Estatistica, Departamento de Matematica, Fund. Univ. Federal do Rio Grande, Brazil
Host: FC

Hiroyuki Kurota
National Research Institute of Far Seas Fisheries Shimizu, Japan
Host: Murdoch McAllister

Brian Langseth
Michigan State University, US
Host: Villy Christensen

Anahita Marzin
Fisheries and Aquatic Sciences, Rennes Agrocampus, France
Host: Murdoch McAllister

Angelie Nellas
Project Seahorse Foundation for Marine Conservation, Philippines
Host: Amanda Vincent

Henrik Osterblom
Stockholm University, Sweden
Hosts: Villy Christensen and Rashid Sumaila

Lenin Oviedo
El Valle, Caracas, Venezuela
Host: Villy Christensen

Persson, Lo
Lund University, Sweden
Host: Daniel Pauly

Ruth Pincinato
Universidade de São Paulo
Host: Rashid Sumaila

Massimiliano Rosso
University of Genoa, Savona, Italy
Host: Andrew Trites

Reza Shokri
University of Newcastle, Australia
Host: Amanda Vincent

Stephen Smikle
Department of Fisheries and Commerce, Jamaica, and University of West Indies
Host: Villy Christensen

Gabriela Rodrigues Vera
Laboratório de Ecologia trófica de Peixes, Universidade de São Paulo, Intituto Oceanográfico, Brazil
Host: Tony Pitcher and Villy Christensen

Maria Villanueva
UNICAEN, France
Host: Villy Christensen
Funding

External research funding of the Fisheries Centre (1993-2009)

Some of our major funders are (in thousands of dollars): North Pacific Marine Science Foundation (28,168), The Pew Charitable Trusts (19,602), Natural Sciences and Engineering Research Council of Canada (3,075), Province of BC Ministries of Fisheries, Environmental and Advanced Education (1,763) John G. Shedd Aquarium (1,434), Chocolaterie Guylian N.V., Belgium (1,031), U.S. Department of Commerce (628) and the Exxon Valdez Oil Spill Trustee Council (481).

The 2008-2009 Fisheries Centre Report was produced by Grace Ong, Carmel Ohman, and Daniel Pauly with input from the Fisheries Centre units and members. Funding for this Report and other Fisheries Centre publications is generously provided by a grant from the Province of British Columbia Ministry of Environment.
Fisheries Centre
Aquatic Ecosystems Research Laboratory (AERL)
The University of British Columbia
2202 Main Mall, Vancouver, B.C.
Canada  V6T 1Z4

Tel:  +1 604 822 2731  Fax: +1 604 822 8934
E-mail: office@fisheries.ubc.ca
www.fisheries.ubc.ca