

2012-2013 Report

**restoring
fisheries**

**conserving
aquatic life**

**rebuilding
ecosystems**

**researching
the options**

Fisheries Centre
The University of British Columbia



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Directors' Introduction

The period from 2012-2013 has been productive for our Centre as we continued to push through our academic mission of research, teaching and service as these relate to fisheries science and management. For this period, we published 192 refereed journal articles, including some in the highest impact journals in the world. We also published 9 Fisheries Centre Research Reports, 14 books and technical reports, and graduated 13 doctoral and 11 master's students, respectively. Our members gave numerous keynote and invited talks in all corners of the world during this period. This high level of achievement by a small unit such as ours was rewarded by the numerous recognitions our members received during this period.

Administratively, this period marked a big change at the Centre as veteran administrative staff such as Ann Tautz and Janice Doyle retired and Rashid Sumaila's term as director ended on June 30, 2013. Practically, these changes marked the end of the Fisheries Centre as a unit within the defunct College for Interdisciplinary Studies (CFIS), and the beginning of its full integration into the Faculty of Science, which Sumaila's successor, Dr. Bill Milsom, is helping to lead.

To succinctly capture our achievement as a unit, here is a quote from the Dean of Science, Simon Peacock "Under Rashid's directorship, the Fisheries Centre has flourished and is increasingly recognized around the world for exceptional scholarship and expertise in aquatic ecosystems research and policy."

These achievements are too numerous to recount further in this introduction. We therefore invite readers to please look through the whole report, kindly assembled by Daniel Pauly and Nicole Gibillini, where the major contributions of Fisheries Centre research units are summarized in an easy to read format.

We both want to take this opportunity to thank all our members for giving us the opportunity to serve you. We look forward to many more years of productive and impactful fish and fisheries research.

Rashid Sumaila



Bill Milsom



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 2012 and 2013, numerous research and outreach activities, both in-house and linked with outside organizations (see list of publications, p. 30-42). 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. 22-26 or www.fisheries.ubc.ca/students).

To document these activities, in 2012-2013, the Fisheries Centre published 9 Fisheries Centre Research Reports (www.fisheries.ubc.ca/publications/fcrrs) and numerous items in our Working Paper Series (www.fisheries.ubc.ca/publications/working-papers), both often serving as basis for subsequent submission to peer-reviewed literature. We also continued to publish the Centre's bimonthly newsletter, FishBytes (www.fisheries.ubc.ca/newsletter), which has been produced and distributed internationally since 1995, and has been "paperless" since January 2010.

The Centre continued to host a weekly seminar from September to April. 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 our members (see p. 44). The Fisheries Centre also hosts a prestigious lecture series, the Larkin Lectures (www.fisheries.ubc.ca/about-us/larkin-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 2012-2013 period was by Dr. Patricia Majluf (2013), from Peru.

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.

Fisheries Centre seminar coordinators:
Dalal Al-Abdulrazzak (2012)
Dyhia Belhabib Padilla (2013)





Aboriginal Fisheries

The Aboriginal Fisheries Research Unit (AFRU) was established in 2008. This unit is led by Dr. David Close, who joined the Fisheries Centre as an Assistant Professor in the spring of 2008. The goals of the unit are:

- 1) To work with First Nations to identify their important aquatic or fisheries scientific questions
- 2) Develop collaborative proposals to conduct research to address those issues, and;
- 3) To build capacity for First Nations by mentoring First Nations graduate students.

The unit focuses on fish ecology, fish physiology, and human dimensions of fisheries. Currently, AFRU includes two PhD Students: Wes Didier (B.C. Metis), Junho Eom, and two MSc. Students: Brent Roberts (Campbell River Indian Band), and Satbir Rai, and Assistant Professor Sang-Seon Yun.

Dr. Close's research focuses on understanding the biology of fish that are culturally important to First Nations and Native American Nations.

Specifically, he has been working on understanding the chemical signaling in fish and in their external environment as well. Dr. Close's work is currently funded by the Kootenai Tribe of Idaho. The main project is to understand if white sturgeon has a sex pheromone.



A sturgeon fish

Answering this question is important for restoration activity in the Kootenai River, where these fish are endangered. Other projects are on culturally important primitive fish called lamprey. In the Columbia and Skeena Rivers along the West Coast of North America, First Nations and Native American Tribes harvest them for food. Another project is examining the regulation of stress hormones in lampreys. This is an important tool in assessing various stressors in the environment. The unit is also studying the sex hormones in lamprey to understand basic biology that may be important for future restoration efforts occurring in the Columbia River Basin.

In 2011/12, Dr. Close contributed his expertise to many different areas at the local and international levels. Dr. Close gave a lecture at the International State of Lamprey Symposium in the U.S. He also gave a talk on the Projected Effects of Climate Change on First Nations fisheries at the Salish Sea Symposium. Junho Eom presented a poster titled: "Olfactory sensitivity of white sturgeon to bile acids" at the International Congress of Fish Biology. Dr. Close delivered another presentation titled, "Identification of migratory pheromones in lamprey" at the Native American Fish and Wildlife Society Conference. Dr. Close was a keynote speaker for UBC Celebrates Science. He also provided technical expertise to the First Nations Fisheries Alliance (30 lower Fraser River First Nations), and to the Fraser River Aboriginal Fisheries Secretariat.

In the future, AFRU will continue to build collaborative research with other Fisheries Centre units and First Nation and Native American fisheries organizations with the goal of building their capacity for fisheries management.



Ministry of Environment

The Fisheries Centre houses the Environment Conservation Science Section; six members of the BC Government, Ministry of Environment Conservation Science Section, four members of the Freshwater Fisheries Society of BC (FFSBC) as well as several adjunct and seasonal staff. The section conducts research on freshwater fisheries management, fish habitat restoration, recreational fisheries assessment. 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. Finally, a focus on the human dimensions of recreational fishing and marketing recreational fishing to improve participation has recently been expanded.

British Columbia has over 200,000 small (<1 ha) lakes, hundreds of larger lakes and wetlands, and thousands of kilometers 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 novel population assessment tools to support government and industry decision-making and policy development.

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. These options are being tested and refined in areas across the province to continue a strong tradition of science-based management and conservation.

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 70 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.

Recreational fisheries in British Columbia are a dynamic system. Managers strive to provide abundant fish and a diversity of fishing opportunities across the province. Angler participation changes over time as competing interests impose on anglers' leisure time. Similarly, the angler community changes over time through changing demography and skill levels. Understanding and anticipating changes in what people want is a rapidly growing field, and the BC Government and FFSBC are leading the way through strategic partnerships and innovative research linking aquatic biology, fishery dynamics, human dimensions and marketing.



Quantitative Modeling Group

The Quantitative Modeling Group develops innovative assessment methodologies and field programs intended to improve understanding of resource systems. The group's focus on Bayesian statistical methods, single and multi-species population dynamics models and fleet dynamics models. Partnerships with colleagues within and outside UBC have generated a wide range of projects ranging from evaluations of factors affecting the abundance of recreationally caught species in B.C. lakes to ecosystem management approaches in the Gulf of Mexico.



PhD Student Rachel Chudnow about to release a PIT-tagged bull trout in the upper Fraser River watershed.

New and continuing projects in 2012-2013:

- A project with the Ecosystems Branch of the British Columbia Ministry of Environment develops new mark-recapture models to estimate the abundance of Nechako River and Fraser River white sturgeon;
- A few members of the group collaborate via the Canadian Fisheries Research Network (see below) with the Department of Oceans Canada on the joint statistical committee for Pacific hake assessment; PhD student Catarina Wor is developing simulations to explore how different policy options for the Canadian and US fishery will impact the hake resource;
- B.C. Ministry of Natural Resource Operations funding for a research project on upper Fraser River bull trout population dynamics and simulation evaluation of alternative management options (PhD Student Rachel Chudnow);
- Funding from the UK Game and Wildlife Conservation Trust is directed towards developing Bayesian assessment models to evaluate alternative management of red fox populations in the UK (PhD student Tom Porteus)
- An Environmental Defense Fund (EDF) project has led to the development of simulation models accounting for different growth type groups within cohorts to evaluate the potential consequences of alternative harvest policies in Gulf of Mexico shrimp fisheries (PhD student Rachael Louton).
- Management strategy evaluation of Chilean jack mackerel (PhD student Roberto Licandeo).

Professor Carl Walters retired in 2013, but remains active, on the supervisory committees of most of the students in the group and working with post docs within the group. He has been for a number of years the Grand Canyon Senior Ecologist, providing stock assessment and ecosystem modeling advice, and continues to work on methods for stock assessment, including delay-differential models and ecosystem models; he also just completed a major population dynamics and ecosystem modeling study for management of oyster populations in Apalachicola Bay, Florida.

Professor Murdoch McAllister's collaborative activities include several research projects in a Canada-wide NSERC-funded strategic network on Canadian Capture Fisheries with members from academia, industry and government laboratories across the country.



Six of the research projects in this network are based at UBC, with involvement also of Drs. Trites, Walters, Sumaila, Christensen, and Martell (now with the International Pacific Halibut Commission).

The network grant funds graduate students and post-doctoral researchers to work on management strategy evaluation in Northeast Pacific Ocean fisheries, including those targeting Pacific hake (PhD student Catarina Wor), chinook (PhD student Sarah Hawkshaw) and sockeye salmon (Mike Hawkshaw), Pacific herring (Dr. Tom Carruthers), sablefish, lingcod, halibut (PhD student Danielle Edwards – evaluation of fishing fleet dynamics; Dr. Hiroshi Okamura) and Dungeness crab (PhD student Aaron Greenberg). Also, a study investigates the impact of grey seal predation on Atlantic cod (PhD student Rachel Neuenhoff).

- An NSERC-funded coordinated research development grant to improve the scientific basis for Canadian freshwater recreational fisheries. Partners including the Freshwater Fisheries Society of B.C., the B.C. Ministry of the Environment, Ontario Ministry of the Environment and academic partners from SFU and the University of Calgary..
- Collaboration with US NOAA scientists at the Southeast Fisheries Science Centre in research projects on evaluating management approaches for Gulf of Mexico reef fishes and methods to set catch limits for data poor fisheries (National Resources Defence Council funded project).
- Collaboration with the B.C. Ministry of the Environment in a study to evaluate variations in habitat use at different life history stages of Fraser River white sturgeon.
- Collaboration with Fisheries and Oceans Canada scientists in developing improved understanding of the relationship between fish density and long-line catch rates (PhD student Shannon Obradovich), and new stock assessment methods for quillback, yelloweye rockfish and lingcod (post doctoral researcher, Hiroshi Okamura) and evaluating the impacts of seal and sea lion predation on various Strait of Georgia fish populations (PhD student Ben Nelson).

Professor Villy Christensen participates in this group working on ecosystem modeling and the further development of Ecopath with Ecosim (see Global Ecosystem Modelling) .

Dr. Tom Carruthers main focus has been on the following projects:

- Spatial population dynamics modeling of Gulf of Mexico grouper, using a range of operating models that account for life history and evaluation of management strategies for this multi-species fishery.
- A landscape-scale model of angling effort dynamics to predict the expected distribution of freshwater angling effort on B.C. lakes under different regimes for stocking and angling regulations.

Dr. Divya Varkey's main focus is on the potential for kokanee salmon-based recreational fisheries in B.C. small lakes to attract additional angling effort and to recruit new freshwater anglers to these fisheries. Her research aims to investigate how kokanee growth and survival rates respond to different types of stocking regimes for kokanee.



Fisheries Economics Research Unit

The Fisheries Economics Research Unit (FERU) is a diverse group of researchers from around the world. Our members work together to explore the many ways in which ocean ecosystems contribute to our social and economic well-being to advance sustainable management of our ocean resources.

Our work examines many aspects of the economics and management of ocean resources, including:

- Valuation of ocean resources for current and future generations;
- Providing information about the policy, economics and management of sustainable recreational, commercial and subsistence fisheries as well as ecotourism;
- Accessing the contribution of women to food security and local economies through fisheries;
- Ocean Health: Developing indices of ocean health to measure changes over time;
- Assessing the contributions of fisheries subsidies to overfishing;
- Investigation the use and abuse of flags of convenience by the international fishing industry and other maritime sectors;
- Effects of overfishing on food security;
- Assessing the contribution of fisheries to global employment;
- Evaluating the cost to create MPAs and the economic value of MPAs;
- Evaluating the economic impacts of past (e.g., Deepwater Horizon) and potential future (e.g., Northern Gateway) oil spills on marine ecosystems;
- Evaluating the potential impacts of climate change and ocean acidification on global fisheries and subsequent effects on the economy and food security of maritime countries.

The years 2012 and 2013 have been exciting for our group: Dale Marsden, Nigel Haggan, Louise Teh, Wilf Swartz and Megan Bailey completed their doctoral research; Liesbeth van der Meer defended her Master's thesis; we were joined by Master's student Andrea Haas, doctoral students Anna Schuhbauer and Sarah Harper and post-doctoral researcher Dana Miller, and we were visited by several scholars from around the world who shared with us their knowledge and expertise. Also during this time, FERU members have contributed to over 50 peer-reviewed journal articles, three books, ten chapters in books or technical papers and seven other publications.

In 2012, Rashid Sumaila participated in several important global events including Prince Charles' Charities International Sustainability Unit Marine Programme Launch in London; a debate at the World Oceans Summit in Singapore; the United Nations' Summit on the Right to Food in Nairobi; the Rio+20 Sustainable Development Dialogues Oceans panel session in Rio de Janeiro; a hearing of the US congressional subcommittee on Investigations, Oversight and Regulation; the African Development Forum VIII in Addis Ababa; and the "Oceans on the Hill" event hosted by Canada's All Party Ocean Caucus and WWF-Canada in Ottawa. Dr. Sumaila also presented to members of the Global Ocean Commission in Cape Town and New York and to the Fisheries Committee of the European Parliament in Brussels in 2013.

During 2012 and 2013, Dr. Sumaila was also appointed to the 2nd Johan Hjordt Chair in Marine Economics and Management by the Nordic Centre of Excellence (NorMER – University of Oslo) for his contributions to the field of ocean and fisheries economics, management and policy and was selected for the 2013 Excellence in Public Outreach Award from the American Fisheries Society.



FERU researchers also presented at several conferences in 2012 and 2013: Vicky Lam spoke at the Second International Symposium on the Effect of Climate Change on World's Oceans; Gordon Munro and Ngaio Hotte presented at the Conference of the International Institute of Fisheries Economics and Trade in Dar-es-Salaam; Dr. Munro gave a keynote address and presented at the Forum: Dialogue on Fisheries Subsidies in La Paz, Mexico, the North American Association of Fisheries Economists Conference in St. Petersburg, Russia, and the Bali Trade and Development Symposium in Indonesia. Lydia Teh was an invited workshop leader at the Third International Conference on Marine Mammals of South East Asia; Ngaio Hotte participated in the CREDible Conversations Forum in Vancouver and presented at the Fifth Annual International Ecosystem Services Partnership Conference in Portland, Oregon, and Andrea Haas presented at the Canadian Fisheries Research Network annual general meeting.



Rashid Sumaila at the EU-US 3rd conference on 'Sustainable Oceans: Reconciling Economic Use and Protection' in Cascais, Portugal June, 2013.

FERU members organized two major events at UBC including a two-day conference to celebrate the contributions of Dr. Colin Clark, UBC Professor Emeritus, to the field of fisheries economics; and a workshop within the framework of the Global Partnership for Small-Scale Fisheries Research, Too Big to Ignore. The workshop, called 'Fishing Futures,' brought together partners, independent researchers, consultants, students and fishers from North America to discuss current issues facing small-scale fisheries, mainly in North America, in order to find possible solutions.

Our members also received several awards from SSHRC and UBC: Andrea Haas received a SSHRC JAB-Masters Scholarship award; Dana Miller was awarded a two-year SSHRC Postdoctoral Fellowship; and Sarah Harper was awarded a four-year UBC Doctoral Fellowship. Anna Schuhbauer was selected to attend a Marine Short Course on Ocean Policy, at the Centre for Oceans Solutions, Stanford, California.

Our work has also received considerable attention from the media: Ngaio Hotte and Rashid Sumaila gained national media attention from multiple outlets for their work on the potential cost of an oil tanker spill on the west coast of British Columbia and published an op-ed in the Vancouver Sun about the economics of the Atlantic seal hunt. Ngaio Hotte also co-authored an op-ed in the Globe and Mail entitled "Failure to add value to resource wealth chains Canada to its colonial past."



Marine Mammal Research Unit



Photo: Andrew Trites

The Marine Mammal Research Unit (MMRU) is an integral component of the Fisheries Centre and works with other groups at UBC and beyond in a coordinated effort to provide independent research and advice on matters related to marine mammals. Members investigate interactions between humans and marine mammals, on using these animals as indicators of ecosystem change, and the natural history, biology and conservation of marine mammals. MMRU research focuses on population dynamics, energetics and physiology, dietary analyses, behaviour and ecology, and simulation modelling. The multi-disciplinary research program of the MMRU addresses these questions through studies with animals in the laboratory and in the field and publications and outreach.

Laboratory Animal Studies. In a unique cooperative research program, MMRU researchers conduct studies with dedicated research animals maintained at the Vancouver Aquarium (Steller sea lions and northern fur seals) as well as other marine mammals in the Aquarium's care (see otters, harbour seals and Pacific white-sided dolphins). The research conducts empirical studies with trained animals that would be impossible to conduct in the field. The goal of these studies is to further the conservation of their wild counterparts, i.e., to investigate a number of hypotheses proposed to explain wild population declines of sea lions and fur seals. In general, these studies examine how changes in the biotic or abiotic environment may be affecting the physiology or health of individual animals and, ultimately, population levels in the wild. Areas of research include physiology energetics, bioacoustics, thermoregulation, digestive efficiency, nutrition, and growth.



These studies at the Aquarium are complemented by a parallel research program at the Open Water Research Station in Port Moody. Here, trained Steller sea lions provide detail for research while freely swimming in the open ocean environment on a range of topics, including diving physiology, swimming biomechanics, and foraging energetics and strategy. Both research programs are also active in developing and testing new techniques and technologies for studying animals in situ. This includes techniques to estimate energy expenditure in wild sea lions (e.g., accelerometers) and to detect prey composition (e.g., via DNA analysis and changes in tissue biochemistry).

Collectively, the laboratory 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 studies are being conducted in collaboration with the Vancouver Aquarium and renowned international scientists.

Field Studies: Field work was undertaken in British Columbia, Alaska and the Canadian Arctic. These studies focused on feeding behaviour of bowhead whales, harbour seals, and northern resident killer whales. MMRU was also part of a range-wide survey of Steller sea lions, providing information on sea lion numbers and identifying new breeding sites along the BC coast.

Data Analysis: Mathematical models are increasingly used to understand the dynamics of marine mammals and their interaction with fisheries. It is a key step in interpreting current or historical data, and a valuable tool in identifying important knowledge gaps. Models were used to determine the distribution and relative abundance of humpback whales in relation to environmental variables in coastal British Columbia and adjacent waters. Models were also used to estimate carrying capacity of South American fur seals, and to link survival and

reproduction to improve model estimates of vital rates derived from limited time-series counts of pinnipeds and other species. Swimming paths of fur seals in the Bering Sea were reconstructed to identify foraging areas and the relationships with prey patch sizes and the influence of oceanography on foraging decisions. Other analyses estimated the food requirements of North Atlantic right whales and Pacific white-sided dolphins, and assessed the effects of seismic testing on bowhead whale behaviour in the Alaskan Beaufort Sea.

Laboratory Analyses: Other studies undertaken in 2012 and 2013 included developing a DNA technique to identify prey from Pacific walrus and harbour seal scats, and assessing whether genetic expression can be used to identify nutritional stress, and a survey of whether a relationship exists between diet, stress and population trends in different populations of marine mammals.

Publications and Outreach: MMRU researchers published 28 papers in 2012-2013. Administratively, MMRU continued to oversee the North Pacific Universities Marine Mammal Research Consortium, which unites researchers at the Universities of Alaska, British Columbia, Washington, and Oregon State. MMRU also continued to host the annual B.C. Marine Mammal Symposium, 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.

Project Seahorse is an interdisciplinary and international marine conservation group led by Professor Amanda Vincent, and dedicated to a world where marine ecosystems are healthy and well-managed. By working to protect seahorses, the project supports marine conservation more broadly. Recognizing the interdependencies between marine life and human communities, we begin with biological research on seahorses and work outwards actively engaging with ecosystems, fishing and other human impacts, trade, policy development, and public outreach.

In 2012, the IUCN's Species Survival Commission, the major international body responsible for biodiversity conservation, designated Project Seahorse as the globally authoritative Seahorse, Pipefish, and Stickleback Specialist Group. In this capacity we have generated and provided expert knowledge in a number of ways: conducted rapid assessments of seahorse populations in Thailand, as well as studies of seahorse life history and fisheries; explored seahorse life histories in Malaysia; provided expert input to a shoreline development project in Hong Kong, China; developed regional identification guides for seahorses in trade for Southeast Asia and translated them into Thai, Vietnamese, and Malay/Indonesian; and collated and synthesised all known material on seahorse biology, life history, habitats, fisheries, trade, management, and conservation action for three species found in Thailand and Vietnam. In 2012-2013, we also completed IUCN Red List assessments for numerous seahorses and relatives and conducted Red List training for 20 participants at the Syngnathid Biology International Symposium in Faro, Portugal in March 2013.

In October 2013, Project Seahorse launched iSeahorse, the first-ever citizen science website and smartphone app for seahorses. iSeahorse expands the number of people observing seahorses in the wild from a handful of scientists to hundreds and potentially thousands of citizen scientists. Project Seahorse scientists and global in-country experts are using this vital information to better understand seahorse behaviour, species ranges, and the threats seahorses face. We will use this knowledge to improve seahorse conservation measures across the globe. Since Project Seahorse began working in Central Philippines nearly 20 years ago, we have collaborated with local communities to establish 35 marine protected areas across Danajon Bank, one of the country's most ecologically important, and threatened, ecosystems.

Fisheries

Using biological and socio-economic knowledge and integrating research efforts with marine management, we promote sustainable fishing practices that balance impacts on ecosystems and human coastal communities. We develop management briefings to help governments use their marine resources effectively and sustainably. Project Seahorse also works with small-scale fishers to protect fish populations and ecosystems and improve food security.



One of our PhD students has been exploring the intersection of gender, small-scale fisheries and marine conservation - specifically examining how the inclusion of women's fishing changes the quantification and characterization of small-scale fishers and their catch. In 2012, one of our researchers applied our philosophy - we don't wait for perfect information to take conservation action - to shrimp trawling and its impacts on small fishes. She demonstrated that precautionary conservation measures should be taken to ensure that trawl nets do not disrupt the life cycles of small fish species, such as the silver stardrum (*Stellifer illecebrosus*), a little-studied animal that is nevertheless an important part of the food web in Mexico's Gulf of California.



Dried seahorses for sale in Hong Kong

Trade and policy

As the global experts on seahorses and their relatives, Project Seahorse work closely with international regulatory bodies such as the Convention for the International Trade of Endangered Species (CITES). Notably, our investigations in 2012 uncovered a burgeoning West African trade of *Hippocampus algricus*, and in 2012-2013 we quantified the trade in Thailand, the world's largest seahorse exporter.

Our work also directly supports trade enforcement. In 2012, Project Seahorse played an essential role in the CITES Review of Significant Trade, i.e., a country-by-country audit of the global trade in threatened species. In 2013, in collaboration with national CITES Authorities and experts, Project Seahorse advanced and supported the implementation of the Appendix II listing for seahorse species in Indonesia and for those species under the Review of Significant Trade in Thailand and Viet Nam.

Project Seahorse also created and revised a framework for making Non-Detriment Findings that underwent practical testing at national consultative workshops in those countries in 2013, which is being used as a model for other marine fishes recently brought under CITES, including sharks. Dr. Amanda Vincent was lead author on a review paper about CITES and marine fishes in Fish and Fisheries. At the 16th CITES Conference of the Parties, this paper was submitted by the U.S. delegation which rigorously responded to worries that CITES members raise about regulating trade in marine fishes.

Outreach

In 2013, in collaboration with the International League of Conservation Photographers, Project Seahorse launched a scientific/photographic expedition to Danajon Bank, Philippines (RAVE). We also launched a photo exhibition and education campaign based on expedition photos at John G. Shedd Aquarium, Chicago in August 2013, which reached over hundreds of thousands of people. We have been featured in media stories in print, online, and on TV/radio, including the CBC, Times of London, Washington Post, National Geographic. Project Seahorse has attracted hundreds of thousands of visitors and followers to our website, Facebook page and Twitter feed. We have reached over a million people with our conservation message, which led to Dr. Amanda Vincent being hailed a "Wildlife Hero" in a 2012 book on the world's leading conservationists.



Sea Around Us

The *Sea Around Us* is devoted to studying, documenting and communicating the impact of fisheries on global oceans. One major way to quantify this impact is through the catches that fisheries extract from ecosystems, and indicators based on these catches. However, there are many uncertainties associated with the marine fisheries catches of most countries, and thus, almost a decade ago, the *Sea Around Us* launched an activity designed to overcome this problem, which we call 'catch reconstruction'. The *Sea Around Us* was consumed by this activity during 2012 and 2013, and we thought we would be able to complete catch reconstructions covering the years 1950 to 2010 for all maritime countries of the world by the end of 2013.

We underestimated the work required for true global coverage: there were just too many countries, island territories and ecosystems to cover for our planned 'Atlas of Fisheries Impacts on the World's Marine Ecosystems' to go to press in 2013. However, it should go to press in 2014.

Still, major advances were made. For example, Fisheries Centre Research Reports were published with reconstructions for countries in the Red Sea (Tesfamichael and Pauly 2012), West Africa (Belhabib et al. 2012, 2013), the Persian Gulf (Al-Abdulrazzak and Pauly 2013), and various islands (Harper et al. 2012); together with publications for numerous countries and or groups of countries (see e.g., Abudaya et al. 2013; Ainley and Pauly 2013; Edelist et al. 2013; Pauly et al. 2013; Ulman et al. 2013).



In July 2013, Deng Palomares and Daniel Pauly spent a week teaching an updated version of the ELEFAN software at the University Cheick Anta Diop in Dakar, Senegal. (Photo: Najih Lazar)



A fishing boat at Taganga, a village in Colombia. (Photo: Robin Ramdeen)

Moreover, some of these country reconstructions - notably that of Senegal (Belhabib et al. 2013) - had spectacular results, i.e., providing an estimation of the loss of revenue inflicted on Senegal by illegal fishing, which motivated Senegal's Minister of Fisheries to arrest a vessel fishing illegally in its waters. Other West African countries endorsed our reconstructions and particularly the estimation of foreign catches in their waters, a promising development that we will follow up on beyond 2013.



Other activities of the Sea Around Us included (1) involvement with the Pew Charitable Trusts' Global Ocean Legacy Project, for which we reviewed the fisheries and biodiversity of sites which could be turned into large marine reserves, e.g., the Exclusive Economic Zone of New Zealand's Kermadec Islands (Palomares et al. 2012); (2) the completion of a major comparative review of country's fisheries rehabilitation potential for the Bloomberg Foundation (Kleisner et al. 2012), (3) Oceana (Pauly et al. 2012), and (3) the Rockefeller Foundation (Kleisner et al. 2013).

Active involvement in the FishBase Consortium, via the activities of the FishBase Liaison and SeaLifeBase Coordinator (Dr. ML "Deng" Palomares), assures the smooth flow of Sea Around Us data needs (e.g., taxonomic integrity, biogeography, ecological and biological data) from FishBase and SeaLifeBase for analyses, e.g., on the impact of climate change on marine ecosystems and fisheries (see Cheung et al. 2012). The *Sea Around Us* also hosts the www.fishbase.ca and www.sealifebase.ca mirror sites since 2012.

The *Sea Around Us* participated in over 20 international conferences, symposia, meetings and similar events in 2012 and 2013. Some highlights include the 2012 AAAS Annual Meeting in Vancouver, the Economist World Oceans summit in Singapore, the 12th International Coral Reef Symposium in Australia, the European Convention of Environmental Laureates, the Expert Roundtable on Fisheries and the Right to Food in Nairobi, the Monaco Blue Initiative in South Korea, and the Aspen Environment Forum., Canada. Furthermore, over 20 keynotes and lectures were given by senior *Sea Around Us* staff, including to policy makers (e.g., Lima, Peru), to FAO staff (Rome, Italy), to a multinational audience of maritime security officials (Victoria, Canada), and to senior West African policy makers in Dakar, Senegal.

Overall, the applied and strategic work of the *Sea Around Us* during 2012-2013 has led to 30 peer reviewed articles in which a team member was first author, and 23 additional publications in which at least one team member was a co-author.



PhD student Dyhia Belhabib and Sea Around Us Principal Investigator Daniel Pauly at the regional Marine and Coastal Forum held in Dakar, Senegal in November 2013.



Policy and Ecosystem Restoration in Fisheries

The Policy and Ecosystem Restoration in Fisheries (PERF) group, led by Professor Tony Pitcher, researches policies for sustainable management of fisheries and the ecosystems in which they are embedded, including analyses of human dimensions.

In the 2012-2013 period, Dr Lingbo Li published ecosystem-based work on seals and zooplankton in the Strait of Georgia, carried out field work for DFO in the Arctic (**see photo to the left**), and was awarded an NSERC postdoc (Visiting Fellow in West Vancouver DFO laboratory) to apply Bayesian mixing models to reconstruct fish diet from stable isotope analyses.



Dr. Mimi Lam was invited to present at the European Society for Agricultural and Food Ethics (Uppsala, Sweden, **see photo below**), the Asia-Pacific Society for Agricultural and Food Ethics (Bangkok, Thailand), and the Universities of Stockholm, Bergen, and Tromsø. She was invited to Earth Stewardship discussions at EcoSummit (Columbus, USA), the Ecological Society of America (ESA) Annual Meeting (Portland, USA), and participated in workshops on Rapfish (Vancouver, Canada), EcoMarkets (Oakland, USA) and IndiSeas II (Paris, France). Dr Lam organized an interdisciplinary session on niche construction and ecological policy at the American Association for the Advancement of Science Annual Meeting (Vancouver, Canada) and presented a new cultural indicator at the 6th World Fisheries Congress (Edinburgh, Scotland) and the University of Bangor, U.K. She organized sessions on ethics and justice in human

ecosystems and the future of ecology (ESA 2013), coastal ecosystems and a Pacific Northwest sense of place (ESA 2012). She contributed to a spatial modelling project for the Haida Gwaii marine ecosystem and concluded a 2-year term as elected Member-at-Large on the Board of ESA. She was also appointed Adjunct Associate Professor at the University of New Mexico, Department of Biology.

After his graduation in 2012, Dr. Dawit Tesfamichael moved to a postdoctoral position with the *Sea Around Us* where he 'reconstructed' the actual catch of Red Sea countries and updated his trophic model of that ecosystem. He also attended, in November 2013, the Western Indian Ocean Marine Science Association (WIOMSA) Eighth Scientific Symposium in Maputo, Mozambique.



Lydia Teh gained her PhD and transferred to a *Sea Around Us* postdoctoral position performing historical marine fish catch reconstructions for Southeast Asian countries, especially small-scale coral reef fisheries, including the magnitude of coral reef fish catches in the Coral Triangle. With Dr. Louise Teh, Lydia organised a workshop on Economics of Small-scale Fisheries at the 3rd Southeast Asian Marine Mammal Symposium (March 2013, Langkawi, Malaysia).

After a paternity leave, Rajeev Kumar published temperature impacts on lake whitefish. He presented results from his PhD thesis on ecosystem-based management of Mille Lacs lake at the Ecological Society of America Annual Meeting (Minneapolis, USA) and to the State of Minnesota Department of Natural Resources, with a special focus on assessing the ecosystem impacts of 3000 tonnes per km² of invading zebra mussels (see photo left).



Mr. Szymon Surma began research on an ecosystem perspective of forage fish and marine mammals, initially examining the impacts of recovered of baleen whale populations on the Haida Gwaii marine ecosystem. He presented results at the PICES Annual Meeting (October 2012, Nanaimo, BC), the 21st Annual BC Marine Mammal Symposium (UBC), and an Alaska Marine Science Symposium (Anchorage, USA). Mr. Surma also evaluated the “krill surplus” hypothesis using a historical model of the Southern Ocean ecosystem.

Jamie Slogan was awarded an NSERC Industrial Fellowship, continued research on a Vancouver Convention Centre shoreline restoration project and developed a new rapid appraisal technique. Yago Coll began his Masters on Rivers Inlet salmon jointly with Dr Evgeny Pakhomov in Oceanography. Nicolas Talloni joined the group from Chile for a PhD that aims to integrate human and ecological measures of fishery status. Dr. Tony Pitcher attended an International Programme on the State of the Ocean meeting (March 2012, Oxford, UK), helped to develop a technique to identify Ecological Biological Significant Areas for seamounts, and presented papers on the warming Antarctic Peninsula, enhancements to the Rapfish technique (6th World Fisheries Congress, May 2012, Edinburgh, UK), and on ecosystem-based analysis of walleye fisheries in Mille Lacs Lake (Ecological Society of America, August 2012, Minneapolis, USA). He also gave research seminars in Bangor (UK), Tromsø (Norway), Stockholm (Sweden) and Seattle (USA).

William Hunt, a 6-month volunteer from Ireland, worked with Dr Pitcher on an analysis of the status of world herring fisheries. Dr. Pitcher led research using a new spatial modelling framework (Ecospace) for the Haida Gwaii marine ecosystem (see photo right). He continued work on marine spatial planning as a member of the Haida Gwaii Marine Advisory Committee and on the Advisory Board, Institute of Marine Research of the University of the Azores. Dr. Pitcher’s journal *Fish and Fisheries* (Wiley-Blackwell) yet again led the world citation rankings for fisheries journals.





NF- UBC Nereus Program

The Nereus Program is an interdisciplinary initiative working on the advancement of international sustainable fisheries and ocean governance initiated and funded by the Nippon Foundation and linking five institutions to the hub at UBC: Duke (Principal Investigator: Dr. P. Halpern) and Princeton Universities (Dr. J. Sarmiento) in the US, the World Conservation Monitoring Centre (Dr. Louisa Woods) and Cambridge University (Dr. Tom Spencer) in the UK, and Stockholm University in Sweden (Dr. H. Österblom). The work is mainly executed by Nereus fellows, i.e., one postdoc and Following on Dr. Villy Christensen as its founding Director, the Nereus Program, since March 2013 is run by Dr. Yoshi Ota, who has coordinates its activities and promotes collaborative work between the fellows, Dr. William Cheung as Science Advisor, and Dr. Daniel Pauly as Chair of the Steering Committee. Jointly, they have moved the Nereus program to a point where the close interdisciplinary relationships between the different institutions involved in the Nereus Program have begun to bear fruits. Dr. Christensen, who became in February 2013 a Nippon Foundation Professor of Ecosystem Modeling and Management has been advancing his research on a model which will integrate different components of global fisheries dynamics (see Global Ocean Modeling). Dr. William Cheung studies the vulnerability and responses of marine ecosystems and fisheries to climate change in a continuing collaboration with our partners at Princeton, World Conservation and Monitoring Centre, and Stockholm University (see also the Changing Ocean Research Unit).



Dr. Yoshitaka Ota, Co-Director of Nereus; Dr. Ryan Rykaczewski, Senior Nereus Fellow (Alumnus); Audrey Valls, Nereus Fellow; Dr. Marc Metian, Senior Nereus Fellow; and Daniel Dunn, Nereus Fellow. (Kei Kodera/The Nippon Foundation)

In 2013, Dr. Ryan Vachon joined the Nereus Program as its Education and Communication Coordinator; he will work on building internal and external communication network for the program, redesigning the web page, increasing social networking, and producing short educational videos. This new position will lead to enhanced program outreach in coming years.

Senior Nereus Fellow Dr. Wilf Swartz has made significant progress in his research on the 'real' price of fish. He also participated in various workshops, expanding his network through new socio-economic and governance approach in fisheries. He was also instrumental in organizing the Nereus trip to Tohoku and continues to support the communities affected by the March 2011 tsunami in north Japan. Nereus Fellow Audrey Valls has made steady progress towards her Ph.D. thesis, in which she aims to predict trophic interactions and refine our understanding of their role of in ecosystem functioning. Also, the research assistant of the Program, Ms. Lauren Weatherdon, who is also a master's student at FC, has is completing her research on the impact of Climate Change on BC First Nations Fisheries at the Fisheries Centre under the supervision of Dr. Cheung and Dr. Ota.



<http://www.nereusprogram.org/>

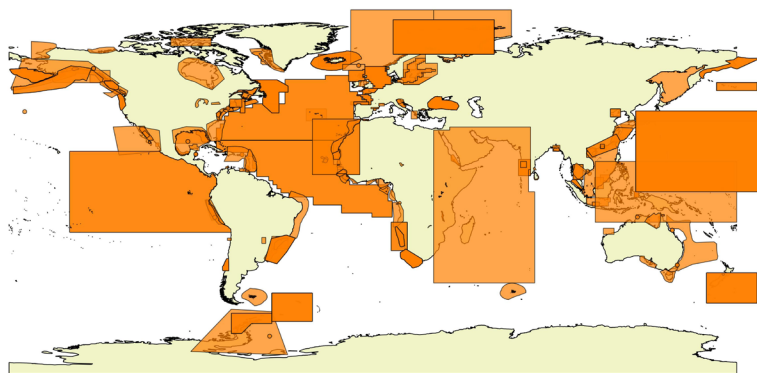
Global Ocean Modeling

The Global Ocean Modeling (GOM) group is a new research unit that was established in 2013, but which builds on many years of development and cooperation. We work with ecosystem modeling of aquatic ecosystems, marine as well as freshwater, and participate in the development of the Ecopath with Ecosim (EwE) approach and software (www.ecopath.org) through the Ecopath Research and Development Consortium. A major part of our work is focused on developing a spatial model of the global ocean as part of the Nereus program in order to evaluate alternative future scenarios.

Our work is interdisciplinary, and we work with climate, earth system, food web, fisheries, ecological, economic, social, and governance researchers, and we conduct our research through wide international cooperation.

Our aim is to develop research that support policymaking, and we focus on management systems that are resilient to climate change. This notably includes work in direct support of the Convention on Biological Diversity, the United Nations Environment Programme, and the Global Environment Facility through initiatives related to Large Marine Ecosystems.

The GOM is led by Professor Villy Christensen, who was appointed Nippon Foundation Professor of Ecosystem Modeling and Management in 2012, and who is involved in numerous international initiatives aimed at supporting introduction of ecosystem-based management and evaluating options for management under climate change. In addition to Dr Christensen, the following participates in the group: Dr Marta Coll who works with ecosystem modeling and biodiversity research with the Mediterranean Sea as a focal area. Dalai Felinto, who develops scientific visualizations using Blender, Python and .Net programming. Jeroen Steenbeek who is instrumental for the EwE development, .Net programming, GUI and databases. Joe Buszowski who works with Net programming, scientific programming, and has developed a WestGrid Mono version of EwE, which is currently used for the global ocean model that GOM is developing. Audrey Valls is PhD student and Nereus Fellow, working with ecosystem modeling, keystone species, and modeling of diet preferences. Further Patricia Woodruff is PhD student working with ecosystem modeling of reservoirs in British Columbia.



Global maps of areas for which Ecopath ecosystem models exist, as can be used to draw inferences on ecosystem states.”

<http://www.globaloceanmodeling.org/>



Changing Ocean Research Unit

The Changing Ocean Research Unit (CORU), led by Assistant Professor William Cheung, aims to develop theoretical and empirical understanding of the vulnerability and responses of marine ecosystems and human society to climate change and other human stressors. Specifically, CORU develops and applies approaches to (1) examine hypotheses about biological responses of marine communities to climate change (CC), ocean acidification (OA) and fishing; (2) develop scenarios of how these human drivers affect marine ecosystems and the resulting socio-economic implications; (3) explore and evaluate options to mitigate and adapt to these changes and (4) communicate research findings to the society to help develop shared-views of our future oceans and their management.

Current and graduated members of CORU are from a diverse range of countries, including Canada, China, Germany, India, Spain, Trinidad and U.K. Current membership includes 1 Research Associate (Miranda Jones – developing multi-model ensemble of species distribution models), 3 PhD students (Ravi Maharaj – studying effects of climate change on Caribbean fisheries, Vijay Jayaraj – examining the potential role of species adaptation in modifying their responses to climate change, Xueying Yin – studying the vulnerability of Chinese marine ecosystems and fisheries to climate change) and 1 MSc student (Lauren Weatherdon – examining the effects of climate change on aboriginal fisheries in British Columbia) and 1 associate member (Vicky Lam – studying the economic impacts of climate change through fisheries). From 2011, CORU has trained 1 postdoctoral fellow (Jose Fernandes) and 2 PhD students (Miranda Jones and Tina Kerby). CORU also hosted visiting scientists from China and Hong Kong.

From 2012-2013, research of CORU contributed to the understanding of how climate change is affecting marine fisheries and biodiversity. Using catch and biogeographic data, we demonstrated for the first time that the catch composition of global fisheries has shifted according to changing ocean temperature and relatively stable thermal preferences of the exploited species (published in *Nature*). These findings provide evidence that climate change has already been affecting global fisheries. Also, we showed for the first time, that climate change may reduce the maximum body size of marine fishes by 14 to 24% by 2050 relative to the present (*Nature Climate Change*). We evaluated the effects of distribution shift on conservation risk of vulnerable species, through changes in rate of bycatch and overlap with protected areas. We also developed state-of-the-art modelling approaches to examine climate change impacts on marine ecosystems, and developed a new version of Dynamic Bioclimate Envelope Model, which explicitly accounts for trophic interaction and fishing, and applied multi-model ensemble approaches to assess the uncertainty of projecting climate change impacts on marine biodiversity and fisheries. Our modelling approaches were applied globally and to different regions, for example, Pacific Canada, Western Europe, Western Australia and West Africa.

CORU also contributed to understanding the trade-offs in fisheries management and conservation. Contributions including assessing the conservation status of world's groupers, particularly the endangered Nassau grouper in the Bahamas, being part of a multi-disciplinary team to develop participatory modelling approaches to help resolve the trade-offs in managing coastal fisheries in East Africa.

CORU has been involved in interdisciplinary research projects with international and regional partners, notably CEFAS, Kenya Marine Fisheries Research Institute, Plymouth Marine Laboratory, Princeton University, Stockholm Resilience Centre, UNEP-WCMC, University of East Anglia, University of Hong Kong, University of Plymouth and Wildlife Conservation Society. CORU's research received international and local funding support, including National Geographic Society, Nereus Program, NSERC, SSHRC and U.K.'s Ecosystem Service for Poverty Alleviation (ESPA) Program.

In 2012-2013, CORU contributed to a number of international assessment reports and to local and international organisations. Notably, William Cheung (PI) was invited by the Intergovernmental Panel of Climate Change (IPCC) to be a lead author for the IPCC's Fifth Assessment Report (Chapter 6 – Ocean Systems).



He is a lead author of *Global Biodiversity Outlook – 4* and a contributing author to UNEP's Global Environmental Outlook – 5 report. He also serves as scientific advisor for WWF Canada, SharkTruth and is a member of the IUCN Groupers and Wrasses Species Specialist Group. Members of CORU gave keynotes, invited talks and seminars in numerous international and regional conferences and meetings.

Below are examples of events that he participated in:

- National Taiwan University, "Climate change effects on marine ecosystems and fisheries", Taipei, 10 Dec 2013 (invited speaker)
- Tokyo University, "Climate change effects on marine ecosystems and fisheries", Tokyo, 10 October 2013 (invited speaker).
- PCC Summer Institute, University of Washington, "Projection and attribution of climate change effects on marine fisheries", Friday Harbour Laboratory, WA, 11 – 13 September 2013 (invited speaker).
- A.I. Climate Workshop, Norwegian University of Science and Technology, "Climate change impacts on global marine ecosystems", Trondheim, Norway, 3 – 5 September 2013 (invited speaker).
- Society for Conservation Biology Annual Meeting, "Projecting climate change effects on marine conservation", Baltimore, 25 July 2013 (invited speaker).
- Society for Experimental Biology Annual Meeting, "Shrinking of fishes exacerbates climate change impacts on marine ecosystems", 4 – 6 July 2013 (invited speaker).
- PICES/ICES, "Global assessment of the implications of climate change on the spatial distribution of fish and fisheries", St. Petersburg, Russia, 20-22 May (invited speaker)
- World Ocean Commission, "Highseas marine protected areas", Oxford, U.K., 8-10 April (invited speaker).
- CoastalWeb, "Changing Ocean Research Unit", Vancouver, Canada, 1 Oct 2012 (invited speaker).
- 2012 Forum on Fisheries Science and Technology, Shanghai, China 17-18 Oct 2012 (invited speaker).
- Annual Meeting of Regional Association for Research on the Gulf of Maine, Portsmouth, NH, USA, 9 Oct 2012 (keynote speaker).
- ICES Annual Science Conference, "Responses of living marine resources to climate change and variability: learning from the past and projecting the future", Reykjavik, Iceland, 23-27 September 2013 (session organizer and speaker).
- Seminar series, Intergovernmental Oceanographic Commission, DFO, "Projecting large-scale effects of climate change on marine ecosystems and fisheries", Sydney, B.C., Canada, 13 Sept. 2012.
- Second International Workshop: Ocean acidification impacts on fisheries and aquaculture economics and industries, Monaco, 11-13 Nov 2012 (invited working group leader).
- East China Sea Fisheries Institute, China, "Impacts of climate change on marine ecosystems and fisheries", Shanghai, China, 22 May 2012.
- 2nd International Symposium on Effects of Climate Change on the World's Oceans, Yeosu, Korea, 13-20 May 2012 (invited speaker).
- Minister of Environment, Peru, "Projecting impacts of climate change on fisheries in Peru", Lima, Peru, 5 February 2012.

CORU seeks to communicate the latest scientific findings to the public. Research findings from 2012-2013 were featured in wide range in the media (e.g., findings on the shrinking body size of fishes under climate change and signature of climate change in global fisheries) including BBC, CNN, Swedish Radio, CBC, CTV, Global TV, The Weather Network, NPR, Ming Pao News (Hong Kong), Washington Post, the Guardian, Nature News, New Scientists and Science Daily.

www.fisheries.ubc.ca/research-units/changing-ocean-research-unit



Graduate Studies

Fisheries Centre students come from all over the world. The 58 PhD and 26 MSc students at the FC during 2012 and 2013 came from 19 countries: Argentina, Canada, Chile, China, Eritrea, France, Germany, Hong Kong, India, Japan, Korea, Kuwait, Mexico, Ireland, Peru, South Africa, the United Kingdom, and the USA . Since the Fisheries Centre is not an admitting unit at UBC, the students that are supervised or co-supervised by a FC faculty member, are admitted to UBC Graduate Studies through other departments, primarily Resource Management and Environmental Studies (RMES) and Zoology, but also Geography and Oceanography.

In 2012, a fisheries stream was created in the RMES program, allowing RMES Masters and PhD students to focus primarily on fisheries management, conservation and governance. This stream is administered by the Fisheries Centre and students are supervised by Fisheries Centre faculty members. It includes a new mandatory 6 credit fisheries core course, FISH 520, which is taught jointly by Fisheries Centre faculty members.

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; economic valuations, and more.

During 2012 and 2013, 13 doctoral and 11 master's students completed their thesis research. A list of these graduates and their thesis titles is on page 28. Thesis abstracts can be seen at www.fisheries.ubc.ca/students/alumni. 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, and edit *FishBytes* and the newsletters of various groups.

Fisheries Centre students are known to tackle rather ambitious projects that often involve travel to remote 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.



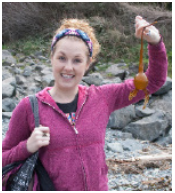
Graduate Students



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



Lucas Brotz (Canada)
PhD Zoology (start 2011)
Project: Trends in global jellyfish populations
Supervisors: Dr Evgeny Pakhomov (MSc) and Dr Daniel Pauly



Elizabeth Atwood (USA)
MSc Zoology (start 2008*)
Project: Assessing the physiological status of northern fur seal populations in North America with fecal hormones
Supervisor: Dr Andrew Trites



Iain Caldwell (Canada)
PhD Zoology (start 2006*)
Project: Habitat use, movement, and vulnerability of sedentary fishes in a dynamic world
Supervisor: Dr Amanda Vincent



Lindsay Aylesworth (USA)
PhD Zoology (start 2012)
Project: Community and population ecology, specifically to address seahorse conservation, threats and management
Supervisor: Dr Amanda Vincent



Susana Cárdenas-Alayza (Peru)
MSc Zoology (start 2008*)
Project: Prey abundance and population dynamics of South American fur seals in Peru (*Arctocephalus australis*)
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 2009-2012



Rachel Chudnow (Canada)
PhD Zoology (start 2012)
MSc Zoology (start 2010*)
Project: Case study of the British Columbia Dungeness Crab (*Cancer Magister*) fishery and lessons from domestic and international experience
Supervisor: Dr. Villy Christensen (MSc), Dr Murdoch McAllister



Dyhia Belhabib (Canada)
PhD RMES (start 2011)**
Project: Fisheries and food security
Supervisor: Dr Daniel Pauly



Leah Biery (USA)
MSc Zoology (start 2010*)
Project: Using enhanced shark catch data to estimate the magnitude and global distribution of the shark fin trade
Supervisor: Dr Daniel Pauly



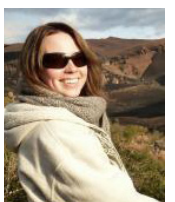
Andres M. Cisneros-Montemayor (Mexico)
PhD RMES (start 2010)**
Project: Canada valuation of marine recreational activities
Supervisor: Dr Rashid Sumaila



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



Mathieu Colléter (France)
PhD Zoology (start 2013)**
Project: The impact of fisheries on the trophic functioning of marine ecosystems: comparative approach and global-scale mapping
Supervisor: Dr Daniel Pauly



Lisa Boonzaier (South Africa)
MSc Zoology (start 2011)**
Project: Effectiveness of marine protected areas for conserving biodiversity
Supervisor: Dr Daniel Pauly
FishBytes and *Sea Around Us* Newsletter editor 2012-2013



Alex Dalton (Canada)
MSc Zoology (start 2010)
Project: How much energy does it take to power a northern fur seal and what is the best way to measure that?
Supervisor: Dr Andrew Trites, Dr David Rosen

*student graduated in 2012 or 2013

**student graduated in 2014





Meaghan Darcy (USA)
 PhD Zoology (start 2005*)
Project: Management procedure evaluation of a data-limited multi-species fishery with application to the Hawaiian bottomfish fishery
Supervisor: Dr Steve Martell



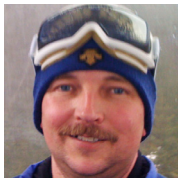
Elizabeth Goundie (USA)
 MSc Zoology (start 2012)
Project: How do changes in prey distribution and density affect Steller sea lions' diving energetics and foraging ability?
Supervisor: Dr David Rosen, Dr Andrew Trites



Mariana Diaz Gomez (Canada)
 MSc Zoology (start 2012)
Project: Does diet quality affect the ability of Northern fur seals (*Callorhinus ursinus*) to meet daily energy requirements?
Supervisor: Dr Andrew Trites



Rhona Govender (South Africa)
 MSc Zoology (start 2009*)
Project: A global estimate of the catch of small-scale fisheries
Supervisor: Dr Daniel Pauly



Wes Didier (USA)
 PhD Zoology (start 2009)
Project: Testing for stresses that may be affecting fecundity of eulachon
Supervisor: Dr David Close



Aaron Greenberg (Canada)
 PhD Zoology (start 2010)
Project: Dungeness crab fisheries
Supervisor: Dr Steve Martell/Dr Murdoch McAllister



Danielle Edwards (Canada)
 PhD RMES (start 2011)
Project: Fishing fleet dynamics and fisheries management policy evaluation for the BC small boat groundfish fleet
Supervisor: Dr Murdoch McAllister



Krista Greer (Canada)
 MSc RMES (start 2011)**
Project: Calculating the carbon emissions of the world's fishing fleets since 1950
Supervisor: Dr Daniel Pauly



Junho (June) Eom (Korea)
 PhD Zoology (start 2011)
Project: The sex pheromone *Acipenser transmontanus* in White Sturgeon
Supervisor: Dr David Close



Andrea Haas (Canada)
 MSc RMES (start 2012)**
Project: small owner-operator fleets in Atlantic Canada (with emphasis on lobster fisheries)
Supervisor: Dr Rashid Sumaila



Sarah Fortune (Canada)
 MSc Zoology (start 2009*)
 PhD Zoology (start 2013)
Project: North Atlantic right whale growth and energetics



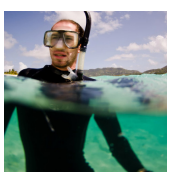
Nigel Haggan (Northern Ireland)
 PhD IIS (start 2006*)
Project: Measurable and immeasurable values in ecosystem-based management
Supervisors: Dr Rashid Sumaila and Dr Ron Trosper



Carling Gerlinsky (Canada)
 MSc Zoology (start 2010)
Project: How do sea lions manage their oxygen and respond to different prey patches while diving?
Supervisor: Dr Andrew Trites and Dr David Rosen



Katherine Haman (USA)
 PhD Zoology (start 2012)
Project: Transfer of diseases from land-to-sea using marine mammals as sentinels
Supervisor: Dr Andrew Trites



Kyle Gillespie (Canada)
 MSc Zoology (start 2012)
Project: Marine invertebrate ecology
Supervisor: Dr Amanda Vincent



Sarah Harper (Canada)
 PhD RMES (start 2013)
Project: Gender and Fisheries
Supervisor: Dr Rashid Sumalia





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



Rajeev Kumar (India)
PhD RMES (start 2006)
Project: Simulation modeling of Mille Lacs Lake ecosystems in support of EBM
Supervisor: Dr Tony Pitcher



Sarah Hawkshaw (Canada)
PhD Zoology (start 2011)
Project: Evaluating management strategies for the salmon troll fishery on the West Coast of Vancouver Island
Supervisor: Dr Murdoch McAllister



Ting-Chun Kuo (Taiwan)
PhD Zoology (start 2012)
Project: Trades in seahorses and other marine wildlife
Supervisor: Dr Amanda Vincent



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



Julia Lawson (Canada)
MSc Zoology (start 2012)**
Project: Modelling seahorse life histories to evaluate vulnerability to exploitation
Supervisor: Dr Amanda Vincent



Carie Hoover (USA)
PhD RMES (start 2006*)
Project: Effects of harvest and climate change on polar marine ecosystems
Supervisor: Dr Tony Pitcher



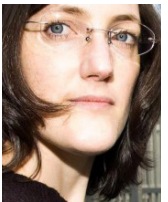
Frédéric Le Manach (France)
PhD RMES, joint with UMR Ifremer - IRD UM2 (start 2011)**
Project: Global fisheries, seafood trade, and food security: ethics and human rights in relationships between developed and developing countries



Vijay Jayaraj (India)
PhD RMES (start 2013)
Project: Modeling responses of marine species and fisheries to climate change
Supervisor: Dr William Cheung



Lingbo Li (China)
PhD Zoology (start 2008*)
Project: Harbour seals, transgenic coho salmon and euphausiids: the food dynamics in the Strait of Georgia
Supervisor: Dr Tony Pitcher



Tiphaine Jeanniard du Dot (France)
PhD Zoology (start 2010)
Project: Effects of environmental changes on fitness and foraging efficiency of fur seals: an energetic approach
Supervisor: Dr Andrew Trites



Roberto Licandeo (Chile)
PhD Zoology (start 2012)
Project: Dynamics of jack mackerel
Supervisor: Dr Steve Martell



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



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



Barbara Koot (Canada)
PhD RMES (start 2011)
Project: Seasonal distribution and relative abundance of threatened and endangered whales in British Columbian waters, from passive acoustic data
Supervisor: Dr Andrew Trites, Dr John



Dale Marsden (Canada)
PhD RMES (start 2003*)
Project: Bioeconomics of Fraser River sock-eye salmon fisheries
Supervisor: Dr Rashid Sumaila





Steve McAdam (Canada)
PhD Zoology (start 2005*)
Project: Diagnosing causes of white sturgeon (*Acipenser transmontanus*) recruitment failure
Supervisor: Dr Carl Walters



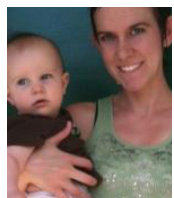
Erin Rechsteiner (Canada)
MSc Zoology (2009)
Project: Diet, distribution and food requirements of the Pacific white-sided dolphins on the British Columbia coast
Supervisor: Dr Andrew Trites



Benjamin Nelson (USA)
PhD Zoology (start 2010)
Project: Multi-species modeling of predator/prey interactions between pinnipeds and Pacific salmon
Supervisor: Dr Andrew Trites and Dr Murdoch McAllister



Brent Roberts (Canada)
MSc Zoology (start 2009*)
Project: Stimulation and production of 11-deoxycortisol in the stress response of lamprey
Supervisor: Dr David Close



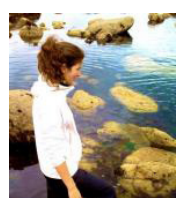
Rachel Neuenhoff (USA)
PhD Zoology (start 2011)
Project: Multi-species modeling to determine how gray seal predation impacts Atlantic cod fishery recovery
Supervisor: Dr Andrew Trites



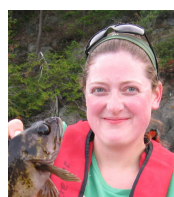
Frances Robertson (UK/Canada)
PhD Zoology (start 2008)
Project: The effects of behaviour, age, status, environmental parameters and exposure to seismic operations on the observed distribution of bowhead whales
Supervisor: Dr Andrew Trites



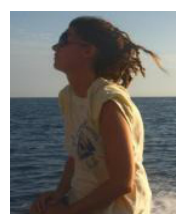
Chad Nordstrom (Canada)
MSc Zoology (2008*)
Project: Habitat selection by foraging northern fur seals: assessing in-situ ocean temperature and links to oceanographic features in the Eastern Bering Sea
Supervisor: Dr Andrew Trites



Laurenne Schiller (Canada)
MSc Zoology (start 2011)**
Project: A global analysis of tuna and billfish capture fishery landings on the high seas from 1950 to present
Supervisor: Dr Daniel Pauly



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



Anna Schuhbauer (Germany)
PhD RMES (start 2012)
Project: Improving the economic viability of small-scale fisheries as part of a global partnership for small-scale fisheries
Supervisor: Dr Rashid Sumaila



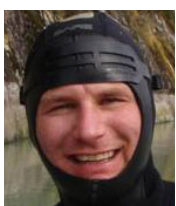
Michelle Paleczny (Canada)
MSc Zoology (start 2008*)
Project: An analysis of temporal and spatial patterns in global seabird abundance during the modern industrial era, 1950-2010
Supervisor: Dr Daniel Pauly



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



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



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



Satbir Rai
MSc Zoology (start 2012)
Project: Identifying the maturation inducing hormone in Pacific Lamprey (*Lampetra tridentate*)
Supervisor: Dr David Close



Allison Stocks (Canada)
MSc Zoology (started 2013)
Project: Providing Vietnam with important information needed to manage vulnerable seahorse populations
Supervisor: Dr Amanda Vincent





Szymon Surma (Canada)
 PhD RMES (start 2012)
Project: The role of Pacific herring in
 Northeast Pacific trophodynamics
Supervisor: Dr Tony Pitcher



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



Wilf Swartz (Canada/Japan)
 PhD RMES (start 2008*)
Project: Global expansion of marine
 fisheries and its drivers, with emphasis on
 Japan
Supervisor: Dr Rashid Sumaila



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



Nicolás Talloni Alvarez (Chile)
 PhD RMES (start 2013)
Project: Evaluating and integrating
 the human dimensions of fisheries in
 sustainable fishing policy
Supervisor: Dr Tony Pitcher



Brett van Poorten (Canada)
 PhD Zoology (start 2005*)
Project: Effects of interspecific competition
 on recruitment processes for rainbow trout
 in simple two fish-species lakes
Supervisor: Dr Carl Walters



Dawit Tesfamichael (Eritrea)
 PhD RMES (start 2002*)
Project: Assessment of the Red Sea
 ecosystem with emphasis on fisheries
Supervisors: Dr Daniel Pauly and Dr Tony
 Pitcher



Lauren Weatherdon
 MSc RMES (start 2012)**
Project: Scenarios for coastal First Nations'
 fisheries under climate change: impacts,
 resilience and adaptation potential
Supervisor: Dr William Cheung



Austen Thomas (USA)
 PhD Zoology (start 2010)
Project: Foraging/spatial ecology of top
 predators in marine ecosystems
Supervisor: Dr Andrew Trites



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



Aylin Ulman (Canada)
 MSc RMES (start 2012)**
Project: Effects of fishing on the marine
 ecosystem of the eastern Mediterranean and
 Black Sea ecosystems
Supervisor: Dr Daniel Pauly



Catarina Wor Lima (Brazil)
 PhD Zoology (start 2012)
Project: Hake management in the US and
 Canada
Supervisor: Dr Steve Martell



Tanvi Vaidyanathan
 PhD Zoology
Project: Implications of trawl fisheries on
 bycatch species and their habitats
Supervisor: Dr Amanda Vincent



Brianna Wright (Canada)
 MSc Zoology (start 2010)
Project: How do fish-eating killer whales
 find their primary prey, Chinook salmon?
Supervisors: Dr Andrew Trites and Dr
 Dominic Tollit



Audrey Valls (France)
 PhD Zoology (start 2009)
Project: Using ecosystem models to
 provide better predictions of global
 changes in marine biodiversity
Supervisor: Dr Villy Christensen



Xiong Zhang (China)
 PhD Zoology
Project: Interactions between seahorses and
 their habitats
Supervisor: Dr Amanda Vincent



Graduate Theses Completed in 2012- 2013*

Elizabeth Atwood (USA)

MSc Zoology

Title: Assessing the physiological status of northern fur seal populations in North America with fecal hormones

Supervisor: Dr Andrew Trites

Megan Bailey (Canada)

PhD RMES

Title: Economics of tuna fisheries in the western and central Pacific Ocean
Supervisor: Dr Rashid Sumaila

Bhathal, Brajgeet

PhD Zoology

Title: Government-led development of India's marine fisheries since 1950: catch and effort trends and bioeconomic models

Supervisor: Dr. Daniel Pauly

Leah Biery (USA)

MSc Zoology

Title: Using enhanced shark catch data to estimate the magnitude and global distribution of the shark fin trade

Supervisor: Dr Daniel Pauly

Iain Caldwell (Canada)

PhD Zoology

Title: Habitat use, movement, and vulnerability of sedentary fishes in a dynamic world

Supervisor: Dr Amanda Vincent

Susana Cárdenas-Alayza (Peru)

MSc Zoology

Title: Prey abundance and population dynamics of South American fur seals (*Arctocephalus australis*) in Peru

Supervisor: Dr Andrew Trites

Rachel Chudnow (Canada)

MSc Zoology

Title: In search of 'effective management': Case study of the British Columbia Dungeness Crab (*Cancer magister*) fishery

Supervisor: Dr Villy Christensen

Meaghan Darcy (USA)

PhD Zoology

Title: Management procedure evaluation of a data-limited multi-

species fishery with application to the Hawaiian bottomfish fishery

Supervisor: Dr. Steve Martell

Sarah Fortune (Canada)

MSc Zoology

Title: North Atlantic right whale growth and energetics

Supervisor: Dr. Andrew Trites

Rhona Govender

Msc Zoology

Title: Small but mighty: a global reconsideration of small-scale fisheries

Supervisor: Dr. Daniel Pauly

Nigel Haggan (Northern Ireland)

PhD IIS

Title: Becoming indigenous: measurable and immeasurable values in ecosystem-based management

Supervisors: Dr. Rashid Sumaila and Dr. Ron Trosper

Carie Hoover (USA)

PhD RMES

Title: Effects of harvest and climate change on polar marine ecosystems

Supervisor: Dr. Tony Pitcher

Vicky WY Lam

PhD RMES

Title: Global fisheries economics in the face of change in climate

Supervisor: Dr. Rashid Sumaila

Lingbo Li (China)

PhD Zoology

Title: Harbour seals, transgenic coho salmon and euphausiids: the food dynamics in the Strait of Georgia.

Supervisor: Dr. Tony Pitcher

Dale Marsden (Canada)

PhD RMES

Title: Bioeconomics of Fraser River sockeye salmon fisheries

Supervisor: Dr. Rashid Sumaila

Steve McAdam (Canada)

PhD Zoology

Title: Diagnosing causes of white sturgeon (*Acipenser transmontanus*) recruitment failure

Supervisor: Dr. Carl Walters

Chad Nordstrom (Canada)

MSc Zoology

Title: Habitat selection by foraging northern fur seals: assessing *in-situ* ocean temperature and links to oceanographic features in the Eastern Bering Sea

Supervisor: Dr. Andrew Trites

Michelle Paleczny (Canada)

MSc Zoology

Title: An analysis of temporal and spatial patterns in global seabird abundance during the modern industrial era, 1950-2010, and the relationship between global seabird decline and marine fisheries catch

Supervisor: Dr. Daniel Pauly

Erin Rechsteiner (Canada)

MSc Zoology

Title: Diet, distribution and food requirements of the Pacific white-sided dolphins on the British Columbia coast

Supervisor: Dr. Andrew Trites

Brent Roberts (Canada)

MSc Zoology

Title: Stimulation and production of 11-deoxycortisol in the stress response of lamprey

Supervisor: Dr. David Close

Wilf Swartz (Canada/Japan)

PhD RMES

Title: How does international trade affect marine fisheries?

Supervisor: Dr. Rashid Sumaila

Dawit Tesfamichael (Eritrea)

PhD RMES

Title: Assessment of the Red Sea ecosystem with emphasis on fisheries

Supervisors: Dr. Daniel Pauly and Dr. Tony Pitcher

Liesbeth van der Meer (Chile)

MSc RMES

Title: Global revenues from wild seafood products

Supervisor: Dr. Rashid Sumaila

Brett van Poorten (Canada)

PhD Zoology

Title: Effects of interspecific competition on recruitment processes for rainbow trout in simple two fish-species lakes

Supervisor: Dr. Carl Walters



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Institute for Resources,
Environment & Sustainability
Ecosystem Services & Biodiversity

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Fisheries Law

Dr Scott Hinch

Forest Sciences and Institute for
Resources & Environment
Forests & Fisheries

Dr Linc Kesler

First Nations House of Learning
Aboriginal Fisheries

Dr David (Ralph) Matthews

Sociology
Fisheries Sociology

Dr Charles Menzies

Anthropology
Fisheries Anthropology

Dr Richard Paisley

Law
Fisheries Law

Dr Royann Petrell

Chemical & Biological Engineering
Fishery Engineering

Dr William Rees

School of Community & Regional
Planning
Ecological Economics

Emeritus Members

Dr Colin Clark

Commercial Fisheries Management

Dr Brian Elliot

Environmental Sociology

Dr Les Lavkulich

Fisheries Education

Dr Paul LeBlond

Fisheries Oceanography

Dr Don Ludwig

Fisheries Mathematics

Dr Gordon Munro

Fisheries Economics

Dr William Neill

Fisheries Limnology

Dr Tom Northcote

Fisheries Biology

Adjunct Professors & Associated Faculty Outside UBC

Dr Cameron Ainsworth

National Oceanic and Atmospheric
Administration
Marine Ecosystem Restoration

Dr Jackie Alder

UNEP, Nairobi
Environmental Policy Implementation

Dr Claire Armstrong

University of Tromsø
Fisheries Economics

Mr Josef Bauer

Commercial Fisherman (retired)

Dr Ratana Chuenpagdee

St. John's Memorial
Fisheries Economics

Marie Étienne

AgroParisTech
Hierarchical modeling in fisheries

Dr John K. B. Ford

DFO, Nanaimo
Marine Mammals

Dr Robyn Forrest

DFO, Nanaimo
Management Strategy Evaluation

Dr Michael Grigg

National Institutes of Health (NIH)
Biochemistry

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 Climaatology

Dr Josh Korman
Ecometric Research Inc.
Adaptive Management

Dr Rosemary Ommer
University of Victoria
Fisheries Sociology

Mr Eric Parkinson
BC Ministry of Environment
Fisheries Management

Dr Ian Perry
DFO, Nanaimo
Fisheries Oceanography

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

Dr Laura Richards
DFO, Nanaimo
Fisheries Assessment

Dr Jordan Rosenfeld
BC Min. Environment
Stream Ecology

Dr Jon Schnute
DFO (retired)
Fisheries Mathematician

Dr Richard Sims
EBA Engineering Consultant
Environmental Science

Mr Alan Sinclair
DFO (retired)
Management Strategy Evaluation

Dr John Stockner
Eco-Logic Ltd
Limnology & Oceanography

Dr Arthur Tautz
BC Fisheries, Vancouver
GIS, Sports Fisheries

Dr John Volpe
University of Victoria
Sustainable Aquaculture

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 Commission
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



Janice Doyle
Administration Support



Marina Campbell
Administration Support
(until June 2012)



Marlene Tecson-Golfinopoulos
Manager, Administration and
Finance (as of July 2012)



Penny Mullen Administration
Support (as of August 2012)



Erin Bedard
Graduate Program Assistant
(until May 2012)



Monica Penner
Graduate Program Assistant
(June-August 2012)



Publications

ARTICLES IN REFEREED JOURNALS

- Abudaya, M., Harper S., Ulman A. and Zeller, D. 2013. Correcting mis- and under-reported marine fisheries catches for the Gaza Strip: 1950-2010. *Acta Adriatica* 54(2): 241-252.
- Ahrens, R. N. M., Walters, C. J., and Christensen, V. 2012. Foraging arena theory. *Fish and Fisheries* 13: 41–59.
- Ainley D. and Pauly D. 2013. Fishing down the food web of the Antarctic continental shelf and slope. *Polar Record*, 50(1): 92-107.
- Al-Abdulrazzak D. and Pauly D. 2013. Managing fisheries from space: Google Earth improves estimates of distant fish catches. *ICES Journal of Marine Science* doi:10.1093/icesjms/fst178.
- Al-Abdulrazzak D. and Trombulak S.C. 2012. Classifying levels of protection in marine protected areas. *Marine Policy* 36: 576-582.
- Al-Abdulrazzak D., Palomares M.L.D. and Pauly D. 2012. Gaining perspective on what we've lost: The reproducibility of encoded accounts in historical ecology. *PLoS One* 7(8): e43386.
- Allnutt T., McClanahan T., Baker M., Lagabriele E., McClennen C., Rakotomanjaka A., Tianarisoa T., Watson R. and Kremen C. 2012. Comparison of marine spatial planning methods in Madagascar demonstrates value of alternative approaches. *PLoS One* 7(2): e28969(2).
- Asamoah, E.K., Nunoo, F.K.E., Osei-Asare, Y.B., and Sumaila, U.R. 2012. A production function analysis of pond aquaculture in Southern Ghana. *Aquaculture Economics & Management*, 16(3): 183-201.
- Asiedu, B., Nunoo, F.K.E., Ofori-Danson, P.K., Sarpong, D.B., and Sumaila, U.R. 2013. Poverty Measurements in Small-scale Fisheries of Ghana: A Step towards Poverty Eradication. *Current Research Journal of Social Sciences*, 5(3): 75-90.
- Bailey, M., Flores, J., Pokajam, S., and Sumaila, U.R. 2012. Towards better management of Coral Triangle tuna. *Ocean & Coastal Management*, 63: 30-42.
- Bailey, M., Ishimura, G., Paisley, R., and Sumaila, U.R. 2013. Moving beyond catch in allocation approaches for internationally shared fish stocks. *Marine Policy*, 40: 124-136.
- Bailey, M., Sumaila, U.R., and Martell, S.J.D. 2013. Can cooperative management of tuna in the western Pacific solve the growth overfishing problem? *Strategic Behavior and the Environment*, 3(1-2): 31-66.
- Battaile, B.C., and Trites, A.W. 2013. Linking survival and reproductive can improve model estimates of vital rates derived from limited time-series counts of pinnipeds and other species. *PLoS One* 8(11): e77389.
- Beck, C., Klemow, J. Paulson, A. Bernstein, M. Lam, G. Middendorf, J. Reynolds, K. Belanger, C. Cardelus, C. Cid, S. Doshi, N. Gerardo, L. Jablonski, H. Kimmel, M. Lowman, A. Macrae-Crerar, B. Pohlad, J. de Roode, and C. Thomas. 2012. Add Ecology to the Pre-Medical Curriculum. *Science* 335: 1301-1302.
- Benoit-Bird, K. J., Battaile, B. C., Heppell, S. A., Hoover, B., Irons, D., Jones, N., Kuletz, K. J., Nordstrom, C. A., Paredes, R., Suryan, R. M., Waluk C. M., and Trites, A. W. 2013. Prey patch patterns predict habitat use by top marine predators with diverse foraging strategies. *PLoS One* 8(1): e53348.
- Benoit-Bird, K. J., Battaile, B. C., Nordstrom, C. A., and Trites, A.W. 2013. Foraging behaviour of northern fur seals closely matches the hierarchical patch scales of prey. *Marine Ecology Progress Series*, 479: 283-302.
- Biery L. and Pauly D. 2012. A global review of species-specific shark fin to body weight ratios and relevant legislation. *Journal of Fish Biology* 80(5): 1643-1677.
- Booth, S., J. Hui, Z. Alojado, V. Lam, W. W. L. Cheung, Dirk Z., D. Steyn and D. Pauly 2013. Global deposition of airborne dioxin. *Marine Pollution Bulletin*.75: 182-186.
- Bowles, E. and Trites, A.W. 2013. Faecal DNA amplification in Pacific walruses (*Odobenus rosmarus divergens*). *Polar Biology* 36: 755-759.
- Brotz L and Pauly D 2012. Jellyfish populations in the Mediterranean Sea. *Acta Adriatica* 53(2): 211-230.
- Brotz L., Cheung W.W.L., Kleisner K., Pakhomov E. and Pauly D. 2012. Increasing jellyfish populations: trends in Large Marine Ecosystems. *Hydrobiologia* 690(1): 3-20.
- Caldwell, I.R. and Vincent A.C.J. 2012. Revisiting two sympatric European seahorse species: apparent decline in the absence of exploitation. *Aquatic Conservation: Marine and Freshwater Ecosystems*. 22: 427–435.
- Caldwell, IR, and Vincent ACJ. 2013. A sedentary fish on the move: effects of displacement on long-snouted seahorse (*Hippocampus guttulatus Cuvier*) movement and habitat use. *Environmental Biology of Fishes*, 96(1): 67-75.
- Carruthers, T.R., Walters, C.J., McAllister, M.K., 2012. Evaluating methods that classify fisheries stock status using only fisheries catch data. *Fisheries Research*, 119-120: 66-79.
- Campbell, B. and Pauly D. 2013. Mariculture: a global analysis of production trends since 1950. *Marine Policy* 39: 94-100.



- Cheung, W. W. L., J. Pinnegar, G. Merino, M. C. Jones and M. Barange. 2012. Impacts of marine climate change on fisheries in the UK and Ireland. *Aquatic Conservation: Marine and Freshwater Ecosystems* 22(3): 368-388.
- Cheung, W. W. L., R. Watson, D. Pauly. 2013. Signature of ocean warming on global marine fisheries. *Nature* 497(7449): 365-368.
- Cheung, W. W. L., Y. J. Sadovy, M. T. Braynen, L. G. Gittens. 2013. Are the last remaining Nassau grouper (*Epinephelus striatus*) fisheries sustainable? The case in the Bahamas. *Endangered Species Research* 20: 27-39.
- Cheung, W.W.L., J.J. Meeuwig, M. Feng, E. Harvey, V. Lam, T. Langolis, D. Slawinski, C. Sun and D. Pauly. 2012. Climate change induced tropicalization of marine communities in Western Australia. *Marine and Freshwater Research* 63(5): 415-427
- Cheung, W.W.L., J.L. Sarmiento, D. Pauly. 2013. Approaches to modeling and projecting climate change effects on marine ecosystems and fisheries. *ICES Journal of Marine Sciences* 70(6): 1069-1074.
- Cheung, W.W.L., Meeuwig, J.J., Feng, M., Harvey, E., Lam, V.W.Y., Langlois, T., Slawinski, D., Sun, C., and Pauly, D. 2012. Climate-change induced tropicalisation of marine communities in Western Australia. *Marine and Freshwater Research*, 63: 415 – 427.
- Cheung, W.W.L., Sarmiento, J.L., Dunne, J., Frölicher, T.L., Lam, V.W.Y., Palomares, D., Watson, R., and Pauly, D. 2012. Shrinking of fishes exacerbates impacts of global ocean changes on marine ecosystems. *Nature Climate Change*, 3: 254 – 258.
- Cisneros-Montemayor A.M., Cisneros-Mata M.A., Harper S. and Pauly D. 2013. Extent and implications of IUU catch in Mexico's marine fisheries. *Marine Policy* 39: 283-288.
- Cisneros-Montemayor, A.M., Barnes-Mauthe, M., Al-Abdulrazzak, D., Navarro-Holm, E., and Sumaila, U.R. 2013. Global economic value of shark ecotourism: implications for conservation. *Oryx*, 1-8.
- Cisneros-Montemayor, A.M., Christensen, V., Arreguín-Sánchez, F., and Sumaila, U.R. 2012. Ecosystem models for management advice: An analysis of recreational and commercial fisheries policies in Baja California Sur, Mexico. *Ecological Modelling*, 228: 8-16.
- Cisneros-Montemayor, A.M., Kirkwood, F.G., Harper, S., Zeller, D., and Sumaila U.R. 2013. Economic use value of the Belize marine ecosystem: Potential risks and benefits from offshore oil exploration. *Natural Resources Forum*, 37(4): 221-230.
- Coll M., P. Cury, E. Azzurro, M. Bariche, G. Bayadas, J. M. Bellido, C. Chaboud, J. Claudet, A-F. El-Sayed, D. Gascuel, L. Knittweis, C. PipitOne, Y. Samuel-Rhoads, S. Taleb, S. Tudela, A. Valls and Participants. 2013. The scientific strategy needed to promote a regional ecosystem-based approach to fisheries in the Mediterranean and Black Seas. *Reviews in Fish Biology and Fisheries*. 23(4): 415-433.
- Coll, M., C. Piroddi, C. Albouy, F. Ben Rais Lasram, W.W.L. Cheung, V. Christensen, V.S. Karpouzi, F. Guilhaumon, D. Mouillot, M. Paleczny, M.L. Palomares, J. Steenbeek, P. Trujillo, R. Watson and D. Pauly. 2012. The Mediterranean Sea under siege: spatial overlap between marine biodiversity, cumulative threats and marine reserves. *Global Ecology and Biogeography*, 21(4): 465-480.
- Coll, M., J. Navarro, R.J. Olson and V. Christensen. 2013. Assessing the trophic position and ecological role of squids in marine ecosystems by means of food web models. *Deep Sea Research II* 95: 21-36.
- Coll, M., Libralato, S., Pitcher, T. J., Solidoro, C. and Tudela, S. 2013. Sustainability implications of honouring the Code of Conduct for Responsible Fisheries. *Global Environmental Change*: 23(1): 157-166.
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- Dalla Rosa, L., Ford, J.K., and Trites, A.W. 2012. Distribution and relative abundance of humpback whales in relation to environmental variables in coastal British Columbia and adjacent waters. *Continental Shelf Research* 36: 89-104.
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Fisheries Centre Visitors

Listed below are some of the visitors to the UBC Fisheries Centre in 2012-2013. These and other Canadian and international visitors came to present seminars, attend workshops, and collaborate with FC researchers.

Brooke Campbell

Canadian International Development
Agency

Host: FISH500

Joshua Cinner

James Cook University, Australia

Host: FISH 500

Marta Coll

Institute of Marine Sciences, Spain

Host: Villy Christensen

Jose Fernandes

University of East Anglia, UK

Host: William Cheung

Stephanie Green

Simon Fraser University

Host: FISH500

William Hunt

MER Consortium

Host: Tony Pitcher

Yazhou Jiang

Visiting professor from China

Host: William Cheung

Miranda Jones

University of East Anglia, UK

Host: William Cheung

Çetin Keskin

Istanbul University

Host: Daniel Pauly

Nils Krueck

University of Queensland, Australia

Host: Tony Pitcher

Anders Knudby

Simon Fraser University

Host: FISH 500

Hideo Kojimoto

Hirosaki University, Japan

Host: Yoshitaka Ota

Nels Krueck

University of Queensland, Australia

Host: Tony Pitcher

Zunlei Liu

Visiting Professor from China

Host: William Cheung

Tse-Lynn Loh

Visiting postdoc

Host: Amanda Vincent

Chris McOwen

UNEP-WCMC, Cambridge University, UK

Host: Villy Christensen

Nicole Mermoud

Universidad de Concepción, Chile

Host: Tony Pitcher

Marc Metian

University of Stockholm, Sweden

Host: Villy Christensen

Lydia Mosunmola

Federal University of Technology, Akure,
Nigeria

Host: Rashid Sumaila

Samliok Ndobe

Tadulako University, Central Sulawesi
and Brawijaya University, Malang

Host: Daniel Pauly

Kjell Nedreaas

Norwegian Institute of Marine Research

Host: Daniel Pauly

Hiroshi Okamura

National Research Institute of Far Seas
Fisheries, Japan

Host: FISH500

Sung-Woo Park

East Sea Fisheries Management Service,
Korea

Host: Sang-Seon Yun and William

Cheung

Alejandro Ramírez

Universidad de Antofagasta, Chile

Host: Villy Christensen

Sergio Alejandro Rosales Carmona

MVPS Mexico

Host: Rashid Sumaila

Yutaro Sakai

University of Calgary

Host: Rashid Sumaila

Katy Seto

University of California at Berkeley

Host: Rashid Sumaila

Isaac Trindade

Science without Borders Program
Brazil

Host: Daniel Pauly

Marjo Vierros

United Nations University, Japan

Host: FISH 500

Jack Whalen

Aalto University, Finland

Host: Rashid Sumaila

Xueying Yin

University of Hong Kong

Host: William Cheung

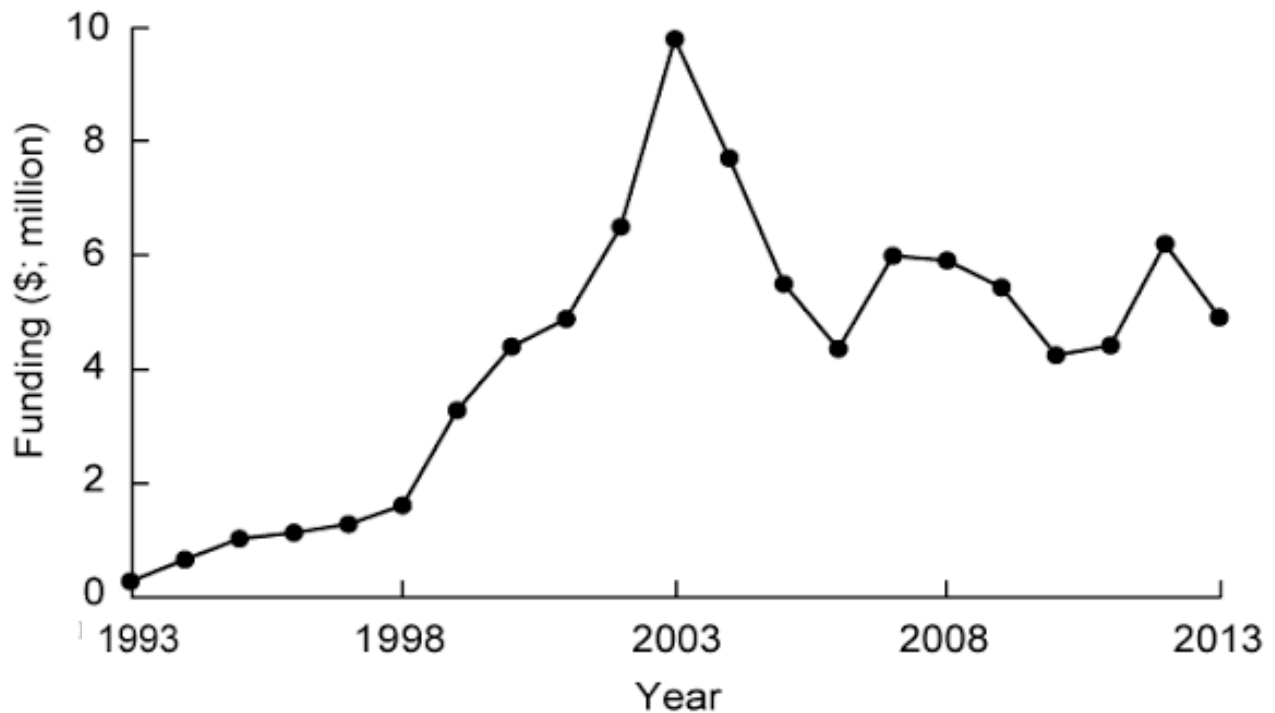
Senlin Zheng

Third Institute of Oceanography, Xiamen,
China

Host: Amanda Vincent



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*The 2012-2013 Fisheries Centre Report was produced by Nicole Gibillini and Daniel Pauly
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