1993 - 2000 Report

ROATED TO

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INTRODUCTION

This brief report summarizes the achievements and output of the Fisheries Centre from the end of the period covered by the 1993-2000 report until March 2002. It is primarily intended as a submission to the Fisheries Centre Review Panel, which will meet in May 2002, but will also serve as the nucleus of a formally published report to be issued in 2004. Each of the themes and topics covered in the 1993-2000 report is briefly updated herein. Where not mentioned, an update was not available. In addition, several of the 11 factual annexes are updated.

Taken together, the original 1993-2000 report with this update, provide a comprehensive record of the Fisheries Centre's development, output and activities, but this document is not intended to be read in isolation from the full 1993-2000 report.



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ESTIMATING THE TRUE FISH CATCH

Work has continued on refining estimates of unreported discard and illegal landings. Case studies have been completed and are being published for Iceland and Morocco. Similar studies are in progress for about 20 further jurisdictions. The aim is to provide estimates on a worldwide basis.

Maps of fisheries catches by half-degree (longitude/latitude) spatial cells all around the globe have been made using an algorithm which allocates FAO reported landings and/or those supplied by regional/national authorities using databases of global species distributions, fishing fleet access, and underlying marine productivity factors.

This work received widespread publicity following a paper published by Reg Watson and Daniel Pauly in Nature in 2002, wherein landings reported to FAO by China were proven to be grossly inflated and had, in fact, masked a global downturn in fishery landings.

Our latest version of the world catch figure is provided here.





DEVELOPMENT OF ECOPATH

ECOSIM now includes Monte Carlo estimation of uncertainty biomass trajectories, and ECOPATH now has an automated balancing procedure.

SOME APPLICATIONS OF ECOPATH WITH ECOSIM

- Ecosystem models of the US South Atlantic States, US Mid-Atlantic Bight, Gulf of Maine and Georges Bank, West Greenland, Iceland, Faeroe Islands, Norwegian and Barents Sea, North Sea, Azores, and Morocco as part of the Sea Around Us activities in the North Atlantic.
- A blue-water model of the tropical and sub-tropical parts of the North Atlantic with special emphasis on the tuna fisheries (Marcelo Vasconcellos).
- Additional work on protected artificial reefs and marine reserves in Hong Kong and the South China Sea (*Fisheries Centre Research Reports 10(3), 2002*).

ECOSYSTEM IMPACTS OF SEAMOUNT FISHERIES

The presence of numerous seamounts in the world's oceans has only become known to the scientific community during the last 40 years. The potential importance of these steep-sided undersea mountains to biogeography and diversity was only recently recognized, but this environment has remained very poorly investigated. This ignorance parallels the recognition of the negative impacts of human activities. Seamounts have been intensively fished during the last 40 years, when several countries began to fish for the pelagic armourhead and alfonsinos. Commercial exploitation of seamounts has rapidly extended to all the world oceans, and serious stock depletion has been detected in every case. Overfishing is now the major threat to seamount communities. The depletion of slow-growing and latereproducing fish populations and the impact of trawling activities on



benthic communities are also raising concerns about the threats to seamount ecosystems. Our lack of awareness of the consequences of such changes needs urgent answers.

The Fisheries Centre is cooperating in a project under an MOU with the Department of Oceanography and Fisheries of the University of the Azores (Portugal) and aims to assess the ecosystem impacts of seamount fisheries. Using the ECOPATH and ECOSIM approaches, we expect to identify the sources of energy for fish productivity over and around seamounts, and to understand how the energy is integrated in seamount fish communities, throughout the water column and trophic levels. Further aims will be to provide insights about the effects of different fishing mortality rates over time and to explore different fishing policies in seamount ecosystems, including the impact of marine-protected areas.

BACK TO THE FUTURE



The 'Back to the Future' work has seen a number of conceptual and technical advances since 2000.

'Opening the Lost Valley' analyzes how sustainable fisheries might be opened in a restored ecosystem. This issue turns out to be critical to the evaluation of what restoring the past would be worth. A paper, including case studies from Canada and the North Sea, was presented at a symposium on sustainable fisheries at the American Fisheries Society Symposium in Phoenix in August 2001, and has since been accepted for publication. The evaluation itself, using a generational equity approach, is also in the process of being published.

'Back to the Future' aims to emplace the restoration of past ecosystems as a policy goal for the future.

But policies work only when humans comply with them. Hence, a second critical issue for 'Back to the Future' is how to obtain community consent for the restoration phase and subsequent sustainable fishing phase for restored ecosystems. A paper on 'Cognitive Maps, Fishers' Knowledge, and 'Back to the Future' was presented at the 'Putting Fishers' Knowledge to Work' conference at UBC in August 2001, and the 'Back to the Future' team has



continued to devise mechanisms for increasing community input to the project.

Fishing community aspects of the project started with interviews, later entered into a publicly accessible database, with over 40 fishers held in Prince Rupert, BC, over a week in August 2001. Then, in December 2001, the 'Back to the Future' team returned to Prince Rupert to present modelling results and to discuss how community consultation might work in the 'Back to the Future' policy process. Over 25 local fishers from all sectors attended, including members the TshimTsiam and Haida of



Nations. This was the first trial of modelling scenarios selected or modified by a fishing community. The team learned some valuable lessons about how to achieve constructive dialogue with fishers, and by the end of the workshop, early suspicion had been dispelled and an excellent rapport had been reached. Additional support for the workshop came from the World Wildlife Fund. It is hoped to obtain funding for a follow-up visit to this community.

A number of technical modelling problems have been tackled, the most important of which was the discovery, and then solution, of a major problem with the optimal fishing policy search routine in ECOSIM. The discovery of how to drive past models with past climate data addresses the criticism that reconstructions of the past might be compromised by climate differences. The team has also agonized (and is writing papers on) how to deal with highly migratory species like salmon and tuna, with local species extinctions, with species flocks like Pacific rockfish (Sebastiformes). with the relative abundance of lower portions of the trophic web in ancient ecosystems which supported many top predators, with ecosystem impacts of aquaculture, with changes in habitats, and with tuning past models to past data.

The 'Back to the Future' concept is inherently multi-disciplinary. A number of encouraging contacts were made following a 'Back to the Future' presentation to the World Congress on fish remains archeology in New Zealand in September 2001. Links with historians and archeologists need to be strengthened.



The project maintains strong links with DFO's work on marine ecosystems of Canada's east coast through Dr Paul Fanning, with the Sea Around Us project at the Fisheries Centre, and with other Coasts under Stress elements in Newfoundland and BC.

All of the advances made in the 'Back to the Future' project were presented and discussed in a three-day symposium held at UBC in February 2002. Over 60 people attended, from both the east and west coasts of Canada, and from Alaska, Brasil, and Hong Kong. Members of the Oweekeno, Haida and Nuu-chah-nulth Nations were



The 'Lost Valley': an ecosystem of the past restored and then fished sustainably.

also present. The symposium will lead to a Fisheries Centre Research Report.

A preliminary 'Back to the Future' workshop is planned for La Paz, Mexico, in October 2002. A new web site designed for 'Back to the Future' projects should go live in the summer of 2002, and will incorporate dynamic database-driven maps and food web diagrams – a step on the way to a visualization tools that will present ecosystem policy scenarios to the public and decision-makers.

The primary output of the 'Back to the Future' project will be available in four Fisheries Centre Research Reports. A number of renowned scientists, archeologists, and social scientists have been asked to write a short critique of the output from the 'Back to the Future' project for its evaluation by NSERC and SSRHC in September 2002.

WHAT IS IT WORTH TO RECONSTRUCT THE PAST?

These ideas have been developed further since the publication of the Fisheries Centre 1993 - 2000 Report. First, modifications of the current approach to evaluating the costs and benefits of restoration are suggested through the use of what is termed 'Generational Cost Benefit Analysis.' Second, a new formula for the calculation of discount factors has been developed, known as 'Intergenerational Discounting.'



BACK TO THE FUTURE IN HONG KONG

The World Wide Fund for Nature Hong Kong, together with the Fisheries Centre's BTF Hong Kong team, Chiu Sein Tuck of the Hong Kong Baptist University, and Yvonne Sadovy of the University of Hong Kong, plan to undertake a five-year project to use the Back to the Future method to facilitate marine ecosystem restoration in Hong Kong. The proposed project will include community participation in data collection and policy evaluation, spatial ecosystem modelling, policy analysis, and public education. The project is planned to commence in 2003, depending on the availability of funding.

SEA AROUND US

The Sea Around Us project was still in its first inception year in 2000, when the Fisheries Centre report was published. In the meantime, the project has completed its planned coverage of the North Atlantic Ocean, leading to a number of publications. This includes a book to be published by Island Press, three comprehensive Fisheries Centre Research Reports



(downloadable from the Sea Around Us web site), and several papers in the primary literature (see Annex 3: Publications by Members). The project also ran a symposium hosted by AAAS during its February meeting in Boston, USA, which presented a comprehensive analysis of the declining fisheries of the North Atlantic and also had a large media impact. Several issues highlighted in the Sea Around Us project have been extensively reported in the media, especially the Chinese misreporting of catch (see above) and latest, now unequivocal, evidence of massive fish population depletion and Fishing Down the Food Web.

The Sea Around Us project presently works on the central and south Atlantic and is preparing a symposium, to be held in Dakar, Senegal, in late June 2002, on the changing status of West African fisheries and ecosystems. The project will then move on to the North Pacific and to a global coverage of fisheries impact on marine ecosystems. Some related work is funded from sources other than the Pew



Charitable Trusts, which so far have shouldered the bulk of the project's funding.

The project web site will begin to provide access to mapped information and summaries of Sea Around Us project results in late 2002.



Generalized life history pattern by depth zone for North Sea plaice (Pleuronectes platessus) using a readily decoded colour presentation. Brown line represents typical depth transect from approx. 53°N, 8°E to 56°N, 3°E. Colour and symbol codes are indicated in the graph. (Work by Dirk Zeller and Daniel Pauly for the Sea Around Us Project.)



RAPID APPRAISAL OF THE STATUS OF FISHERIES – RAPFISH

A RAPFISH add-in for Excel has been programmed by Pat Kavanagh and tested in a graduate course. This work has automated Monte Carlo error estimation, the leverage of individual attributes, and basic graphical output and diagnostics. Analyses for 16 countries around the North Atlantic are in progress. The method has also been adapted by Eric Parkinson and Tony Pitcher to the evaluation of status of recreational fisheries, and to the evaluation of the performance of marine reserves by Jacqueline Alder.

BIOECONOMICS

Dr Rashid Sumaila has been appointed as Assistant Professor in the Fisheries Centre from January 2002. He is developing graduate teaching in fisheries economics and has a small team working on intergenerational equity in economic evaluation, on world markets in seafood, and on the perverse impact of subsidies on fisheries. Dr Gordon Munro, recently retired from UBC Economics Department, has joined this bioeconomic research team.

RECREATIONAL FISHERIES

The book *Recreational Fisheries: Ecological, Economic and Social Evaluation*, edited by Tony Pitcher and Chuck Hollingworth and published in 2002, contains 17 peer-reviewed chapters by 34 authors from 9 countries, many of which derive from the Vancouver conference in June 1999. Tony Pitcher is the Keynote speaker at the next World Conference to be held in Darwin, Australia, in May 2002.

Carl Walters published a seminal paper in the AFS bulletin on stock collapses that are invisible to sport fishery managers. Robyn Forrest, as part of both the Sea Around Us and Coasts under Stress projects, has assembled data on a number of fisheries where sport fish catch is a significant, and often underreported, contributor to total fish mortality.



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MARINE RESERVES AND HUMAN-MADE REEFS IN HONG KONG

The initial baseline ECOPATH model of the Hong Kong inshore ecosystem (Fisheries Centre Research Reports 6(1), 1998) has now been revised to spatially model the effects of marine-protected areas with protected human-made reefs (Fisheries Centre Research Reports 10(3), 2002). Alternative designs of protected human-made reef placements have been explored, and the effects of deployment on each fishery sector and for ecosystem rebuilding estimated. Two main areas explored in this modelling exercise were Tolo Harbour and Port Shelter, which, following several iterative public consultations, are the two main areas proposed by AFCD as Fishery Protected Areas (FPAs) deployed with human-made reefs. Deployment of artificial reefs in Hong Kong waters has started in Tolo Harbour, while those in Port Shelter will start in the latter half of 2002 (see also BACK TO THE FUTURE.).



SCHOOLING PELAGIC FISH

During 2002, Nathaniel Newlands completed his PhD on spatial modelling of mesoscale phenomena in schooling bluefin tuna. The objective has been to distinguish between two hypotheses about the biomass and status of tuna in the Gulf of Maine, thought by some to be in serious danger of collapse, and by others to have a stable biomass. The school model is constructed using information from a wide range of previous work, including the fuzzy logic material from Steven Mackinson, and presents a novel automated image analysis method. The modelling work tackles these questions:

- How often do tuna enter and leave the Gulf during the summer season and how does this affect abundance estimation?
- What are the true movements of tuna as revealed by satellite pop-up tags?
- How is school size as seen by spotter pilots employed by the fishery related to the 3-D structure and movements of the school?
- How often do BFT come to the surface and become potentially visible to spotter planes?



• Can the present tuna survey technique be improved to better reflect schooling tuna abundance and location?

The work has culminated in a spatially explicit model of tuna school movements in the Gulf of Maine as driven by temperature, currents, food organisms, and predators like sharks.

FISH BIODIVERSITY: FISHBASE

The FishBase Consortium of seven institutions (including the Fisheries Centre) had its constitutive meeting at FAO in Rome on November 16-17, 2000 and its second meeting in Prague on September 2, 2001. The latter meeting was attended by Dr Daniel Pauly and Dr M.L. Palomares (who started work with Sea Around Us in fall 2001).

FishBase has made great progress since the end of the period covered by the Fisheries Centre report, as illustrated by the current number of hits to its Internet version (2.3M hits per month, not counting the mirror sites in Germany and France). Specific inputs from the Fisheries Centre have included 3,000 different common names of Brazilian marine fishes (assembled by graduate student Katia Freire), about 1,500 Maltese fish common names (Yvette Rizzo), diet composition data for 400 populations of Mediterranean fish in about 150 species (Vasiliki Karpouzi), and other inputs covering various aspects of fish nomenclature and biology.

Other related activities include the use of FishBase for checking the fish distributions used by the Sea Around Us project for mapping fisheries, and the extraction of inputs and the preparation of routines for the systematic extraction of inputs for the parameterization of ecosystem models, an activity which is likely to expand in the near future.

Another activity conducted in collaboration with the Muséum National d'Histoire Naturelle in Paris is the recovery of ichthyologic information from historic voyage explorations by French vessels, leading to new or more precise occurrence records of fish and, based thereon, work on their biodiversity. Dr. Palomares is lead author of one contribution on this topic to *La Recherche*, a French science magazine.



From oceanographic vessels, to paintings and jars, to "cabinets of curiosities" and finally catalogued in museum collections available for GIS and biodiversity analyses.



IUCN

This project maps global commercial fisheries catches into Large Marine Ecosystems (LMEs) of the world. Its web site (http://data.fisheries.ubc.ca) allows users to click on any LME (or non-LME) area and obtain either graphs or tables showing catches since 1950. The data is based on statistics from the Food and Agriculture Organization of the United Nations, modified by a spatial allocation algorithm. Links to FishBase allow the fish species found and their tropic levels to be provided. Other statistics, such as coral reef coverage and primary production levels, are included in the output. The work is sponsored by the International Union for the Conservation of Nature.

FISH BIODIVERSITY: CHESAPEAKE BAY

Researchers at the Fisheries Centre are conducting a study of Chesapeake Bay as part of an initiative funded by the National Marine Fisheries Service, NOAA Chesapeake Bay Office. The purpose of the project is to introduce ECOPATH WITH ECOSIM to the research community around Chesapeake Bay, and in the process construct and document an ecosystem model centred on the exploited parts of Chesapeake Bay, assemble available time-series data related to the abundance and exploitation of the ecosystem resources of Chesapeake Bay, fit the time-dynamic ecosystem model to these data, and finally explore policy options for exploitation of Chesapeake Bay based on the fitted ecosystem model. The one-year activity is led by Villy Christensen and Carl Walters from the Fisheries Centre in cooperation with Dr Ratana Chuenpagdee from the Virginia Institute of Marine Science.



COASTS UNDER STRESS

Coasts under Stress (CUS) (<u>http://www.coastsunderstress.ca</u>) is a flagship, multi-disciplinary research project funded by NSERC and SSHRC with many government, industry and First Nations partners. CUS research is designed to assess the impact of changes in society and resource harvest patterns on individual, community and environmental health. The major objective is to work with First Nations, government, community and industry partners to explore local, regional and national policies and options to ensure the long-



term survival of vibrant and healthy coastal communities. CUS is the umbrella project for Northern BC and East Coast Back to the Future work. Subject to a mid-term review, CUS will have a five-year life, with the potential for a further five years.

PUTTING FISHERS' KNOWLEDGE TO WORK

The world's first international conference on the resource management application of fishers' knowledge took place at UBC in August 2001. The conference was inspired by Bob Johannes, whose 1981 book Words of the Lagoon, was the first serious study in this area, and co-hosted by the UBC Fisheries Centre, UBC First Nations House of Learning, and the BC Aboriginal Fisheries Commission. Over 200 people from 23 countries and 36 North American First Nations attended. The conference was generally felt to be successful in 'stepping beyond' fishers' frustration that their knowledge is ignored, and scientists' standard position that the knowledge is anecdotal, and cannot easily be captured in the reports, tables, and graphs they are used to. The strong Canadian First Nations presence contributed to spirited discussions on the role of indigenous peoples in resource management, appropriate use of knowledge, and accreditation of informants. Presentations by Arnie Narcisse and Chief Simon Lucas of the BC Aboriginal Fisheries Commission illustrated how transmission of culture and knowledge down the generations is vital to the survival of species and ecosystems. Conference proceedings will be issued as a Fisheries Centre Research Report, with a peer-reviewed book to follow. 'Spin-off' activities include development of a concept for an international centre or unit for research and application of fishers' knowledge, and a follow-up conference.

4TH WORLD FISHERIES CONGRESS

World Fisheries Congresses are held every four years. The theme of the next congress, to be held in Vancouver in May 2004, is 'Reconciling Fisheries with Conservation: the challenge of fisheries in the 21st Century.' Tony Pitcher chairs the Program Committee for the Congress, and Bruce Ward, from the BC Fisheries Research Unit, is Co-Chair of the meeting and a member of the Program Committee. The Congress Keynote speaker is to be Daniel Pauly.







Bob Johannes



The Congress Theme

The world demand for both fisheries and conservation challenges fisheries science and management. Although fisheries date back thousands of years, recent decades have witnessed an unprecedented expansion. Serial depletions by area, species and trophic level have led to a world fish catch in decline. Major alterations to fish habitat have depleted resources in the world's marine and freshwater ecosystems. In the developed world, fish resources continue to collapse, often with little warning, bringing economic and social ruin to fisheries communities. In parts of the developing world, people eke out an existence in aquatic ecosystems that are but a shadow of their former diversity and abundance. In the past decade, a broad consensus has emerged that this situation cannot continue, yet solutions remain elusive.

How do we reconcile the human use of aquatic resources with the conservation of ecosystems? We must seek ways to manage fisheries without causing unacceptable losses of biomass, species, diversity, habitats, and ecosystem function. To achieve this goal, we shall examine fresh, interdisciplinary ways to evaluate and maintain the economic and social benefits of healthy fisheries, in the face of global climate change, human population trends, competing habitat demands, and the expressed desire for a future world of aquatic ecosystems endowed with natural diversity and resilience. These are the major challenges facing the management of aquatic ecosystems at the opening of the 21st Century.

The 4th World Fisheries Congress in Vancouver, Canada, will be a five-day global conference focused on this theme. It is in accord with the goals, purposes, and objectives of the series of World Fisheries Congresses held every four years since 1992. The 4th Congress in 2004 aims, first, to systematize and explore the issues that underpin the reconciliation of fisheries with conservation, and, second, to promote scientific advice, cooperation, and partnership among the world's fisheries scientists, managers, the fishing industry, and conservation movement in achieving this vital goal.

Keynote Speakers

The opening Keynote paper of the Congress will be delivered by Professor Daniel Pauly (Canada/France). Subsequent Keynote speakers will approach the issue of reconciling fisheries with conservation by addressing four critical questions:



- What should we care about when attempting to reconcile fisheries with exploitation? Dr Kevern Cochrane (FAO/South Africa)
- Who owns the fish and what are they worth to society? Dr Abraham Iyambo (Namibia)
- Can we get more fish or benefits from fishing while reconciling fishing with conservation? Professor Yingqi Zhou (China)
- How can we manage fisheries ecosystems to achieve the reconciliation of fisheries with conservation? Professor Stephen Hall (Australia/UK)

In addition, two Keynote speakers will address the congress theme in two example habitats of great relevance: Dr Jack Stanford (USA) on freshwater fisheries and Professor Amanda Vincent (Canada/UK) on coral reef fisheries. Other habitats will be reviewed in concurrent sessions of the Congress. On the final afternoon, a plenary discussion will be led by the Keynote speakers, and joined by Professor Carl Walters (Canada/US). The Congress ends with an "End Note" perspective from a senior scientific policy advisor.

In addition to these Keynote speakers, over 35 invited session leaders will present spoken papers summarizing key questions grouped under the main themes. Over 150 short contributed spoken papers and over 300 posters are also expected. The Congress will lead to a published book of peer-reviewed Keynote and other selected papers.

ABORIGINAL FISHERIES

UBC will award an honorary doctorate to Chief Simon Lucas in May 2002. The award is in recognition of his lifetime dedication to the conservation and restoration of the marine and freshwater ecosystems of British Columbia. His hereditary name is Kla-kishtke-is and he is the seventh ranking hereditary chief of the Hesquiat Tribe of the Nuu-chah-nulth Nation on the west coast of Vancouver Island. As co-chairman of the BC Aboriginal Fisheries Commission, he is extremely effective in working towards an expanded role for First Nations people in resource management. Simon Lucas works actively with the UBC Fisheries Centre and First Nations House of Learning in Back to the Future ecosystem restoration projects and initiatives to increase the enrollment of Aboriginal students in masters and graduate programs.



Simon Lucas



'Education for Aboriginal Fisheries Science and Ecosystem Management,' a workshop to accelerate Aboriginal participation in all aspects of fisheries management was held at the UBC First Nations Longhouse in March 2001.

A New Director of the UBC First Nations House of Learning, Mr Richard Vedan of the Secwepemc (Shuswap) Nation, has taken over from Dr Jo-ann Archibald as Director of the First Nations House of Learning. We thank Jo-ann for initiating a fruitful collaboration and look forward to working with Richard.

Work in Progress includes:

- Funding for Endowed Chair in Aboriginal Fisheries
- Funding for Aboriginal Scholarship program
- Planning for an international Aboriginal Fisheries Conference in 2003
- Planning for a possible Aboriginal Fisheries session at the 4th World Fisheries Congress, Vancouver 2004



PROJECT SEAHORSE

Dr Amanda Vincent will be joining the Fisheries Centre at UBC in July 2002, complete with her 'Project Seahorse' team. Dr Vincent is a Pew Fellow in Marine Conservation and will bring a large team of postdocs, research assistants, and students to UBC, together with links to a number of overseas employees and associates of 'Project Seahorse' worldwide. This is a major development for the Fisheries Centre because it significantly enhances our multi-disciplinary international work aimed at influencing policy in aquatic resource management and conservation. Dr Vincent is currently William Dawson Scholar and Associate Professor at McGill University.







FISHERIES CENTRE MEMBERS

DIRECTOR

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

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Dr Michael Healey Professor, Earth and Ocean Sciences and Institute for Resources and Environment Fisheries and Watershed Management

Dr William Neill Professor, Fisheries Centre and Zoology Fisheries Limnology

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

Dr Rashid Sumaila Assistant Professor, Fisheries Centre Fisheries Economics

Dr Andrew Trites Associate Professor, Fisheries Centre Marine Mammals and Fisheries

Dr Carl Walters Professor, Fisheries Centre and Zoology Modelling, Assessment and Ecosystems

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Dr George Iwama Agricultural Sciences Aquaculture

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Dr Charles Menzies Anthropology Fisheries Anthropology

Dr Dianne Newell History History of Fishers' Communities

Dr Royann Petrell Chemical & Biological Engineering Fishery Engineering

Dr William Rees School of Community and Regional Planning Community and Regional Planning

Dr Jim Thompson Agricultural Sciences Aquaculture

Richard Vedan Social Work & Family Studies Aboriginal Fisheries

RESEARCH Associates

This category includes: Research Associates, Research Assistants, Senior Research Fellows, and Consultants. **Dr Jackie Alder** Coastal Zone Management and Marine & Fisheries Policy

Dr Villy Christensen Ecosystem Modelling

Aftab Erfan Back to the Future Project

Robyn Forrest Sea Around Us Project

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Russ Jones Haida Fisheries Management

Richard K. Paisley Fisheries Law

Dr Maria Palomares FishBase and Biodiversity

Dr David Rosen Marine Mammals

Dr Reg Watson Fisheries Mapping and Databases

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Dr Don Ludwig Fisheries Mathematics

Dr Patricia Marchak Forests and Fisheries

Dr Gordon Munro Fisheries Economics

Dr Tom Northcote Fisheries Biology

ANNEX 1



SUPPORT STAFF

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Dr Laura Richards DFO, Nanaimo Fisheries Assessment

Dr Gary D. Sharp NOAA, Monterey Fisheries Oceanography

Dr John Spence BC Science Council Industry and Fisheries

Dr Max Stocker DFO, Nanaimo Fisheries Assessment

Dr John G. Stockner DFO, West Vancouver Food Chain Dynamics

Dr Arthur Tautz BC Fisheries, Vancouver GIS, Sport Fisheries

Dr Amanda Vincent McGill University, Montreal Marine Conservation

Dr Daniel M. Ware DFO, Nanaimo Pelagic Fisheries Models

Dr Jane C. Watson Bamfield and Nanaimo Marine Mammals

Dr Martin Weinstein Comox Human Ecology

POST-DOCTORAL RESEARCHERS

Dr Sylvie Guénette (Canada) Sea Around Us Project 1999-present Supervisor: Dr Daniel Pauly

Dr Sheila Heymans (Namibia) Back to the Future models 2000-present Supervisor: Dr Tony Pitcher

Dr Dominic Tollit (UK)

Improving estimation methods of population and diet of Steller sea lions 2000-present Supervisor: Dr Andrew Trites

Dr Dirk Zeller (Australia)

Sea Around Us Project 1999-present Supervisor: Dr Daniel Pauly

LONG-TERM VISITORS

Dr Kevern Cochrane (Italy) FAO, Rome

Dr Sang-Go Lee (South Korea) Pukyong National University

CURRENT GRADUATE STUDENTS

Cameron Ainsworth (Canada) MSc RMES (start 2001) Project: Spatial modelling of forage fish in northern BC Supervisor: Dr Tony Pitcher

Alasdair Beattie (Canada) PhD RMES (start 2001) Project: Optimal size and placement of marine protected areas Supervisor: Dr Daniel Pauly **Dori Bixler** PhD RMES (start 2000) Project: Law, water policy Supervisor: Dr Michael Healey

Emma Bredesen (Canada) MSc Zoology (start 2000) Project: Marine mammals in the Antarctic Ecosystem Supervisor: Dr Andrew Trites

Eny Buchary (Indonesia)

PhD RMES (start 2001) Project: Back to the Future with paleoclimatic analysis Supervisor: Dr Tony Pitcher

Rik Buckworth (Australia)

PhD Zoology (start 1995) Project: Dynamics of tropical line fisheries Supervisor: Dr Carl Walters

Olivier Cheneval (Canada)

Dr Andrew Trites

MSc Zoology (start 1999) Project: Steller sea lions and predator-prey relationships Supervisor: Dr Andrew Trites

Andrea Coombs (Canada) MSc RMES (start 2000) Project: Modeling the flow of PCBs in eastern Bering Sea Supervisors: Dr Daniel Pauly and

Raychelle Daniel (USA) MSc Zoology (start 2000) Project: Molting of Steller sea lions Supervisor: Dr Andrew Trites

Katia Freire (Brazil) PhD RMES (start 2000) Project: Analysis of northeastern Brazilian fisheries Supervisor: Dr Daniel Pauly

Jody Frolek MSc RMES (start 2000) Supervisor: Dr Michael Healey

Ahmed Gelchu (Ethiopia)

PhD RMES (start 2001) Project: Evolution and distribution of fishing efforts Supervisor: Dr Daniel Pauly

Anna Hall (Canada)

MSc Zoology (start 2000) Project: Harbour Porpoise (*Phocoena phocoena*) Habitat use, diet and interactions with selective fisheries in southern BC Supervisor: Dr Andrew Trites

Paul Higgins (Canada)

PhD RMES (start 1997) Project: Experimental management of water releases from BC Hydro dams Supervisor: Dr Carl Walters

Andrea Hunter (Canada)

MSc Zoology (start 2000) Project: Estimating marine mammal energy requirements Supervisors: Dr Daniel Pauly and Dr Andrew Trites

Kerry Irish (Canada)

MSc RMES (start 2001) Project: Killer whales in Alaska Supervisor: Dr Andrew Trites

Vasiliki Karpouzi (Greece)

MSc Zoology (start 2001) Project: Modelling of global seabird food consumption Supervisor: Dr Daniel Pauly

Kristin Kaschner (Germany)

PhD Zoology (start 1998) Project: Modelling of global marine mammal food consumption Supervisors: Dr Daniel Pauly and Dr Andrew Trites

Alison Keple (Canada)

MSc Zoology (start 1999) Project: Marine mammal population surveys in the Strait of Georgia Supervisors: Dr Andrew Trites and Dr John Ford



Saeko Kumagai (Japan) MSc Zoology (start 2001) Project: Steller sea lions Supervisors: Dr Andrew Trites and Dr David Rosen

Bob Lessard Supervisor: Dr Carl Walters

Yajie Liu (China) PhD RMES (start 2001) Supervisor: Dr Rashid Sumaila

Charlene Lobsinger MSc Zoology (start 2001) Supervisor: Dr Michael Healey

Hector Lozano (Mexico) PhD RMES (start 2001) Project: Applying information from fossil fish scales preserved in anaerobic sediments (Guaymas Basin, Mexico) to tune ECOSIM modelling in the Gulf of California, Mexico

Supervisor: Dr Tony Pitcher

Steven Martell (Canada) PhD Zoology (start 1999) Project: Shrimp fisheries and

Project: Shrimp fisheries and ecosystem impacts of benthic trawl fisheries Supervisor: Dr Carl Walters

Camela Matheson MSc RMES (start 2001) Supervisor: Dr Michael Healey

Ladan Mehranvar MSc Zoology (start 2000) Supervisor: Dr Michael Healey

Elizabeth Mohammed (Trinidad and Tobago)

PhD RMES (start 1999) Project: Reconstructing the southeastern Caribbean ecosystem: applications for assessment and management Supervisor: Dr Daniel Pauly

Telmo Morato Gomes (Portugal) PhD RMES (start 2002) Project: Ecological modelling of seamounts Supervisor: Dr Tony Pitcher

Lyne Morisette (Canada) PhD Zoology (start 2001) Project: Quality, complexity, and stability of marine ecosystem models Supervisor: Dr Daniel Pauly

Nathaniel Newlands (Canada) PhD RMES (start 1997)

Project: Biomass estimation using a schooling in model for Atlantic Bluefin Tuna in the Gulf of Maine Supervisor: Dr Tony Pitcher

David O'Brien Visiting Student, McGill University Supervisor: Dr Carl Walters

Thomas Okey (USA) PhD Zoology (start 2001) Project: Alternate states in marine communities Supervisor: Dr Daniel Pauly

Tyese Patton MSc RMES (start 2000) Supervisor: Dr Michael Healey

Mike Pearson PhD RMES (start 1999) Supervisor: Dr Michael Healey

Amy Poon (Canada) MSc RMES (start 1999) Project: Impact of Ghost Fishing: A tentative Global Estimate Supervisor: Dr Daniel Pauly

Melanie Power (Canada) PhD RMES (start 1997) Ethics and Policy in Canadian Fisheries: A Rapfish Analysis Supervisor: Dr Tony Pitcher

David Preikshot (Canada) PhD Zoology (start 2000) Project: Fish biodiversity in large marine ecosystems Supervisor: Dr Daniel Pauly

Jason Quigley

MSc Forest Science (start 2000) Supervisors: Dr Michael Healey and Dr Scott Hinch

Cynthia Rejwan (Canada) Visiting Student, University of Calgary

Laurel Rempel

PhD Geography (start 2000) Supervisors: Dr Michael Healey and Dr Michael Church

Yvette Rizzo (Malta)

PhD RMES (start 2000) Project: The central Mediterranean: functioning of a large marine ecosystem Supervisor: Dr Daniel Pauly

Richard Stanford (UK)

MSc RMES (start 2000) Project: Fisheries ecosystem in the English Channel Supervisor: Dr Tony Pitcher

Nathan Taylor (Canada)

MSc Zoology (start 2001) Project: Pike minnows and rainbow trout Supervisor: Dr Carl Walters

Dawit Tesfamichael (Eritrea)

PhD RMES (start 2002) Project: Ecosystem based fisheries management for west Indian Ocean Supervisor: Dr Daniel Pauly

Pablo Trujillo (Canada)

PhD RMES (start 2001) Project: Adding aquaculture to ECOPATH models Supervisor: Dr Tony Pitcher

Harald Yurk (Germany)

PhD Zoology (start 1996) Project: The evolutionary history of resident killer whale clans in the northeastern Pacific, using vocal dialects Supervisors: Dr Andrew Trites and Dr John Ford



COMPLETED THESES

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

2002

Aran Kay (Canada)

MSc Zoology (2002) Title: *Mysis relicta* and kokanee salmon(*Oncorhynchus nerka*) in Okanagan Lake, BC: from 1970 and into the future Supervisor: Dr Daniel Pauly Current Position: Science Writer

2001

Alasdair Beattie (Canada)

MSc RMES (2001) Title: A new model for evaluating the optimal size, placement and configuration of marine protected areas Supervisor: Dr Daniel Pauly

Current Position: Ph.D. program, UBC Fisheries Centre

Carolyn Donnelly (Canada)

MSc Zoology (2001) Title: Possible effects of pollock and herring on the growth and reproductive success of Steller sea lions: insights from feeding experiments using an alternative animal model, *Rattus norvegicus* Supervisor: Dr Andrew Trites

Jan McPhee (Canada)

MSc Zoology (2001) Title: Heart rate as a monitor for metabolic rate in captive juvenile Steller sea lions (*Eumetopias jubatus*) Supervisor: Dr Andrew Trites

Dana Haggarty MSc Zoology (2001) Supervisor: Dr Michael Healey

Leonardo Huato (Mexico)

PhD Zoology (2001) Title: A modeling investigation of migratory behaviour in fishes: a case study of sockeye salmon. Supervisor: Dr Carl Walters Current Position: Consultant

Stephen Watkinson (Canada)

MSc RMES (2001 Title: Life after death: the importance of salmon carcasses to watershed function Supervisor: Dr Daniel Pauly Current Position: Oweekeno-Kitasoo-Nuxalt Tribal Council

1997

(omitted in 1993-2000 report)

Remco Jonker (The Netherlands)

MSc Zoology (1997) Title: Reliability of calipers to measure the blubber thickness in *Eumetopias jubata* Supervisors: Dr Andrew Trites and Dr G.M. Dorrestein







FISHERIES CENTRE RESEARCH REPORTS

ANNEX 2

2002

Information Supporting Past and Present Ecosystem Models of Northern British Columbia and the Newfoundland Shelf

2002. 10(1). 116 pages. Edited by T.J. Pitcher, M. Vasconcellos, S. Heymans, C. Brignall and N. Haggan.

The Use of Ecosystem Models to Investigate Multispecies Management Strategies for Capture Fisheries

2002. 10(2). 156 pages. Edited by T.J. Pitcher and K. Cochrane.

Spatial Simulations of Hong Kong's Marine Ecosystem: Ecological and Economic Forecasting of Marine Protected Areas with Human-Made Reefs 2002. 10(3). 169 pages. Edited by T.J. Pitcher, E. Buchary and P. Trujillo.

2001

An Annotated Bibliography of Scientific Literature (1751-2000) Pertaining to Steller Sea Lions (*Eumetopias jubatus*) in Alaska 2001. 9(1). 45 pages. Edited by A. Hunter and A. Trites.

The Marine Fisheries of China: Development and Reported Catches

2001. 9(2). 50 pages. Edited by R. Watson, L. Pang and D. Pauly.

Fisheries Impacts on North Atlantic Ecosystems: Catch, Effort and National/Regional Data Sets 2001. 9(3). 254 pages. Edited by D. Zeller, R. Watson and D. Pauly.

Fisheries Impacts on North Atlantic Ecosystems: Models and Analyses 2001. 9(4). xxx pages. Edited by S. Guénette,

V. Christensen and D. Pauly.

Fisheries Impacts on North Atlantic Ecosystems:

Evaluations and Policy Exploration 2001. 9(5). 94 pages. Edited by T.J. Pitcher, R. Sumaila and D. Pauly.

Fishing for Answers: analysis of ecosystem dynamics, tropic shifts and salmonid population changes in Puget Sound, 1970-1999 2001. 9(6). 35 pages. Edited by D. Preikshot and

A. Beattie.

A Review of the Impacts of Climate Change on BC's Freshwater Fish Resources and Possible Management Responses 2001. 9(7). 12 pages. Edited by P. Tyedmers and

B. Ward.

Economics of Marine Protected Areas 2001. 9(8). 250 pages. R. Sumaila and J. Alder.





PUBLICATIONS BY MEMBERS

This annex is divided into two sections: papers in journals, books and edited volumes that have been peer reviewed, and other published contributions that have not been through this process. The editing of contributions which have themselves been peer reviewed is included in this latter section.

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2002 (OR IN PRESS)

Alder, J., U.R. Sumaila, D. Zeller and T.J. Pitcher. (2002) A method for evaluating Marine Protected Areas Management. Coastal Management 30(2): 121-131.

Beattie, A., U.R. Sumaila, V. Christensen and D. Pauly. (2002) A model for the bioeconomic evaluation of marine protected area size and placement in the North Sea. Natural Resources Modelling (in press).

Beattie, A., U.R. Sumaila, V. Christensen and D. Pauly. (2002) Ecological and economic aspects of size and placement of marine protected areas: A spatial modeling approach. *Natural Resource Modeling* (in press).

Benson, A.J. and A.W. Trites. (2002) A review of the effects of regime shifts on the production domains in the eastern North Pacific Ocean. Fish and Fisheries (in press).

Buchary, E.A., W.L. Cheung, U.R. Sumaila and
T.J. Pitcher. (2002) Back to the Future: A Paradigm Shift for Restoring Hong Kong's Marine Ecosystem.
Proceedings of the Third World Fisheries Congress.
Beijing, People's Republic of China, October 31November 3, 2000. American Fisheries Society (in press).

Cottrell, P.E. and A.W. Trites. (2002) Classifying prey hard part structures recovered from fecal remains of captive Steller sea lions (*Eumetopias jubatus*). Marine Mammal Science (in press).

Fauzi, A. and E.A. Buchary, (2002) A socioeconomic perspective of environmental degradation at Kepulauan Seribu Marine National Park, Indonesia. Coastal Management 30(2): 167-181.

Flinn, R.D., A.W. Trites, E.J. Gregr and I. Perry. (2002) Diets of fin, sei and sperm whales in British Columbia: an analysis of commercial whaling records, 1963-1967. Marine Mammal Science (in press). Hempel, G. and D. Pauly. (2002) Fisheries and Fisheries Science and their search for sustainability. Chapter 5 in: J.G. Field, G. Hempel and C.P. Summerayes (eds.). Oceans 2020: Science for future needs. Island Press, Washington, D.C. (book in press).

Heymans, J.J. L.J. Shannon and A. Jarre-Teichmann. (2002) The Northern Benguela Ecosystem: Changes over three decades (1970, 1980 and 1990). (Submitted to *Ecological Modelling*).

Heymans, J.J., R.E. Ulanowicz and C. Bondavalli. (2002) Network analysis of the South Florida Everglades graminoid marshes and comparison with nearby cypress ecosystems. Ecological Modelling, 49(1-2): 5-23.

Nøttestad, L., A. Fernö, S. Mackinson, T.J. Pitcher and O.A. Misund. (2002) How Whales Influence Herring School Dynamics in a Cold Front Area in the Norwegian Sea. ICES J. Mar Sci. (in press).

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Pitcher, T.J. (2002) A Bumpy Old Road: Size-Based Methods in Fisheries Assessment. Chapter 8 in (Hart, ed) Handbook of Fish & Fisheries, Blackwell Science, Oxford, UK.

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Sumaila, U.R. and A. Charles. (2002) Economic analysis of marine protected areas: An introduction. *Natural Resource Modeling* (in press).

Sumaila, U.R. and J. Alder (guest editors). (2002) Social and economics aspects of protected marine areas implementation. Special Issue of Coastal Management (in press).

Sumaila, U.R. and T. Charles (guest editors). (2002) Economics of protected marine areas. Special Issue of Natural Resource Modeling (in press).

Trites, A.W. and B.T. Porter. (2002) Attendance patterns of Steller sea lions (*Eumetopias jubatus*) and their young during winter. Journal of Zoology, London 256:547-556.

Williams, R.M., A.W. Trites and D.E. Bain. (2002) Behavioural responses of killer whales to whalewatching: opportunistic observations and experimental approaches. Journal of Zoology (London) 256:255-270.

Winship, A., A.W. Trites, and D.A.S. Rosen. (2002) A bioenergetics model for estimating the food requirements of Steller sea lions (*Eumetopias jubatus*) in Alaska. Marine Ecology Progress Series 229:291-312.

Zeller D. (2002) Tidal current orientation of *Plectropomus leopardus* (Serranidae). Coral Reefs (in press).

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Armstrong, C.W. and U.R. Sumaila. (2001) Optimal allocation of TAC and the implications of implementing an ITQ management system for the North-East Arctic cod. *Land Economics*, 77: 350-359.

Bundy, A. and D. Pauly. (2001) Selective harvesting by small-scale fisheries: ecosystem analysis of San Miguel Bay, Philippines. Fisheries Research 53: 263-281.

Gregr, E.J. and A.W. Trites. (2001) Predictions of critical habitat for five whales species in the waters of coastal British Columbia. Canadian Journal of Fisheries and Aquatic Science 58:1265-1285.

Heymans, J.J. (2001) Handbook of Ecological Parameters and Ecotoxicology, Edited by
L.A. Jørgensen, S.E. Jørgensen and S.N. Nielsen,
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Heymans, J.J. (2001) ECOTOX: Ecological Modelling and Ecotoxicology, Edited by L.A. Jorgensen,
S.E. Jorgensen, S.N. Nielsen, Elsevier Science,
Amsterdam, 2000. CD-ROM. ISBN 0-444-50240-8;
NLG 1,200 or USD 609. Ecological Modelling 144: 97-98.

Hutton, T., M.H. Griffiths, U.R. Sumaila and T.J. Pitcher. (2001) Cooperative versus non-cooperative management of shared linefish stocks in South Africa: An assessment of alternative management strategies for Geebek, *Fisheries Research* 51: 53-68.

Newlands, N. and M. Lutcavage. (2001) From individuals to local population densities: North Atlantic Bluefin Tuna (*Tunnus thynnus*). Pages 421-441 in J.R. Sibert and J.L. Nielsen (eds.). Electronic Tagging and Tracking in Marine Fisheries.

Pauly, D. (2001) Review of: Tropical Estuarine Fishes: Ecology, Exploitation and Conservation by S.J.M. Blaber. Fish and Fisheries .2(4): 385.

Pauly, D. P. Tyedmers, R. Froese and L.Y. Liu. (2001) Fishing down and farming up the food web. Conservation Biology in Practice 2(4):25.

Pauly, D., M.L. Palomares, R. Froese, P. Sa-a, M. Vakily, D. Preikshot and S. Wallace. (2001) Fishing down Canadian aquatic food webs. Can. J. Fish. Aquat. Sci. 58: 51-62.

Pitcher T.J. (2001) Fish Schooling: Implications for Pattern in the Oceans and Impacts on Human Fisheries. Pages 975-987 in J.H. Steele, K.K. Turekian and S.A. Thorpe (eds.). Encyclopedia of Ocean Sciences, Academic Press, UK, 3399 pp.

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Pitcher, T.J. and D.B. Preikshot. (2001) Rapfish: A Rapid Appraisal Technique to Evaluate the Sustainability Status of Fisheries. Fisheries Research 49(3): 255-270.

Salas, S. and T.J. Pitcher. (2001) Fishing strategies of small-scale lobster fishermen in Yucatan, Mexico. In Gonzalez R. (ed.). Proc. 3rd Bi-National Mexico-Cuba Lobster workshop. Lobster 97, National University of Sinaloa, Mazatlan, Mexico.

Sumaila, R.S., T.J. Pitcher, N. Haggan and R. Jones.
(2001) Evaluating the Benefits from Restored
Ecosystems: A Back to the Future Approach. Pages 1-7, Chapter 18 in A.L. Shriver and R.S. Johnston (eds.).
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2000

Armstrong, C.W. and U.R. Sumaila. (2000) Cannibalism and the optimal sharing of the North-East Atlantic cod stock: A bioeconomic model. *Journal of Bioeconomics*, 2: 99-115.

Cury, P. and D. Pauly. (2000) Patterns and propensities in reproduction and growth of fishes. Ecological Research 15: 101-106. Freire, K.M.F. and J.P. Castello. (2000) Feeding aspects of the *Engraulis anchoita* larvae in the extreme south of Brazil. *Boletim do Instituto de Pesca* (Brazil), 26(2): 189-201.

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Heymans, J.J. and D. Baird. (2000) A carbon flow model and network analysis of the northern Benguela upwelling system, Namibia. *Ecological Modelling* 126: 9-32.

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Pauly, D., A. Beattie, A. Bundy, N. Newlands, M. Power and S. Wallace. (2000) Not just fish: value of marine ecosystems on the Atlantic and Pacific coasts. In H. Coward, R. Ommer and T. Pitcher (eds.). Just Fish: Ethics and Canadian Marine Fisheries, pp. 34-46.

Pauly, D., V. Christensen and C. Walters. (2000) Ecopath, Ecosim and Ecospace as tools for evaluating ecosystem impact of fisheries. ICES Journal of Marine Science 57: 697-706.

Pauly, D., V. Christensen, R. Froese and M.L.D. Palomares. (2000) Fishing down aquatic food webs. American Scientist 88: 46-51.

Pitcher, T.J., R. Watson, N. Haggan, S. Guénette, U.R. Sumaila, R. Kennish, D. Cook and A. Leung. (2000) Marine reserves and the restoration of fisheries and marine ecosystems in the South China Sea. *Bulletin of Marine Science*, 66(3): 543-566.

Samb, B. and D. Pauly. (2000) On 'variability' as a sampling artefact: the case of *Sardinella* in north-western Africa. Fish and Fisheries. 1: 206-210.

Sumaila, U.R. (2000) Fish as vehicle for economic development in Namibia. *Forum for Development Studies*, 2: 295-315.



OTHER PUBLISHED CONTRIBUTIONS

2002 (OR IN PRESS)

Buchary, E.A. (2002) Preliminary reconstruction of the Icelandic marine ecosystem in 1950 and some predictions with time series data. Fisheries Centre Research Report, University of British Columbia, Vancouver, British Columbia (in press).

Buchary, E.A., J. Alder, S. Nurhakim and T. Wagey. (2002) The Use of Ecosystem-based Modelling to Investigate Multi-species Management Strategies for Capture Fisheries in the Bali Strait, Indonesia. Fisheries Centre Research Reports 10(2): 24-32.

Christensen, V., S. Guénette, S. Heymans, C.J. Walters, R. Watson, D. Zeller and D. Pauly. (2002) Trends in the abundance of high-trophic level fishes in the North Atlantic, 1950 to 2000. In: S. Guénette, V. Christensen, T. Pitcher and D. Pauly (eds.). Fisheries Impacts on North Atlantic Ecosystems: Models and Analyses Fisheries Centre Research Report, University of British Columbia, Vancouver, British Columbia: 9(4) (in press).

Guénette, S. and T. Morato. (2002) The Azores archipelago, 1997: and Ecopath approach. Sea Around Us Project, University of British Columbia, Canada. 21 pp. (in press).

Kaschner, K., R. Watson, V. Christensen, A.W. Trites, and D. Pauly. (2002) Modeling and mapping trophic overlap between Marine mammals and commercial fisheries in the North Atlantic. In D. Zeller, R. Watson, T. Pitcher and D. Pauly (eds.). Fisheries Impacts on North Atlantic Ecosystems: Catch, Effort and National/Regional Data Sets. Fisheries Centre Research Reports, University of British Columbia, Vancouver, British Columbia: 9(3) 35-45.

Mendy, A.N. and E.A. Buchary. (2002) Constructing the Icelandic marine ecosystem model for 1997 using a mass balance modelling approach. Fisheries Centre Research Report, University of British Columbia, Vancouver, British Columbia (in press).

Morato, T.; S. Guénette and T. Pitcher (2002) Fisheries of the Azores, 1982-1999. In: D. Zeller; R. Watson; T. Pitcher, and D. Pauly (eds). Fisheries impacts on North Atlantic Ecosystems: Catch, effort and national/regional data sets. Fisheries Centre, University of British Columbia, Vancouver, British Columbia, Vol. 9(3) (in press).

Pauly, D. (2002) Darwin's Fishes: an encyclopedia of ichthyology, ecology and evolution. Cambridge University Press, Cambridge (in press).

Pauly, D. (2002) Growth and mortality of basking shark *Cetorhinus maximus*, and their implications for whale shark *Rhincodon typus*. Pages 000-000 in: S.L. Fowler, T. Reid, and F.A. Dipper (eds.). Elasmobranch biodiversity: conservation and management. Proceedings of an International Seminar and Workshop held in Sabah, Malaysia. IUCN, Gland (in press).

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Pauly, D. and V. Christensen. (2002) Chapter 10: Ecosystem Models in P. Hart and J. Reynolds (eds.). Handbook of Fish and Fisheries. Blackwell Science (in press).

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Pitcher, T., M. Vasconcellos, S. Heymans, C. Brignall and N. Haggan (eds.). (2002) Information Supporting Pat and Present Ecosystem Models of Norther British Columbia and the Newfoundland Shelf. Fisheries Centre, University of British Columbia, Vancouver, British Columbia, Vol. 10(1) 116 pp.

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CONFERENCES AND WORKSHOPS

ANNEX 4

2002

Sea Around Us (at Symposium on Fisheries Impact on Marine Ecosystems) February 16: AAAS Meeting, Boston, USA.

Back to the Future: Methods and Results Symposium February 20-22: University of British Columbia, Vancouver, Canada.

2001

Scientific Writing Course February 19-23: University of British Columbia, Vancouver, Canada.

Education for Aboriginal Fisheries Science & Ecosystem Management March 26-27: University of British Columbia, Vancouver, Canada.

Putting Fishers' Knowledge to Work August 27-31: University of British Columbia, Vancouver, Canada.

Back to the Future: Community Consultation Workshop December 4-7: Prince George, BC, Canada.







SEMINARS

ANNEX 5

2002

Maria Lourdes Palomares (Fisheries Centre, UBC) Biodiversity in FishBase: Georeferencing Expedition Records from the Early 1800s.

Dom Tollit (Marine Mammal Unit, Fisheries Centre, UBC) Towards Accurate Estimates of Pinniped Diet Composition.

Stephen Hall (Australian Institute of Marine Science)

Fisheries Management from an Ecosystem Perspective: How Do We Get There from Here?

Bill Seaman (Florida Sea Grant College Program, University of Florida)

Human-made Reefs in Ocean Fisheries and Ecosystems: Using Suspicion and Science to Define Their Roles.

Jacques Moreau (Ecole Nationale Supérieure Agronomique de Toulouse (ENSAT))

Lake Ubolratana, Thailand: A Multi Disciplinary Approach and Integration of Information Towards Proper Management and Sustainability of a Tropical Manmade Lake.

Gerry Silvestre (Consultative Group on International Agricultural Research) Demersal Fisheries of Southeast Asia: Key Challenges and Opportunities.

Bill Montevecchi (Memorial

University of Newfoundland) Seabird x Fish Interactions: Intersecting Prey, Fisheries and Oceanographic Conditions.

Andre E. Punt (School of Aquatic & Fishery Science, University of Washington)

Assessment of Data Poor Species: Can Bayesian Methods Help Us?

John Atta-Mills (Former Vice President of Ghana and Visiting Professor at Centre for the Study of Global Issues, UBC) Ghanaian Fisheries.

Bruce Ward (Fisheries Research and Development Section, BC Ministry of Water, Land and Air Protection)

Climate-induced Variation in Survival of Salmonids on the West Coast of North America during Freshwater and Marine Life Stages.

Carin Magnhagen & Torleif

Eriksson (Dept. of Aquaculture) and Kjell Danell & Kjell Sjoberg (Dept. of Animal Ecology) (Swedish University of Agricultural Sciences, Umea, Sweden) Utilisation of the Fish and Wildlife Resources in Boreal Ecosystems: Information about a Program for Bilateral Co-operation between UBC and SLU (Swedish University of Agricultural Sciences).

Nathan Taylor (Fisheries Centre, UBC)

Exploring the Effects of Density Manipulations on Growth, Mortality and Behavior of the Northern Pikeminnow in B.C.

Andrea Coombs (Fisheries Centre, UBC)

Modeling the flow of PCBs in the Eastern Bering Sea.

Telmo Morato Gomes (Fisheries Centre, UBC)

Coastal Marine Fish Communities' Research in the Azores.

Kerry Irish (Fisheries Centre, UBC)

One Whale, Two Whales, Red Whale, Blue Whale: Towards an Abundance Estimate for Killer Whales in Alaska.

Vasiliki Karpouzi (Fisheries Centre, UBC)

Feeding Habits and Trophic Levels of Mediterranean Fishes.

Hector Lozano (Fisheries Centre, UBC)

Historical Ecosystem Analysis and Modeling of the Upper Gulf of California after Nearly a Century of Discharge Loss.

Pablo Trujillo (Fisheries Centre, UBC)

Salmon Farming in Chile and BC: An Ecosystem Approach.

Ahmed Gelchu (Fisheries Centre, UBC)

Evolution and Distribution of Fishing Effort: A GIS Based Analysis.

2001

Murray Rudd (School for Field Studies, Turks and Caicos Islands)

Does seafood import tariff protection for artisanal fishers increase fishing pressure on vulnerable reef fish in the Turks and Caicos Islands?

Ivonne Ortiz (School of Aquatic and Fisheries Sciences, UW) On the brink of extinction: the plight of the vaquita.

Dorothee Schreiber (Fisheries Centre, UBC)

Individual quotas in the Pacific halibut and groundfish fisheries.



Teresa Ryan (Fisheries Centre, UBC)

Grease Trails to Ghost Trails: Modelling the pre-contact North Coastal eulachon fishery for comparison to recent commercial fisheries management.

Dave Lightly (Chief of Sooke Band)

Use of trapnets in selective fishing in B.C.

Ransom A. Myers (Killam Chair of Ocean Studies, Dalhousie University)

Can meta-analysis solve all outstanding problems in the populations dynamics and management of fish?

Dave Preikshot (Fisheries Centre, UBC)

Everything I ever needed to know I learnt from Puget Sound.

Shelton Harley (Dalhousie

University) Meta-analysis and hierarchical modelling of fisheries data.

Emma Bredesen (MMRU,

Fisheries Centre, UBC) Ecosystem modelling of the Antarctic.

Cameron Ainsworth (Fisheries

Centre, UBC) Modeling the Bay of Biscay, France with Ecopath and Ecosim

Raychelle Daniel (MMRU,

Fisheries Centre, UBC) Timing of molt in wild and captive Steller Sea Lions.

David Policansky (National Research Council, Washington, DC) Managing space and access in recreational fisheries.

Lee Alverson (Natural Resources Consultants Inc., WA) 5th Larkin Lecture: The Good, the Bad and the Ugly: Factors influencing the scope and quality of fisheries science and management decisions.

Lee Alverson (Natural Resources Consultants Inc., WA)

Larkin Lecture Discussion: Factors influencing the scope and quality of fisheries science and management decisions.

Teresa Ryan (Fisheries Centre, UBC) Indigenous people and correct terminology.

Ellen Pikitch (Wildlife Conservation Society, Marine Conservation)

A seascape approach to fisheries management and biodiversity conservation.

Andrea Morgan (Steelhead Society Habitat Restoration Corp.)

Squamish River watershed restoration program – overview of restoration work completed over the past seven years.

Richard Stanford (Fisheries

Centre, UBC) Using Ecopath to model the English Channel/La Manche.

Julia Baum (MMRU, Fisheries Centre, UBC)

Bycatch of sharks in Pelagic Longline Fisheries.

Anna Hall (MMRU, Fisheries Centre, UBC)

Evaluation of harbour porpoise population status off southern Vancouver Island and development of a small cetacean conservation model.

Tom Tomascik (Parks Canada) The role of national marine

conservation areas in conservation of marine biodiversity.

Marc Porter (BC Fisheries)

Defining logging risk to BC's freshwater fish fauna: an exercise in GIS and armchair ecology.

Cecilie Kvamme (Institute of Marine Research, Bergen, Norway)

A preliminary assessment of the effects of introducing a grid in the trawl fishery for North-East Arctic Cod.

Martin Sayer (Scottish Association for Marine Science, UK)

Sustainable fisheries management and artificial reefs: Scottish perspective.

Daniel Pauly (Fisheries Centre, UBC)

The Sea Around Us Project, with key results from its first 2 years.

Wolfgang Haider (School of Resource and Environmental Management, SFU)

Theory and applications of stated choice models to recreational fishing.

Julia Parrish (Pacific Northwest Coastal Ecosystem Regional Study, UW)

The canary in the coalmine: what can common murres tell us about nearshore ecosystem health?

Dianne Newell (Department of History, UBC)

What constitutes the 'economic history' of fisheries: An International Perspective.

Rashid Sumaila (Fisheries Centre, UBC)

Evaluating marine ecosystem restoration efforts: cost-benefit analysis.

Charles Menzies (Department of Anthropology and Sociology, UBC)

Indigenous resource management, local governance, and the health of pacific salmon in the Tsimshian territories: a preliminary review.

Tonny Wagey (Oceanography, UBC)

Study of phytoplankton ecology in Ambon Bay.

Eric Parkinson (BC Ministry of Fisheries)

The regulation of population abundance in lacustine rainbow trout.

Vardis Tsontos (Department of Biological Science, USC)

The Gulf of Maine Biogeographical Information System (GMBIS) Project: A spatial data management framework supporting fisheries oceanography and marine biogeographical studies.

Eny Buchary (Fisheries Centre, UBC)

Spatial simulations of Hong Kong's marine ecosystem.

Arnie Narcisse (The BC Aboriginal Fisheries Commission) First Nations fisheries in BC.

Bob Francis (School of Aquatic and Fishery Sciences, UW) A web of small tensions.







GRADUATE COURSES

The following 3-credit courses are currently run by the Fisheries Centre:

Fish 500 Issues in Fisheries Research: Seminars Fish 501 Issues in Fisheries Research: Freshwater Fish 502 Issues in Fisheries Research: Marine Fish 503 Issues in Fisheries Research: Policy Fish 504 Quantitative Analysis of Fisheries I Fish 505 Quantitative Analysis of Fisheries II Fish 506 Critical Issues in Fisheries Development

Several of the above courses are comprised of modules. Different modules are run each year depending on our partners, visitors, and workshops in the Centre.

Fisheries Centre Graduate Program

General Information

The new Fisheries Centre at UBC was formed as a unit of the Faculty of Graduate Studies and aims to focus and promote the multidisciplinary study of fisheries. 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.

This guideline is to complement the general regulations detailed by the Faculty of Graduate Studies. Students of the Fisheries Centre can be enrolled at various departments under the <u>Faculty of Graduate</u> <u>Studies</u>, e.g. <u>Resource Management and Environmental Studies</u>, or <u>Zoology</u>. The Fisheries Centre and the First Nations House of Learning are also encouraging aboriginal students to apply for graduate studies in Master and PhD programs. More information can be found in the <u>Aboriginal Fisheries</u> <u>Initiatives</u> web page.

Admission Requirements

Students should refer to the admission requirements of the <u>Faculty of Graduate Studies</u> for general information and minimum academic guidelines. In general, a bachelors degree in Science (e.g. Ecology, Biology, Zoology), or in relevant quantitative subjects within Arts (e.g. Mathematics, Economics) will normally be required. Degrees from other disciplines will be considered where an applicant's main background is in policy or sociology of fisheries, and where evidence of quantitative experience can be provided. A master's degree is normally required for admission to the doctoral program.



Courses

Students should check with the department where they are registered for course requirements. Additionally, the Fisheries Centre offers a series of fisheries courses which students are encouraged to take. These courses are as follows:

- FISH 500 (3 credits) Issues in Fisheries Research: Seminars: Terms 1 & 2
- FISH 501 (3 credits) Issues in Fisheries Research: Freshwater
- FISH 502 (3 credits) Issues in Fisheries Research: Marine: Term 2
- FISH 503 (3 credits) Issues in Fisheries Research: Policy (Not offered 2001/2002 school year)
- FISH 504 (3 credits) Quantitative Analysis of Fisheries I: Term 1
- FISH 505 (3 credits) Quantitative Analysis of Fisheries II: Term 2
- FISH 506 (3 credits) Critical Issues in Fisheries: Term 1

Other recommended courses:

- AGEC 421B Economics of Biodiversity & Nature Conservation
- AGSC 480 Intensive Fish Production
- AGSC 490 Aquaculture and the Environment
- ANTH 495A/ANTH 540A Ecology, Social Science and Fisheries Crises
- BIOL 402 Aquatic Ecology
- BIOL 408 Principles of Applied Ecology
- ECON 308 Introduction to Microeconomics
- ECON 309 Principles of Economics
- ECON 472 Economics of Renewable Resources
- ECON 571 Economics Analysis and Natural Resources
- FRST 387 Fish/Forestry Interactions
- FRST 485 Forest Water Management
- GEOG 539/RMES 500C Climate Change in the 21st Century
- RMES 500X Integrated Coastal Zone Management
- RMES 501 Perspectives on Resources & Environments
- ZOOL 523 Fish Behaviour & Ecology
- ZOOL 527 Theoretical Population Dynamics

Fisheries Centre Members

The students of the Fisheries Centre can take advantage of the knowledge of the members of the Fisheries Centre who have expertise in various fields ranging from Fish Behavior, Fisheries Assessment and Modelling, Tropical Fisheries, Fisheries Policy and Economics, Aquaculture, and much more. Fisheries Centre members can serve as students' supervisors or in supervisory committees.

More Information

Students interested in knowing more about the Fisheries Centre and our graduate program can contact the Fisheries Centre Graduate Secretary, at the following address:



Fisheries Centre 2204 Main Mall Vancouver, B.C. V6T 1Z4 tel. (604) 822-2731 fax. (604) 822-8934 email: office@fisheries.ubc.ca



FISH 500: Issues in Fisheries Research Seminars

FISH 500 (3 credits; Catalogue # 88710 Section 001)

Course Organizers:

Yajie (Lucy) Liu and Dr Tony Pitcher, Fisheries Centre, UBC

Time:

Fridays, 11:00 am -12:30 pm (starting Friday, September 14 2001; coffee & muffins at 10:30 am before the seminar)

<u>Organisational meeting</u>, for students taking the course for credit, set for Friday, September 7th at 11 am in the Ralf Yorque Room (confirmed)

Place:

Ralf Yorque Room (Room 115, Fisheries Centre)

Remarks:

The aim of this two-term seminar course is to give students a broad perspective of the scope of fisheries science, to give students an opportunity to present an informal working seminar on their research and to enable active participation in discussion of fisheries issues. The students will also have to prepare an abstract of some of the seminars that are presented (see the <u>list of seminars</u> - updated January 4, 2002). All Fisheries Centre graduate students are expected to present one FISH 500 seminar each year.

Fish 500 Seminar Student Information

Winter 2001 - 2002 Terms 1 and 2 Fridays, 11:00-12:30 pm, RYR Course organizers: Tony Pitcher & <u>Yajie (Lucy) Liu</u>

Organisational meeting for students taking Fish 500 for credit: Friday, September 7, 2001 11:00 am, Ralf Yorque Room, Hut B-8 (confirmed!)

Course description

The seminar series will feature presentations from external speakers and students from the Fisheries Centre. The aim of the course is to give students a broad perspective of the scope of fisheries science, and enable active participation in discussion of fisheries issues. Each student will have an opportunity to present an informal working seminar on their research during the second term. For credits, students will be required to prepare an abstract of some of the seminars presented and prepare a "conference report". Details of the assessments are presented below.

Assessments

1. Abstracts (40%)

Each term, **3 abstracts** of seminars must be written, a total of 6 for the whole year. Abstracts must be short (300 words) and specific (no "... were discussed" kind of sentences). Seminars have to be chosen from among those of external and non-student FC speakers. Abstracts must be handed in a week after the seminar (Friday, 5pm in Yajie's mailbox). Use the word counter in your word processor. Do not send abstracts by e-mail.

2. Seminar (10%)

This is intended to be an informal presentation of your work in progress of what you expect to do. This seminar should be 20 minutes long and leave 10 minutes for questions. The structure and format of the seminar should follow the criteria generally recognized for presentations (no reading allowed). Speakers should hand out the **title** and a **short abstract** a week before their presentations, hard copies or by e-mail to Yajie.

3. Conference report (50%)

Write a report of all the seminars presented during the 2 terms using the format of published conference reports. Such reports are generally short (800 words). They give the reader an



overview of what was presented, *highlights* of some papers and *critique* of some aspects of the series or particular seminars. The reports are due by the end of Spring term 2001.

4. Presence

Students are expected to attend every seminar.





FISH 501: Issues in Fisheries Research: Freshwater

FISH 501 (3 credits; Catalogue # 10434 Section 001)

Course Organizers:

Dr Tony Pitcher, Fisheries Centre, UBC

Time:

9 am to 4 pm (times may vary on specific days)

Place:

Ralf Yorque Room

Remarks:

Module 1, February 4 - 7 2002 Dr. Tony Pitcher, UBC Fisheries Centre *Advanced RapFish*

DETAILED SCHEDULE:

Monday 4 Feb. 10.30-12.00 and 2.00-4.30: Introductory Lectures on Rapfish, literature on Rapfish.
Tuesday 5 Feb. 10.30-12.00: Practical session on methods, assignment of seminar topics, to be followed up in own time.
Wednesday 6 Feb. 10.3-12.00: Practical help session, to be followed up in own time.
Thursday 7 Feb 2-4.30: Seminar presentations and wrap-up of course

Module 2, March 4: 1 - 4 pm March 5: 9 - 12 am and 2 - 4 pm March 6: 1 - 4 pm March 8: 9 am - 2 pm Dr. Rashid Sumaila, UBC Fisheries Centre *Economics of Fisheries Restoration and Management* This course will begin by introducing students to the key concepts in fisheries economics. It will then proceed to discuss the latest ideas in the economics of marine ecosystem restoration and fisheries management. These ideas are then extended to look at the broader issue of maintaining environmental quality for the benefit of both current and future generations.

Module 3: March 25, 26, 27, 28, 2002 Dr. Daniel Pauly, UBC Fisheries Centre *Advanced EcoPath with EcoSim*



<u>FISH 502</u>: Issues in Fisheries Research: Marine Uncertainty and Conflict: the Challenges to Responsible Fisheries Management

This course will be jointly taught in 2001-2002 as Interdisciplinary Studies course INDS 502Q.

FISH 502 (3 credits; catalogue #53730, Section 001, Term 2)

Course Organizer:

Dr. Kevern Cochrane, Senior Fishery Resources Officer FAO, Rome, Italy Cecil H. and Ida Green Visiting Professor, 2002

Place and Time:

Green College, Wednesdays 4 - 6 pm

Remarks:

Dr Kevern Cochrane, is a 2002 Green Visiting Professor in Residence, a term-long professorship awarded by the Cecil H. and Ida Green Visiting Professorships. The UBC Fisheries Centre nominated Dr. Cochrane for the Professorship, with the support of faculty and students in a number of UBC departments.

Dr Cochrane is based at the Food and Agriculture Organization of the United Nations, in Rome, where his work includes the Caribbean and Southeast Atlantic regions, as well as the Code of Conduct for Responsible Fisheries. His diverse experience also includes a period as a Justice and Reconciliation Worker for the Church of the Province of Southern Africa (Episcopalian), in his native South Africa.

All Fisheries Centre students are very strongly urged to register for this course.

See the <u>course description</u> or the <u>web site for Interdisciplinary Studies</u> for more details of Dr. Cochrane's seminar.





Course Description: Fish 502 and Interdisciplinary Studies 502Q Dr. Kevern Cochrane Uncertainty and Conflict: the Challenges to Responsible Fisheries Management

The course will provide an overview of the successes and failures of fisheries management in recent history, and address some of the primary causes of its failures. Fisheries exist to meet human requirements and the fundamental conflict between human demand and limited ecological productivity is at the heart of the crisis facing fisheries and conservation of marine resources. This over-riding conflict is frequently obscured by multiple use of resources, where the impact of different use-groups on the resources may be hard to estimate and competing requirements difficult to resolve. Adding to the complexity of most fisheries is pervasive uncertainty about the biological and ecological quantities and processes driving resource productivity, and of the true impact of human use on these resources in each case. This course will examine the net effect of these conflicts and of the far from perfect information on our attempts to obtain optimal benefits from capture fisheries in a responsible and sustainable manner. The topic will be addressed in different ways, including the use of simulation models and through examination of case studies, drawing particularly, but not exclusively, on recent developments in South African fisheries. In this country, the on-going attempts to address the imbalances in access to fishery resources resulting from apartheid, so as to achieve equity in the fishing sector, have encountered and highlighted many of the fundamental problems common to all fisheries.

While conventional single-species management is yet to be implemented effectively in most fisheries, the current movement in fisheries towards ecosystem-based management will lead to recognition of even greater uncertainties and more conflicts than have been explicitly included in the single-species oriented approaches used up to know. This will further complicate implementation of responsible management, as will be addressed in the course.

The course will consider methods for estimating uncertainties in scientific advice and using them in decision-making, as well as approaches to identifying and resolving conflicts. Finally, the contribution of some major governmental and non-governmental global initiatives intended to encourage better management of marine resources will be considered, including the UN Law of the Sea, the FAO Code of Conduct for Responsible Fisheries and eco-labelling.

The following specific topics will be covered.

- 1. The recent history of fisheries and fisheries management and the evolution of the current global crisis in fisheries.
- 2. The role of science and the scientist in informing decision-making in fisheries management.
- 3. Uncertainty and risk.
- 4. Reconciling the irreconcilable: case studies reflecting the conflicts between different ecological, economic, social and other interests.
- 5. The institutional requirements for implementing ecosystem-based fisheries management.
- 6. Practical examples of providing scientific advice for ecosystem-based management, illustrated through use of Ecopath with Ecosim.



- 7. Determining management strategies: a patchwork of measures.
- 8. Global instruments and initiatives: achievements, failures and still pending.
- 9. Looking to the future



UBC FISHERIES CENTRE - GRADUATE COURSES

Fish 504 - Fisheries Analysis Timetable for 2000

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	Ī			Sessions		
Session		Dat	e	9.30-11.00	14.00-16.30	Theme
	1	Friday	08-Sep	tjp	tjp	Modelling growth and mortality
	2	Friday	15-Sep	tjp	tjp	Dynamic Pool Models 1
	3	Friday	22-Sep	tjp	tjp	Dynamic Pool Models 2
	4	Friday	29-Sep	dp	dp	Growth parameters from length-frequency data
	5	Friday	06-Oct	tjp	tjp	Surplus Production Models 1
	6	Friday	13-Oct	dp	dp	Introduction to FISAT software
	7	Friday	20-Oct	tjp	tjp	Surplus Production Models 2
	8	Friday	27-Oct	tjp	tjp	A two-sector bioeconomic fishery model
	9	Friday	03-Nov	dp	dp	Yield and value per recruit
	10	Friday	10-Nov	tjp	tjp	Virtual Population Analysis
	11	Friday	17-Nov	dp	dp	Mortality parameters from length-frequency data
	12	Friday	24-Nov	dp	dp	Length-structured VPA
						Assessment*
				tjp	50%	2 topics written up, deadline Jan 2nd 2001
				dp	50%	2 topics written up, deadline Jan 2nd 2001
				Cource Tute	arc.	

urse	lutors	
	Dr Tony J. Pitcher	
	Dr Daniel Pauly	

* please note that Fish 504 assigments have been delivered very late in previous years. For the 2000/01 session, assignments handed in after this deadline will be subjected to a 5% penalty per day. All assigrnents should be handed in to Janice Doyle in the FC office (room 100 Hut B8)



FISH 505: Quantitative Analysis of Fisheries II

FISH 505 (3 credits; Catalogue # 10548 Section 001)

Course Instructor:

Robert Ahrens, Fisheries Centre, UBC

Time:

Fridays, 9:00 am -10:30 am and 2 - 4 pm (starting 11 January 2002)

Place:

Ralf Yorque Room (Room 115, Fisheries Centre)

Remarks:

A study of world fisheries that presently or potentially can be utilized; including consideration of sport and non-extractive use. World aquatic renewable resources are explored in a framework of biological, technological and institutional factors. Theoretical and applied approaches to management are examined in depth including techniques of analysis, synthesis and implementation.

FISH 506: Critical Issues in Fisheries

FISH 506 (3 credits; Catalogue # 53730 Section 001)

Course Organizers:

Dr Andrew Trites, Fisheries Centre, UBC

Time: (Term 1, 2001/2002 Academic Year)

Mondays and Wednesdays 10:30 am to 12:00 (45 minutes lecture, 45 minutes discussion)

Place:

Ralf Yorque Room (Room 115, Fisheries Centre)

Remarks:

This course aims to introduce students to the scope and focus of fisheries research being carried out in the UBC Fisheries Centre.

The overall research theme is that of the problems and status of world fisheries. The course includes introductory material on a range of topics, such as ecosystem modeling and rapid appraisal, later covered in depth in other FC graduate courses. In addition, the course includes brief introductions to useful techniques such as GIS and databases. Sessions are run by FC Faculty, Postdocs and Research Associates.

To receive credit for Fish 506, students choose four of the topics given by the professors and submit an essay (3000 word maximum) on each. Detailed list of topics TBA.

All graduate students in the Fisheries Centre are expected to attend this course in their first year.

Wednesday, 5 Sept., 10:30 am: Introductory Session.







RESEARCH SUPPORT INCOME

ANNEX 9

Funding from UBC (2001-2002):	
Salaries	
Operating costs	

\$393,686 \$24,469

External research funding:

\$4,068,094

External research funding by year:



*Project finances are as declared to the Fisheries Centre.





