

Guelph, June 5-8, 2005

# *Fish Barcode of Life*

**662** Med. & Black Sea

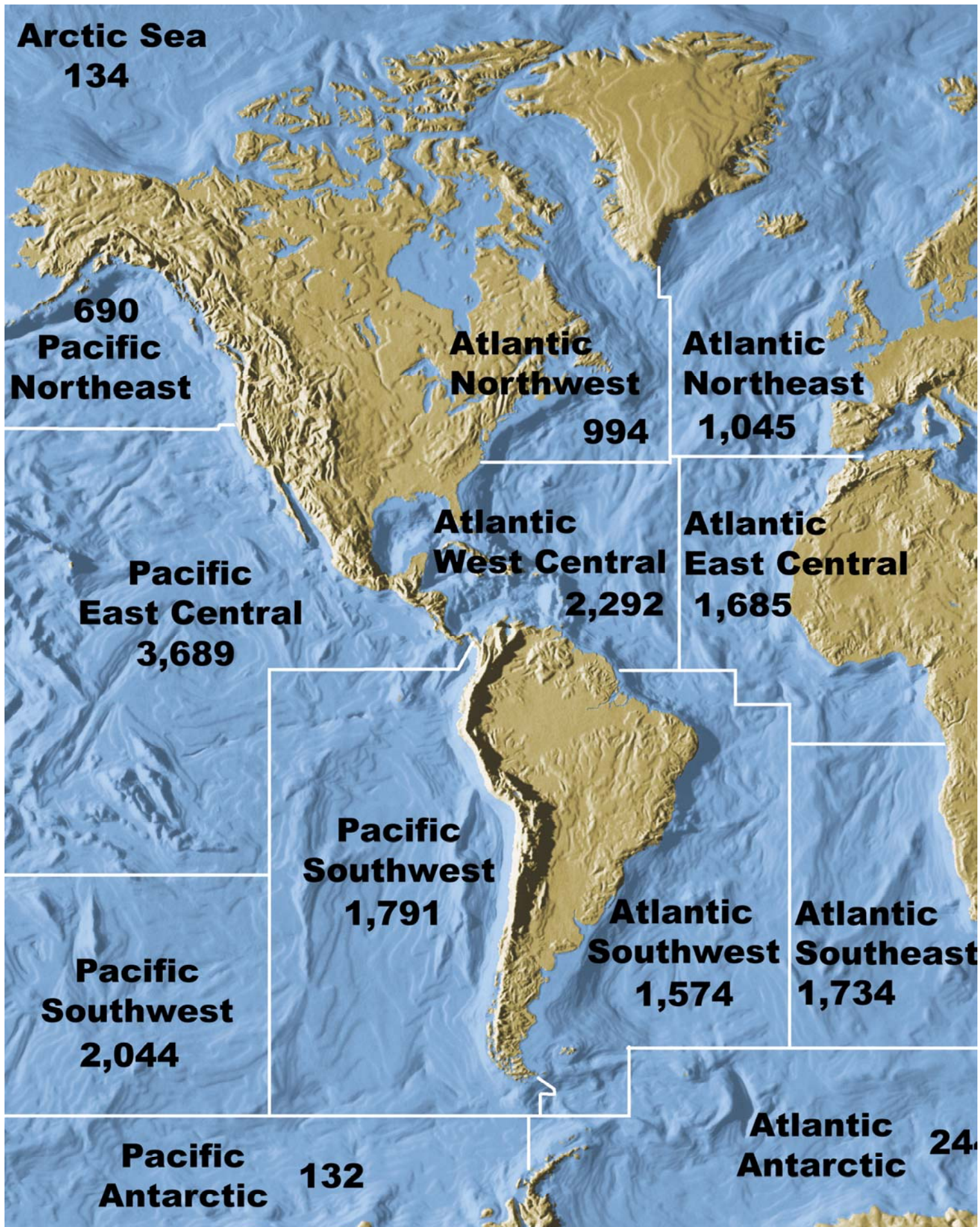
**Pacific Northwest**  
**4,760**

**Pacific West Central**  
**> 5,706**

**4,175**  
**Indian Ocean, Western**

**Indian Ocean, Eastern**  
**4,234**

**4** **Indian Ocean, Antarctic** **232**



# Fish Barcode of Life (FISH-BOL)

*June 5-8th, 2005*

## Conference Sponsorships:

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## Hosted By:

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## Conference Co-Chairs:

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**Paul Hebert**  
*Biodiversity Institute of Ontario  
University of Guelph*

**Bob Ward**  
*CSIRO Marine Research*

# FISH-BOL Workshop Program

## Arrival Day: Sunday, June 5

|           |   |
|-----------|---|
| 4:45 pm   | Pickup from Hotel                           |
| 5:00-7:00 | President's House: Pre-Conference Reception |

## Day One: Monday, June 6

|           |                   |
|-----------|-------------------|
| 8:30-8:45 | Pickup from Hotel |
|-----------|-------------------|

### Theme 1: Fish-BOL: What it's All About (Chair Bob Hanner)

|             |                                   |               |
|-------------|-----------------------------------|---------------|
| 9:00-9:05   | Welcome                           | Bob Hanner    |
| 9:05-9:20   | Perspectives on Barcodes          | Jim Omura     |
| 9:20-9:30   | Barcodes- the Scientific Dialogue | Jesse Ausubel |
| 9:30-10:00  | Background to the Barcode of Life | Paul Hebert   |
| 10:00-10:20 | A Plan to Barcode All Fish        | Bob Ward      |
| 10:20-10:40 | Break                             |               |

### Theme 2: Enabling Tools (Chair Haile Yancy)

|             |                                     |                       |
|-------------|-------------------------------------|-----------------------|
| 10:40-11:00 | Analytical Capacity and Approaches  | Lee Weigt             |
| 11:00-11:20 | Barcode of Life Data (BOLD) Systems | Sujeevan Ratnasingham |
| 11:20-11:40 | FishBase                            | Nicolas Bailly        |
| 11:40-12:00 | GenBank                             | Scott Federhen        |
| 12:00-12:30 | Open Discussion                     |                       |
| 12:30- 1:10 | Lunch                               |                       |

### Theme 3: Fish Genes – From Barcodes to Tree of Life (Chair Allan Connell)

|            |  |               |
|------------|--|---------------|
| 1:10- 1:30 | Barcoding Australian Fish                  | Bronwyn Innes |
| 1:30- 1:50 | Barcoding Fishes- Intercontinental Efforts | Tyler Zemplak |
| 1:50- 2:10 | Planetary Bio: Catfishes                   | John Lundberg |
| 2:10- 2:30 | Tree of Life: Cypriniformes                | Rick Mayden   |
| 2:30- 2:50 | Fish Mitochondrial Genomes                 | Masaki Miya   |
| 2:50- 3:10 | Break                                      |               |

### Theme 4: Enabling Organizations (Chair Jim Boutillier )

|            |                       |                |
|------------|-----------------------|----------------|
| 3:10- 3:30 | Census of Marine Life | Jesse Ausubel  |
| 3:30- 3:50 | World Fish Centre     | Menchie Ablan  |
| 3:50- 4:10 | CBOL                  | David Schindel |
| 4:10- 4:30 | ITIS                  | Tom Orrell     |
| 4:30- 5:30 | General Discussion    |                |
| 5:30-6:30  | Break                 |                |
| 6:30- 9:00 | Dinner ELORA MILL     |                |

# FISH-BOL Workshop Program

## Day Two: Tuesday, June 7

8:30-8:45 Pickup from Hotel

### Theme 5: Taxonomic Perspectives (Chair Ekaterina Vasilieva)

|             |   |                      |
|-------------|---|----------------------|
| 9:00- 9:20  | The Diversity of Bony Fishes                    | Bruce Collette       |
| 9:20- 9:40  | The Diversity of Cartilaginous and other Fishes | Peter Last           |
| 9:40-10:00  | Vouchering Specimens                            | Richard Winterbottom |
| 10:00-10:20 | DNA Repositories                                | Angelique Corthals   |
| 10:20-10:40 | Break   |                      |

### Theme 6: Regional Perspectives (Chair Juan Diaz de Astarloa)

|             |                            |                      |
|-------------|----------------------------|----------------------|
| 10:40-10:55 | North America              | Phil Hastings        |
| 10:55-11:10 | Central America            | Biff Bermingham      |
| 11:10-11:25 | South America              | Ricardo Galleguillos |
| 11:25-11:40 | Europe                     | Gary Carvalho        |
| 11:40-11:55 | Oceania                    | Serge Planes         |
| 11:55-12:10 | New Zealand and Antarctica | Peter Smith          |
| 12:10-12:25 | Australia                  | Bob Ward             |
| 12:30-1:15  | Lunch                      |                      |

### Theme 6: Regional Perspectives (Chair Fang Kullander)

|           |                     |                  |
|-----------|---------------------|------------------|
| 1:15-1:30 | Asia                | Mutsumi Nishida  |
| 1:30-1:45 | Russia              | Yuri Kartavtsev  |
| 1:45-2:00 | India               | Wazir Lakra      |
| 2:00-2:15 | Africa and Malagasy | Robert Schelly   |
| 2:15-2:45 | Regional Discussion | All Participants |
| 2:45-3:10 | Coffee Break        |                  |

### Theme 7: Organizational Issues and the Fish-BOL Network (Chair David Schindel)

|           |   |  |
|-----------|---|--|
| 3:10-3:40 | Assembly and Identification of Specimens          |  |
| 3:40-4:10 | Vouchering Specimens - Protocols and Repositories |  |
| 4:10-4:30 | Sequence Analysis and DNA Repositories            |  |
| 4:30-5:00 | Data Management                                   |  |
| 5:00-5:15 | Publication Policy                                |  |
| 5:15-6:30 | Break   |  |
| 6:30-9:30 | Dinner: MILLCROFT INN                             |  |

# FISH-BOL Workshop Program

## Day 3 Wednesday, June 8

8:30-8:45 Pickup from Hotel

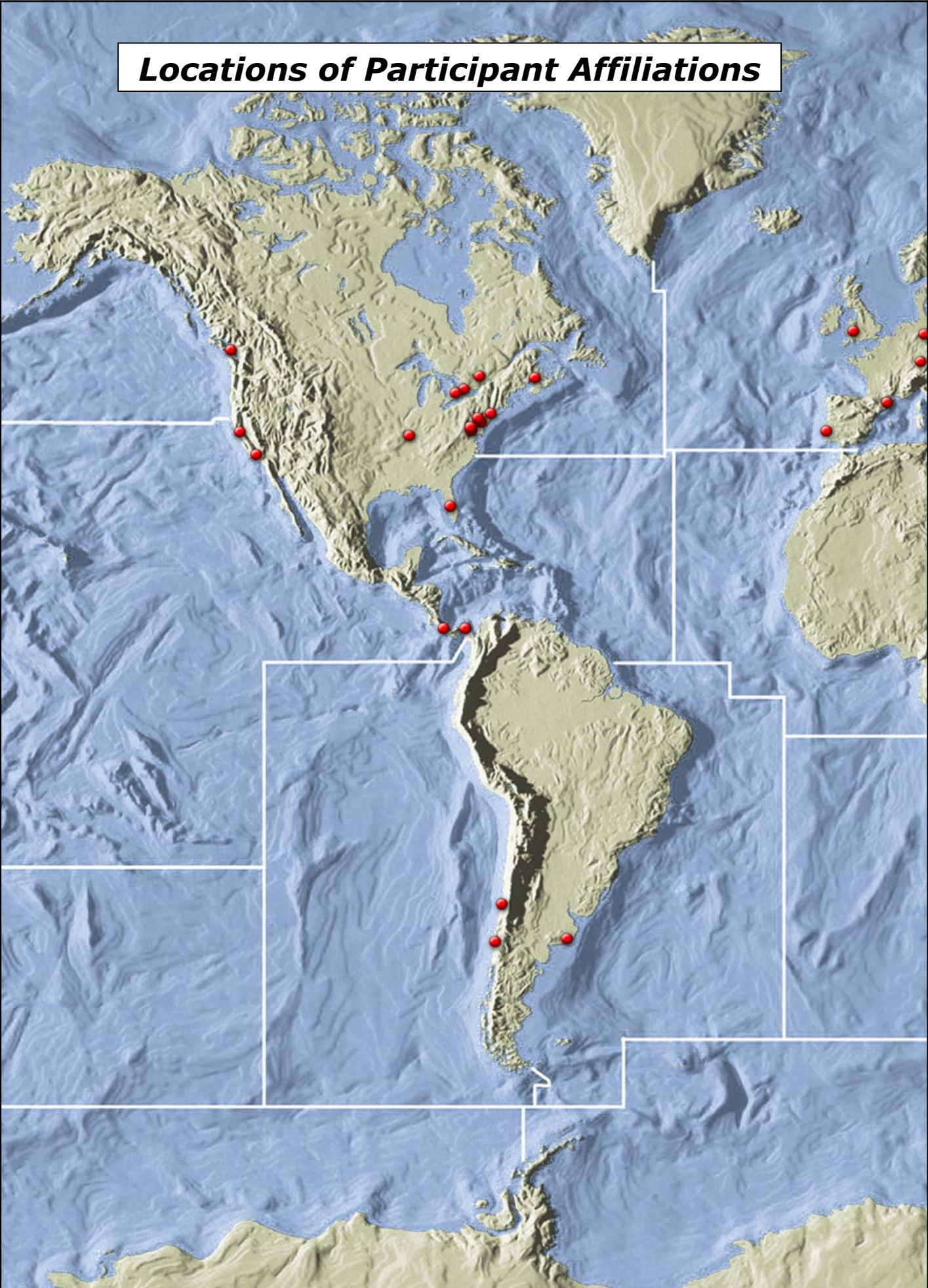
### Theme 8: Administrative Structures and Funding (Chair David Schindel)

|             |                                  |                        |
|-------------|----------------------------------|------------------------|
| 8:30-8:45   | A Draft Administrative Structure | Bob Ward & Paul Hebert |
| 8:45-9:30   | Discussion and Feedback          | All Participants       |
| 9:30-10:30  | Potential Funding Sources        | All Participants       |
| 10:30-10:45 | Coffee Break                     |                        |
| 10:45-11:30 | Assembling Proposals             | All Participants       |
| 11:30-12:00 | Deadlines for Action             | All Participants       |
| 12:00-12:30 | Summary of the Meeting           | Bob Hanner             |
| 12:30-1:00  | Lunch                            |                        |
| 1:30        | Homeward Travel                  |                        |

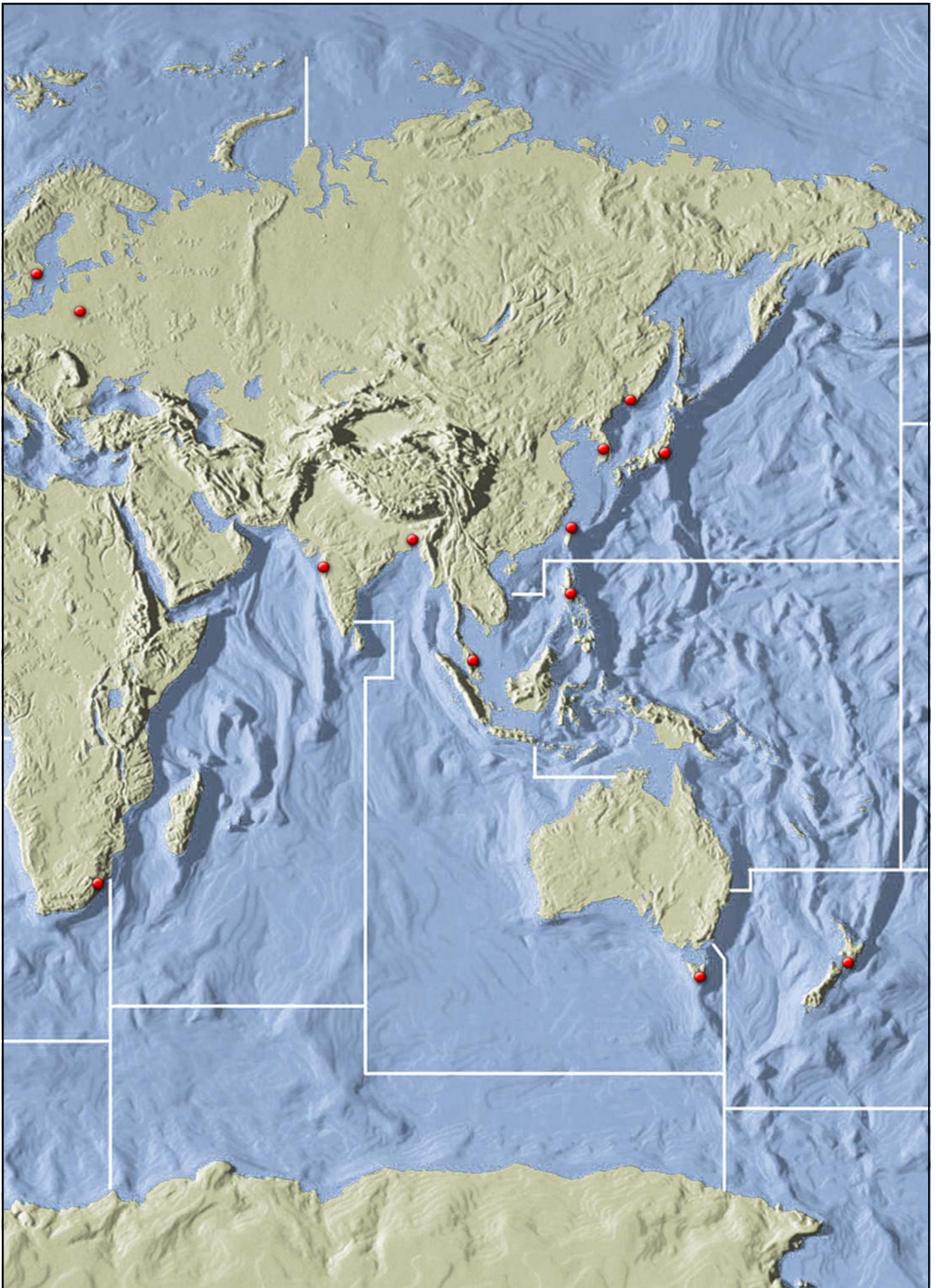
# FISH-BOL Participants

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|-------------------------|--|---|
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***Locations of Participant Affiliations***







# About the Participants

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Current Position: Head, Molecular Genetics Laboratory

Primary Research or Administrative Involvements: Initiate and continue to develop molecular genetics for the fisheries management and conservation program of the WorldFish Center; Carry out research projects that demonstrate empirical examples of using the molecular approach to address specific management and conservation issues; Coordinate multi-country projects on specific species or fisheries issues (initially in Southeast Asia) to develop synergy among these projects.; Conduct short-term training programs on the applications of genetics to fisheries management.

Groups of Special Taxonomic Interest: Reef Fish particularly the Caesionidae and Lutjanidae

Areas of Field Work: Applications of molecular genetics research to fisheries management and conservation of coastal fisheries in developing countries; training

**Name: Jesse Ausubel**

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Current Position: Program Director, Alfred P. Sloan Foundation

Primary Research or Administrative Involvements: Helping the research community to conduct the Census of Marine Life and the Barcode of Life Initiative

**Name: Nicolas Bailly**

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Work Fax: as above

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Current Position: Consultant as FishBase Project Leader

Primary Research or Administrative Involvements: Biodiversity databases, Chair of The FishBase Consortium

Groups of Special Taxonomic Interest: Global (for FishBase)

# About the Participants

Name: **Eldredge (Biff) Bermingham**

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Current Position: Senior Staff Scientist and Deputy Director

Primary Research: Molecular population genetics and evolutionary biology; historical biogeography and molecular systematics of Neotropical fishes

Administrative Involvements: Co-organizer with Nancy Knowlton for the Coral Reef Barcode of Life workshop

Groups of Special Taxonomic Interest: Pomacentridae, Characidae

Areas of Field Work: Central America, South America. Our lab carries out studies in the areas of evolutionary biology, genetics and molecular systematics. Our principal research interest is biogeography and history-based analysis of community assembly, diversification and maintenance. We have focused our attention on two regional community assemblages: 1) the Neotropical freshwater fishes of Mesoamerica, and 2) the birds of the Lesser Antilles. The lab uses the tools of molecular biology to infer the phylogenetic and demographic histories of the taxa comprising these avian and freshwater fish communities. Because we are interested in the tempo as well as the mode of evolutionary change in these communities, we also study the behavior of molecular clocks. Our molecular clock studies have tended to focus on the molecular divergence between marine fish species pairs found on either side of the Isthmus of Panama.

Fish Collections suitable for DNA barcoding: Our Neotropical fish specimen and tissue collection includes extensive geographical series of fishes collected from Mesoamerica, based on expeditions to Guatemala, Honduras, Nicaragua, Costa Rica and numerous collections in Panama. The size of the collection has more than doubled in the past five years. Our Mesoamerica holdings number 11709 tissues and associated numbered specimens representing 85 families, 213 genera and 476 species and include samples representing 47 Caribbean and 60 Pacific slope drainages. In addition, many of the numbered specimens represent larger lots of unnumbered fishes in series of sufficient quantity for morphological analysis. Our collection also includes modest holdings from the following South American locations: 1) Trinidad; 2) Rio Cuyabeno, Ecuador; 3) Rio Manu, Peru; and 4) the Parana/Paraguay drainages of Paraguay and Argentina. Holdings representing South America number 1506 tissues and associated numbered specimens representing 27 families, 135 genera and 185 species. In total, our Neotropical fish collection, including marine species, includes 18894 tissues and associated numbered specimens representing 130 families, 374 genera and 814 species.

Name: **Dietmar Blohm**

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Current Position: Head of Department Biotechnology and Molecular Genetics,  
Speaker of the Centre of Applied Gene Sensor Technology (CAG)

# About the Participants

Primary Research and Administrative Involvements: DNA-analytics by microarray and gene sensor technology; Co-ordinator of the EU-financed project "Towards DNA chip technology as a standard analytical tool for the identification of marine organisms (fish&chips)"

Groups of Special Taxonomic Interest: Serranidae (M. Kochzius, co-worker)

Areas of Field Work: Near East and Indonesia (M. Kochzius and other co-worker)

## Name: **James Boutillier**

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Current Position: Head Shellfish Section & Head Conservation Biology Section within the Marine Ecosystem and Aquaculture Division

Primary Research or Administrative Involvements: Research conducted in these two groups include assessment of all marine invertebrates and marine mammals within the Pacific Region of Canada. The information and advice provided through these studies goes to developing decision rules with respect to fisheries management, aquaculture impact management, and aquaculture development. I am also responsible for the coordination of the Pacific regions science responsibilities as they relate to all species at risk including fresh water and marine fish.

Groups of Special Taxonomic Interest: Marine Crustaceans mainly decapods

Areas of Field Work: We work everywhere on the B.C. coast from intertidal to the deep abyss depending on the issue.

## Name: **Christian Burks**

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Current Position: President and CEO, Ontario Genomics Institute

Primary Research or Administrative Involvements: Prior to joining OGI in 2004, Dr. Christian Burks was a founder and principal of Scienega, which provided consulting services for life sciences start-up companies. He was previously Chief Scientific Officer with Affinium Pharmaceuticals in Toronto. Dr. Burks has also served as Vice-President and Chief Informatics Officer with Exelixis, a global biotechnology company in South San Francisco. Prior to that at Los Alamos National Laboratory he led GenBank (the global database for DNA sequences, including the human genome), was Group Leader for the Theoretical Biology & Biophysics Group, and served as laboratory-wide Program Leader for Computational Biology. Dr. Burks has co-authored numerous publications and served on a number of national and international editorial, review, and advisory boards, including most recently the Scientific Advisory Board of Cognia in New York and the Advisory Board for ITI Life Sciences in Scotland. He received his B.A. in the Great Books Program from St. John's College and his Ph.D. in Molecular Biophysics and Biochemistry from Yale University.

# About the Participants

Groups of Special Taxonomic Interest: All

## Name: **Kent Carpenter**

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Current Position: Associate Professor

Primary Research or Administrative Involvements: Primary research interests are the morphological and molecular systematics of percoid fishes; and the biogeography, phylogeography, and conservation of SE Asia marine fishes with a special interest in the Philippines.

Groups of Special Taxonomic Interest: Percoid fishes, Sparidae, Lethrinidae, Nemipteridae, Lutjanidae, Caesionidae, Carangidae.

Areas of Field Work: SE Asia, primarily in the Philippines.

## Name: **Gary Carvalho**

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Current Position: Professor of Molecular Ecology

Primary Research or Administrative Involvements: Research interests have focused on the molecular analysis of population and species biodiversity of aquatic animals, with studies aimed at understanding the evolutionary and ecological forces that shape genetic structure in the wild, and how such structure may influence adaptation, population persistence and distribution. Notable areas of activity include: the evolution and ecological significance of population differentiation, phylogeography and phylogenetics of aquatic taxa, speciation of fishes in the Great African lakes, the genetics of introductions and biological invasions, the molecular analysis of past populations using PCR-based recovery of DNA (ancient DNA) from resting eggs and preserved material (e.g. fish otoliths and scales), the evolutionary genetics of clonal animals, the evolution of adaptive traits using molecular and quantitative genetic analysis, and fisheries and conservation genetics of exploited fish and squid in temperate, tropical and Antarctic waters. Fisheries genetics interests include stock structure analysis, estimates of effective population size, impacts of harvesting, influence of supplemental stocking, links between recruitment and demographic variability in the wild.

Groups of Special Taxonomic Interest: Particular interest in population genetics and genetic management of fishes of commercial interest, including salmonids, gadoids, clupeids and Notothenioids (Antarctic), as well as fundamental evolutionary biology of guppies and African cichlids

Areas of Field Work: Contacts and involvement in sampling in African Great Lakes, Antarctic marine system, Northern European waters (North Sea, Norwegian Sea, Baltic).

# About the Participants

## Name: **Seinen Chow**

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Current Position: Chief, Coastal Ecosystem Section, Coastal Fisheries and Aquaculture Division

Primary Research or Administrative Involvements: Ecology, Population Genetics

Groups of Special Taxonomic Interest: Decapod, Crustacea

## Name: **Bruce Collette**

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Current Position: Senior Scientist

Research/admin involvement: Research on the taxonomy, anatomy, and zoogeography of fishes of the orders and suborders listed in the next category and I have students and former students studying molecular phylogeny of these and other groups of fishes.

Administration: The National Systematics Laboratory is the focal point for taxonomic research within the National Marine Fisheries Service so we should be able to assist in obtaining tissue samples and voucher material from all six of the regional Fisheries Science Centers.

I am the NOAA member of the Steering Committee for ITIS. Among my goals for ITIS are to insure that the correct scientific name of all taxa of interest to NOAA are contained in ITIS, including all species of fishes.

Groups of special taxonomic interest: Orders Batrachoidiformes and Beloniformes; suborders Scombroidei and Xiphioidi; families Coryphaenidae, Echeineidae, and Ammodytidae.

Areas of field work: I have collected worldwide particularly coral-reef and mangrove fishes around islands such as Bermuda, Navassa, Cuba, New Guinea, Tonga, etc.; also epipelagic fishes collected with night light/dip nets and long-lines; and bottom-trawling throughout much of the western North Atlantic.

## Name: **Allan Connell**

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# About the Participants

**Current Position:** Recently retired, but operating as a consultant marine ecologist, and as an Honorary Research Associate, South African Institute of Aquatic Biodiversity (formerly JLBSmith Institute of Ichthyology in Grahamstown).

**Primary Research:** My career was in marine pollution research, primarily around the environmental impact of marine outfalls and urban spread. Research on the use of pelagic fish larvae as toxicity testing organisms, both in the lab and within mixing zones at sea, initiated an interest in pelagic fish eggs and larvae, which has now extended into a 19 year data set on fish spawning patterns, off a small portion of the east coast of South Africa. While I successfully reared about 65 species to larvae of 30 days plus, and identified many from the literature, there are many that remain unknown. The barcoding initiative has offered the opportunity to confirm most of the egg/larvae to adult links within my data. In addition, I am currently conducting research into recruitment of juvenile marine fishes into small, temporarily open estuaries.

**Groups of Special Taxonomic Interest:** Mysid shrimps

**Areas of Field Work:** Kwazulu-Natal (east) coast of South Africa. My fish eggs and larvae sampling entails launching to sea once or twice per week. Sampling begins about 5km offshore over ca 40m water depth, where we also usually conduct a SCUBA dive, and line-fish for DNA material. During the dive, I collect mysids and juvenile fish using a hand-net. Eggs are collected with a surface-towed plankton net.

## Name: **Andrew Cooper**

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**Current Position:** Advisor, Population Status

**Primary Research or Administrative Involvements:** Science advisor to the Minister for Fisheries and Oceans for stock status of Atlantic invertebrate fisheries, and analyst for the Fisheries Research program which includes modernization in fisheries monitoring and research.

**Groups of Special Taxonomic Interest:** Fishes, Pleuronectiformes

**Areas of Field Work:** Systematics, biogeography, and evolution of the Pleuronectidae.  
Systematic work for Gulf of Maine Discovery Corridor.

## Name: **Angelique Corthals**

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**Current Position:** Curatorial Associate

## About the Participants

**Primary Research or Administrative Involvements:** Angelique Corthals started working for the Ambrose Monell Cryo Collection (AMCC) since December 2000, and helped in the development and expansion of the collection from the beginning of the operations under the leadership of Drs. Desalle and Hanner. She worked first as Collection Manager and, as of April 2003, has been director of the Collection. She has been active in creating research programs involving undergraduate students with the Barcode of Life plans. Her role at the AMCC is to reach out to academic institutions about the need for long term biological repository in the age of the 'genomic revolution'. With Mark Breedlove, she built the online database of the collection, and is currently developing research programs in tissue preservation, quantification of DNA damage in ancient and fresh tissue, and forensic protocols. She earned her DPhil (PhD) from the University of Oxford (Michaelmas 2003), and is specialized in biological anthropology.

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**Current Position:** Researcher at the Institute of Marine Research (IMAR), node of the New University of Lisbon, Portugal.

**Primary Research or Administrative Involvements:** Coordination of the recently established research network Fish-BoL Portugal (Fish-Bol.pt). This network involves several University-based research institutes, the National Museum of Natural History of Portugal, and the Portuguese governmental agency in charge of marine research and fisheries (IPIMAR). Fish-BoL.pt is part of the broader scope network Barcoding Aquatic Life – Portugal (BAL.pt). For the last one half years developed barcoding project within the University of Guelph team, dedicated to barcoding of crustaceans, namely decapods and amphipods.

**Groups of Special Taxonomic Interest:** The ultimate goal of our project is to barcode all fish, marine and freshwater, occurring in Portugal. So far we have been focusing mostly on commercially-exploited fish species.

**Areas of Field Work:** Our primary interest is on fishes of the NE Atlantic and Mediterranean, particularly on species occurring in the Portuguese Exclusive Economic Zone (EEZ). The Portuguese EEZ spreads for an area of 1,6 million square km, and it is one of the largest in Europe. It is composed of the mainland EEZ together with the Atlantic archipelagos of Azores and Madeira. We would also be interested in extending the network scope to barcode fishes from Portuguese-speaking African countries (PALOP).

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**Current position:** MSc student (Louis Bernatchez's laboratory)



# About the Participants

Primary Research: Molecular Phylogenetics and DNA bar-coding of Salmonidae; Canadian Research Chair in Conservation Genetics of Aquatic Resources (LB)

Groups of Special Taxonomic Interest: Freshwater Fishes, Salmonidae, Osmeridae, *Gasterosteus aculeatus*, *Anguilla* spp.

Area of Field Work: North America, Europe

## Name: **Nelson Díaz**

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Current Position: Professor. Facultad de Ciencias Agronómicas. Universidad de Chile.

Primary Research or Administrative Involvements: Genetics and Biotechnology in Aquaculture

Groups of Special Taxonomic Interest: Fish

Areas of Field Work: Molecular markers

## Name: **Juan Díaz de Astarloa**

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Current Position: Professor Universidad Nacional de Mar del Plata. Researcher at the National Council of Scientific and Technical Research (CONICET).

Primary Research or Administrative Involvements: Responsibilities include: planning, conducting, and writing taxonomic revisions and systematic studies of pleuronectiform fishes applied to fisheries biology. Responsibilities also include: flatfish biology (reproduction and description of early life history of commercial important *Paralichthys* species, trophic ecology, identification of flatfish fishing stocks by means of meristic and morphometric analyses. Preparation of identification guides of fishes in form of keys, illustrations, descriptions, charts, and tables based on specimens and literature intended for a variety of users, including professional taxonomists, fisheries workers, and others. Participation in and direction of field activities with national and international scientific research programs. Identification of specimens submitted by federal, state, and private institutions and providing information on systematic, and biology of commercial important fishes. Collection and identification of Argentine marine fishes aboard research cruises carried out by the National Institute for Fisheries Research and Development (INIDEP).

Groups of Special Taxonomic Interest: Flatfishes (*Pleuronectiformes*), soft-nose skates, *Bathyraja* spp. (*Rajidae*)

Areas of Field Work: Ichthyology, Biology of Fishes, Ecology, distribution and diversity of southwestern Atlantic fishes.

# About the Participants

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Current Position: Staff Scientist

Primary Research or Administrative Involvements: Head of GenBank Taxonomy Group

Groups of Special Taxonomic Interest: Arthropods, Amphibians

**Name: Ricardo Galleguillos González**

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Current Position: Associated Professor. Department of Oceanography.

Primary Research or Administrative Involvements: The primary research is related with population genetics and microevolutionary process in fishes that are important in terms of fisheries. The first studies involved protein as molecular markers applied to pelagic fishes like anchovy, common sardine, jack mackerel and flatfishes. The objectives in this studies was the identification of stocks.

In demersal fishes mainly in the *Merluccius* genus, phylogenetics relationships were studied in species of South Pacific and South Atlantic.

In the species *Xiphias gladius*, we studied different populations from the Pacific Ocean, with genetic markers from nuclear and mitochondrial DNA. We applied DNA markers in others species, *Macruronus magellanicus*, *Brama australis*, *Engraulis ringens*.

During 2005 we are doing a research in populations of *Genypterus blacodes*. With microsatellites and *Merluccius australis*, comparing populations using Cytochrome *b*, and D-loop,

Areas of Field Work: South eastern Pacific. Austral Region of Chile and Subantartic.

**Name: Bob Hanner**

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Current Position: Associate Director, Canadian Barcode of Life Network

# About the Participants

Primary Research or Administrative Involvements: Chair, Database Working Group, Consortium for the Barcode of Life Initiative Curation and molecular characterization of genetic resource collections.

Groups of Special Taxonomic Interest: Sturgeons and paddlefishes

## Name: **Phil Hastings**

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Current Position: Professor and Curator of Marine Vertebrates

Primary Research or Administrative Involvements: As Curator of the SIO Marine Vertebrates Collection <http://collections.ucsd.edu/mv/>, I oversee one of the world's major collections of marine fishes. The MVC's coverage is worldwide, with special emphasis on global pelagic and deep-sea fishes and coastal fishes of the eastern Pacific (Alaska to Chile). Our tissue archive (95% ethanol) includes over 600 species (with vouchers) and continues to grow. Barcoding projects underway include the marine fishes of California (800+ species), funded by California Sea Grant. As per our original proposal, we are currently sequencing 16s and Cytochrome B, but have applied for funds to also sequence COI from the same specimens. This will provide a test of the efficacy of each of these genes in discriminating among species from a diverse ichthyofauna.

Groups of Special Taxonomic Interest: Blennioidei, Serranidae, Gobiidae, Gobiesocidae

Areas of Field Work: Eastern Pacific especially California, Mexico and Central America; Caribbean

## Name: **Paul Hebert**

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Current Position: Canada Research Chair, Molecular Biodiversity

Primary Research or Administrative Involvements: I currently serve as Scientific Director for the Canadian Barcode of Life Network (BOL.ca). This Network involves more than 35 researchers based in University and governmental laboratories across Canada. Over the next 5 years, the Network will assemble barcode records for at least 10,000 Canadian species including all marine and freshwater fishes. Aside from my involvements with BOL.ca, I lead a laboratory that is deeply involved in the optimization of protocols for DNA barcode assembly and analysis.

Groups of Special Taxonomic Interest: zooplankton

# About the Participants

Areas of Field Work: My past work on fishes has focused on taxa from arctic marine and freshwaters and from the Great Barrier Reef in Australia. However, we are now collaborating with varied researchers to sample the Pacific fish fauna of Canada.

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Current position: Research assistant

Primary research or Administrative Involvements: Research assistant to Bob Ward on barcoding of Australian fishes and undertake all experimental work and sequence analysis for this project. Previously I have worked on population genetics studies of Atlantic salmon, Pacific oysters and various tunas using microsatellite and mitochondrial DNA markers.

Name: **Yuri Kartavtsev**

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Current Position: Leading Science Researcher.

Primary Research or Administrative Involvements: 2002-2006 - Head of the grant project in the frame of the State Program "Integration among Universities and Academy of Science Institutions" (award No P0008). Title: "Investigation of Taxonomic Similarity and Microevolution in Marine Fish and Shellfish Taxa" (Cooperative project Russia-Japan-Korea). 2002-2006 - Head of the official theme at the Institute of Marine Biology (4.2.2), Russian Academy of Science Program. Title: Investigation of genetic aspects of microevolution in some species of mollusks and fishes.

Groups of Special Taxonomic Interest: Marine fish and Shellfish.

Areas of Field Work: Russian Far East, Japan, Korea.

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# About the Participants

Current Position: Senior Research Scientist in Marine Living Resources Research Division, Korea Ocean Research and Development Institute

Primary Research or Administrative Involvements: Molecular phylogenies of invertebrates (ground beetles; Carabidae); Genome research of Ape (Chimpanzee genome project)

Groups of Special Taxonomic Interest: Skate fish (Rajidae), Molecular marker of fishes

Areas of Field Work: nearshore waters of the Korean peninsula, Yellow sea, East-china sea East/Japan sea

## Name: **Fang Fang Kullander**

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Current Position: Curator for FishBase Sweden

Primary Research or Administrative Involvements: My research projects are focused on both morphological and molecular systematics and phylogeny of South and Southeast Asian cyprinid species, especially the danionin and rasboines, and also Chinese and Burmese freshwater fishes.

Groups of Special Taxonomic Interest: Cyprinid fishes, especially the danionin and rasborine species. Also freshwater fishes from China and Myanmar.

Areas of Field Work: Myanmar, China, Viet Nam, India, Sweden

## Name: **Wazir Lakra**

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Current Position: Professor and Chair

Current Research Programs: Population genetics of *Penaeus monodon* and *Macrobrachium rosenbergii*  
Genetic improvement of *Penaeus monodon* through selective breeding; Human Resource Development in Coastal and Marine Bioresources Management and Conservation; Phylogenetics of Penaeid shrimps, Sea horse, Puffer fish and Sciaenids based on mitochondrial DNA sequencing; Development of cell lines from fish species used in aquaculture; Supervision of graduate and Ph. D. students working on aspects related to population genetics, molecular genetics and genetic conservation of finfish and shellfish species

# About the Participants

Administrative responsibilities: Research planning and management involving prioritization, project formulation, obtaining grants from both domestic and foreign funding agencies, networking and collaborations with national and international scientists /organizations, policy decisions for the academic and research programs on fish genetics and biotechnology at CIFE and national level.

Groups of special taxonomic interest: Both finfish and shellfish, currently marine with a plan for freshwater fishes also.

Areas of field work: Presently all coastal states of India

## Name: **Peter Last**

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Current Position: Senior Principal Research Scientist

Primary Research or Administrative Involvements: Ichthyology, taxonomic, biogeographic research and management. Conservation biology. Seafood naming standards. Indo-West Pacific fishes

Groups of Special Taxonomic Interest: sharks and rays

Areas of Field Work: Research cruises, fish market, and reef fish surveys (South-East Asia, Australia, Western Pacific)

## Name: **Jake Lowenstein**

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Current Position: Researcher within the Area de Conservación Guanacaste (ACG).

Primary Research or Administrative Involvements: Assisting the Sector Marino of the ACG make the transition from a "paper park" to a de facto conservation area. Collecting specimens for BoLD.

Groups of Special Taxonomic Interest: Fish of the Tropical Eastern Pacific.

Areas of Field Work: Costa Rica.

## Name: **John Lundberg**

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# About the Participants

Current Position: Curator and Chair of Ichthyology

Primary Research or Administrative Involvements: Taxonomy, Phylogenetic Systematics, Paleontology and Biogeography

Groups of Special Taxonomic Interest: Siluriformes (catfishes) and Gymnotiformes (electric eels and knife fishes)

Areas of Field Work: South and Central America; Africa

## Name: **Richard Mayden**

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Current Position: Professor, Department of Biology; Chair, Department of Biology; Director, Integrated Genomics, Biodiversity, and Conservation; Endowed Chair of Natural Sciences

Primary Research or Administrative Involvements: Systematics, evolution, and biodiversity of fishes; morphological and molecular divergences; species concepts; diagnostics of species, especially fishes; Cypriniformes Tree of Life initiative

Groups of Special Taxonomic Interest: All of North American freshwater fishes; Cypriniformes, Acipenseriformes, Petromyzontidae, Percidae, Cottidae

Areas of Field Work: North America, Central America, Russia, Central Asia

## Name: **Masaki Miya**

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Current Position: Senior Research Scientist

Primary Research or Administrative Involvements: molecular phylogeny and evolution

Groups of Special Taxonomic Interest: all fishes

Areas of Field Work: western North Pacific Ocean

## Name: **Mutsumi Nishida**

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# About the Participants

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Current Position: Professor and Vice Director

Primary Research or Administrative Involvements: Molecular phylogenetics of fishes; Molecular evolutionary genetics of aquatic organisms

## Name: **Michael Noren**

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Current Position: Senior assistant.

Primary Research or Administrative Involvements: FISHTRACE, a european, EU funded, project aimed at establishing a database for molecular characterization and identification of commercially or scientifically important marine species of fish. I am in charge of collecting and sequencing species from the Skagerrack and Baltic Sea.

Groups of Special Taxonomic Interest: Cyprinidae.

Areas of Field Work: Tjärnö and Klubban marine biological stations on the west coast of Sweden.

## Name: **Jim Omura**

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Current Position: Technology Strategist

Primary Research or Administrative Involvements: Grant lead

## Name: **Thomas Orrell**

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# About the Participants

Current Position: Research Biologist and Program Manager, ITIS

Research: Evolutionary history, biogeography and diversity of fishes - with emphasis on molecular systematics; invasive fish species.

Administration: I serve as the Smithsonian Institution liaison to Integrated Taxonomic Information System (ITIS) and serve as an authoritative advisor on taxonomic problems to the ITIS program. I am the point of contact and expert advisor on professional matters in this area to Smithsonian colleagues, Federal agencies, other governments, institutions, organizations, and the general public.

Groups of Taxonomic Interest: Sparidae and close relatives; Moronidae, Channidae; and suborders Scombroidei and Xiphoidei.

Areas of Field Work: Past field work includes surveys of freshwater fishes in the southern United States and in marine collecting in the Chesapeake Bay, Western Atlantic, Belize, and Panama. I have contributed numerous specimens and tissue samples to ichthyological collections.

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Current Position: staff member and Chairman of Dept. Oceanography

Primary Research or Administrative Involvements: Microevolutive process and fisheries

Groups of Special Taxonomic Interest: Notothenioidei, Clupeidae, Ophidiidae

Areas of Field Work: Trophic and reproductive ecology

Name: **Serge Planes**

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Current Position: Principal research Scientist CNRS (Directeur de recherche au CNRS)

Primary Research or Administrative Involvements: Population genetic, MPA, molecular biology. In charge of a genetic lab for the EPHE - UMR CNRS 8046.

Groups of Special Taxonomic Interest: FISH

Areas of Field Work: Pacific Ocean, Mediterranean Sea

# About the Participants

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Current Position: Lead Programmer

Primary Research or Administrative Involvements: Design and construction of BOLD (Barcodes Of Life Data systems), a management and analytical platform to facilitate the barcoding of life.

**Name: Rafiqul Sarder**

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Current Position: Professor

Primary Research or Administrative Involvements: At present two research projects are going on and six MS students are involved in the projects. I am doing research on investigation of genetic variation of Indian major carps using allozyme and microsatellite techniques. The project work is being conducted with the collaboration of National Environmental Research Institute, Denmark and funded by DANIDA. The main theme of the project is to identify the inter-specific hybridization and inbreeding that are most common phenomena in the hatcheries in Bangladesh. Research work is also going on indigenous and exotic carps gamete (sperm) cryopreservation and the project is funded by Worldfish Center. Besides these I did work with chromosome manipulation using gynogenesis and androgenesis and produced clonal lines of tilapia. I also produced multiple DNA fingerprinting to verify the success of chromosome manipulation and clone production. I have worked on determination of polymorphism of MHC class I genes in Rainbow trout and sequenced Onmy-UBA alleles using automated sequencer (CEQ 2000 DNA analysis system, Beckman Coulter, Inc.).

Areas of Field Work: Fish breeding and genetics, YY monosex tilapia production, immunological study, fish culture in ponds and cages.

**Name: Robert Schelly**

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Current Position: Postdoctoral Fellow

Primary Research or Administrative Involvements: Biodiversity of African fishes.

# About the Participants

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Current Position: Executive Secretary, Consortium for the Barcode of Life

Primary Research or Administrative Involvements: Purely administrative; facilitating the Fish BOL initiative

## Name: **Kwang-Tsao Shao**

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Current Position: Research Fellow & Acting Director, Research Center for Biodiversity Academia Sinica, Taiwan.

Primary Research or Administrative Involvements: Fish taxonomy, ecology, evolution and database; Coordinator for National Digital Archive Program, Marine LTER in Taiwan, Taiwan biodiversity information network, Cryobanking & Barcode of Life in Taiwan. Executive Secretary of IUBS/DIVERSITAS/CODATA of Taiwan.

Groups of Special Taxonomic Interest: All fishes: mainly focused on marine, especially coral reef and deep-sea fishes.

Areas of Field Work: Taiwan and Pratas Island

## Name: **Peter Smith**

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Current Position: Biotechnology Group manager

Primary Research or Administrative Involvements: Evolutionary biology and population genetics of aquatic species. The development and application of biochemical and molecular techniques for stock discrimination of commercially important marine fishes and invertebrates; for molecular taxonomies of "problem" species; and for fish product identification. Techniques include protein iso-electric focusing, allozymes, mtDNA, RAPDs, introns, and microsatellite DNA.

# About the Participants

Groups of Special Taxonomic Interest :

|                    |                  |                                |
|--------------------|------------------|--------------------------------|
| Seaperches         | Scorpaenidae:    | <i>Helicolenus</i>             |
| Longfin perches    | Serranidae:      | <i>Caprodon</i>                |
| Stargazers         | Uranoscopidae:   | <i>Kathetostoma</i>            |
| Dogfishes          | Squalidae:       | <i>Squalus</i>                 |
| Roughies           | Trachichthyidae: | <i>Hoplostethus</i>            |
| Antarctic skates   | Rajidae:         | <i>Amblyraja and Bathyraja</i> |
| Freshwater bullies | Eleotridae:      | <i>Gobiomorphus</i>            |

Areas of Field Work: New Zealand EEZ (SW Pacific): research vessels and observers on commercial vessels. Access to Ross Sea (Antarctica): toothfish longline fishery and research trawls.

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Current Position: PhD student

Primary Research or Administrative Involvements: Comparative genomics of fishes

Groups of Special Taxonomic Interest: Cichlidae

Name: **Michael Dominic Tringali**

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Current Position: Associate Research Scientist

Primary Research or Administrative Involvements: Program Leader, FWRI Molecular Genetics Laboratory.

Research Interests: Genetic stock identification of marine fishes; Genetic risk assessment and management of supplementation hatcheries; Population genetics, biology, molecular ecology, and evolution of marine organisms; Taxonomy and systematics of fishes; Population dynamics and fisheries biology; FWRI's Molecular Genetics Laboratory is outfitted with automated-sequencing and associated equipment, including four ABI genetic analyzers (two 310s & two 3100s) and is staffed by 7 experienced technicians. FWRI also maintains an extensive, curated marine fish collection within a modern Information Science and Management group.

Areas of Field Work: Primarily estuarine and coastal waters of Florida. Some projects involvement specimen collection throughout the western Atlantic.

# About the Participants

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Current Position: Atlantic Reference Centre Curator of Fishes & Collections Manager

Primary Research or Administrative Involvements: taxonomy, life history, biogeography, laboratory processing procedures, and preservation of all life stages of Canadian Atlantic fishes; climate change impacts on fish, invertebrate, and plant populations; Internet integration of biodiversity information

Areas of Field Work: coastal waters of New Brunswick

Relevant Committee Memberships: Committee on the Status of Endangered Wildlife in Canada - Marine Fishes Species Specialist Subcommittee; General Status Assessment of Marine Fishes, DFO  
Gulf of Maine Area Program of the Census of Marine Life – Scientific Advisory Committee; Gulf of Maine Ocean Data Partnership - Governing Board and Technical Committee; Gulf of Maine Biodiversity Discovery Corridor - Steering Committee, and Systematics Working Group co-chair; Centre for Marine Biodiversity - Technical Committee; American Society of Ichthyologists and Herpetologists - Collections Committee

Name: **Ekaterina Vasilieva**

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Current Position: Dr. Sc., the Chief of ichthyological department

Primary Research or Administrative Involvements: one from leading specialist in taxonomy of fishes from the continental Eurasian waters, international expert in taxonomy of gobiid, cobitid and acipenserid fishes.

Groups of Special Taxonomic Interest: Gobiids, Cobitids, Cyprinids, Acipenserids.

Areas of Field Work: South-western Russia (Don, Kuban, Dnieper and other rivers) and Far East (Amur R.) for the last two years.

Name: **Bob Ward**

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# About the Participants

Current Position: Senior Principal Research Scientist at CMR

Primary Research or Administrative Involvements: Research into the population genetics of a variety of marine species, using allozymes, mitochondrial DNA and microsatellites. Genetic methods of species identification. Genetic improvement of aquaculture species.

Groups of Special Taxonomic Interest : None in particular, though I have worked more extensively with tunas than other marine species.

Areas of Field Work: Have access to the waters around Australia, including Antarctic waters.

Name: **Lee Weigt**

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4210 Silver Hill Rd  
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Email: lweigt@lab.si.edu

Current Position: Manager, LAB (Laboratories of Analytical Biology, National Museum of Natural History) Smithsonian Institution

Primary Research or Administrative Involvements: Our lab will be hosting a DNA Barcoding pipeline: a laboratory offering access to high-throughput automation for DNA extraction, amplification and sequencing. We also have a parallel computing cluster for data analysis. We intend to host people and projects who only need to cover their consumable expenses.

Groups of Special Taxonomic Interest: Collaborative effort on the reef fishes of Belize and the Caribbean.

Areas of Field Work: I am actively involved with the reef fishes of Belize and the Caribbean, and we are starting collaborations for the Indian River Lagoon in Florida, and the Chesapeake Bay in Maryland.

Name: **Richard Winterbottom**

Mailing Address: Department of Natural History  
Royal Ontario Museum  
100 Queen's Park  
Toronto, Ontario, M5S 2C6 Canada

Work Phone: 1 416 586 5759

Work Fax: 1 416 586 7921

Email: rickw@rom.on.ca

Current Position: Senior Curator

Primary Research or Administrative Involvements: The systematics, phylogeny, higher classification, biogeography and macro-evolution of fishes, especially those of Indo-Pacific coral reef and mangroves. Developing a website (PhyloFish) with Prof. D. McLennan of illustrated and documented fish phylogenies, to be linked to FishBase and the Tree of Life.

Groups of Special Taxonomic Interest: Perciforms and their allies, especially the gobioid and acanthuroid fishes.

# About the Participants

Areas of Field Work: Throughout the Indo-Pacific (South Africa to Society Islands), most recently in Vietnam (twice) and Palau, making synoptic collections of coral reef and mangrove fishes to enhance museum collections and concomitantly obtain distributional data for incorporation into biogeographic studies and material for other research projects. Building a collection of specimens for subsequent DNA analyses (again, especially gobioids). Documenting freshly collected colouration through extensive field photography (35 mm colour transparencies); archives currently contain photo portraits of about 7,500 specimens.

**Name: Haile Yancy**

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Email: hyancy@cvm.fda.gov

Current Position: Staff Fellow

Primary Research or Administrative Involvements: R&D FDA/CVM

Groups of Special Taxonomic Interest: Mammals, Fish, Insects, and Vertebrates

**Name: Tyler Zemlak**

Mailing Address: Department of Integrative Biology  
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Guelph, ON N1G 2W1 Canada

Work Phone: 1 519 824 4120 ex 56393  
Work Fax: 1 519 767 1656  
Email: tzemlak@uoguelph.ca

Current Position: MSc. Candidate

Primary Research: Testing the efficacy of a DNA barcoding system for marine fishes. Current investigations include the analysis of COI divergences for both larval and adult samples from a wide range of Australian and South African taxa. Recent interests include the potential utility of DNA barcoding for large-scale phylogeographic studies to aid in the understanding of evolutionary patterns and processes governing reef fishes.

# Marine Fish Orders of the World



Acipenseriformes (15 spp)



Atelepodiformes (12 spp)



Batrachoidiformes (73 spp)



Carcharhiniformes (229 spp)



Clupeiformes (279 spp)



Cyprinodontiformes (18 spp)



Gasterosteiformes (17 spp)



Heterodontiformes (8 spp)



Albuliformes (8 spp)



Atheriniformes (92 spp)



Beloniformes (175 spp)



Cetomimiformes (32 spp)



Coelacanthiformes (2 spp)



Elopiformes (8 spp)



Gobiesociformes (137 spp)



Hexanchiformes (5 spp)



Anguilliformes (838 spp)



Aulopiformes (241 spp)



Beryciformes (157 spp)



Chimaeriformes (38 spp)



Cypriniformes (2 spp)



Gadiformes (593 spp)



Gonorynchiformes (6 spp)



Lamniformes (16 spp)





Lampriformes (23 spp)



Myxiniiformes (69 spp)



Oreotlobiformes (33 spp)



Petromyzontiformes (12 spp)



Pristiformes (7 spp)



Saccopharyngiformes (29 spp)



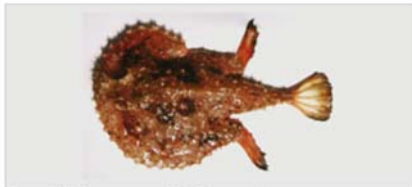
Siluriformes (108 spp)



Stephanobercyiformes (43 spp)



Tetraodontiformes (388 spp)



Lophiiformes (316 spp)



Notacanthiformes (28 spp)



Osmeriformes (257 spp)



Pleuronectiformes (690 spp)



Pristiophoriformes (5 spp)



Salmoniformes (41 spp)



Squaliformes (103 spp)



Stomiiformes (406 spp)



Torpediniformes (60 spp)



Myctophiformes (253 spp)



Ophidiiformes (385 spp)



Perciformes (7308 spp)



Polymixiiformes (10 spp)



Rajiformes (457 spp)



Scorpaeniformes (1397 spp)



Squatiniformes (17 spp)



Syngnathiformes (272 spp)



Zeiformes (44 spp)

# Fish Collections Summary

|    | Institution  | # species            | # specimens           |
|----|--|----------------------|-----------------------|
| 1  | American Museum of Natural History, Dept. of Ichthyology   | not specified        | 1919905               |
| 2  | American Museum of Natural History, Ambrose Monell Cryo Collection   | not specified        | 564 (all with tissue) |
| 3  | Atlantic Reference Centre, Collection of Fishes  | 3382                 | 113582 lots           |
| 4  | Auburn University Natural History Museum, Fish collection  | not specified        | 450000                |
| 5  | Australian Museum, Fish Department   | not specified        | 635000                |
| 6  | Bell Museum of Natural History, University of Minnesota, Fish collection   | not specified        | 41000 lots            |
| 7  | British Museum of Natural History, Dept. of Zoology, Fish Section  | not specified        | 2500000               |
| 8  | Canadian Museum of Nature, Fish collection   | unknown              | 60000 lots            |
| 9  | Commonwealth Scientific and Industrial Research Organisation, The Australian National Fish Collection  | 2800                 | 135000                |
| 10 | Cornell University Museum of Vertebrates, Ichthyological Collection  | 4350                 | 1200000               |
| 11 | Field Museum of Natural History, Zoology Dept., Division of Fishes   | 7000                 | 1700000               |
| 12 | Fisheries Research Agency, National Research Institute of Fisheries Science, Coastal Ecosystem Section, Coastal Fisheries and Aquaculture Division | unknown              | unknown               |
| 13 | Florida Museum of Natural History, Ichthyology   | not specified        | 1430000               |
| 14 | Harvard Museum of Comparative Zoology, Ichthyology Department  | unknown              | unknown               |
| 15 | Illinois Natural History Survey, Fish collection   | 1600                 | 800000                |
| 16 | Katholieke Universiteit Leuven, Laboratory of Aquatic Ecology  | 243                  | not specified         |
| 17 | Louisiana State University Museum of Natural Science, Fish collection  | not specified        | 270000                |
| 18 | Massachusetts Museum of Natural History, Fish collection   | not specified        | not specified         |
| 19 | National Museum of Natural History, Paris, Fish collection   | 13000                | 400000                |
| 20 | National Science Museum, Tokyo, Department of Zoology, Division of Fishes  | not specified        | 1200000               |
| 21 | Philadelphia Academy of Natural Sciences, Fish collection  | not specified        | 1138720               |
| 22 | Royal Museum for Central Africa, Vertebrate Zoology Collection   | not specified        | 1000000               |
| 23 | Royal Ontario Museum, Centre for Biodiversity and Conservation Biology, Ichthyology  | not specified        | not specified         |
| 24 | Saint Louis University, Department of Biology, Laboratory for Genomics, Biodiversity and Conservation  | not specified        | not specified         |
| 25 | Scripps Institution of Oceanography, Marine Vertebrates Collection   | 5300 (400*)          | 2000000               |
| 26 | Smithsonian Institution National Museum of Natural History, Dept. of Vertebrate Zoology, Division of Fishes  | not specified        | 3500000               |
| 27 | South African Institute for Aquatic Biodiversity, National Fish Collection   | not specified        | 880000                |
| 28 | Swedish Museum of Natural History, Department of Vertebrate Zoology, Ichthyology Section   | 6350                 | 400000                |
| 29 | Texas Memorial Museum, University of Texas, Austin, Ichthyology  | 1730                 | 676384                |
| 30 | Tulane University Museum of Natural History, Fish collection   | not specified        | 6000000               |
| 31 | University of Alaska Museum of the North, Fish collection  | not specified        | not specified         |
| 32 | University of British Columbia, University of British Columbia Fish Museum   | not specified        | 800000 (5000*)        |
| 33 | University of Kansas Natural History Museum, Division of Ichthyology   | 1071 (1040*)         | 434000 (5300*)        |
| 34 | University of Michigan Museum of Zoology, Division of Fishes   | not specified        | 3500000               |
| 35 | University of the Philippines in the Visayas, UPV Museum of Natural Sciences Fish Collection   | not specified        | not specified         |
| 36 | University of Washington, Fish collection  | 3778                 | 230000                |
| 37 | Virginia Institute of Marine Sciences, Ichthyological Collection   | not specified        | 128000                |
| 38 | Zoological Institute, Russian Academy of Sciences, Laboratory of Ichthyology   | 8700                 | 400000                |
| 39 | Zoological Museum of Moscow University, Ichthyological Section   | not specified (200*) | (1-50 per species)    |
| 40 | Zoological Museum, University of Copenhagen, Vertebrate Department   | not specified        | 72096 (577*)          |
| 41 | Zoologisches Institut und Zoologisches Museum, Universität Hamburg, Ichthyological Collection  | 7000                 | 200000                |

Total count: over 33 999 669 specimens in collections; at least 11 441 specimens with tissue  
 (\* species/specimens with tissue)

# Guelph and Area

## The City of Guelph

Guelph was founded on April 23, 1827 by John Galt of the Canada Company, a British land settlement firm. The town, considered to be one of Canada's first planned towns, was designed to attract settlers to it and the surrounding countryside. The Speed and Eramosa Rivers provided water for drinking, power for mills, and a focus for Galt's vision for the city. Resembling a European city centre with squares, broad main streets, and narrow side streets, Galt planned to have a series of streets diverge from a bend in the Speed River. Heavy forests and the formation of Lockport dolomite along both the rivers made his chosen site all the more ideal.

Galt's vision was impressive, but it wasn't until 1856, when the Grand Trunk Railroad reached Guelph from Toronto, that the town began to grow. Many prominent buildings were constructed during this time, most by local architects, builders, and stone carvers who used locally quarried, amber-hued limestone giving Guelph the visual unity seen in older parts of the city today.



From its initial settlement, Guelph was an attractive town for both industry and citizens. By 1915, the city boasted lively sports and music cultures and offered a free public library, daily and weekly newspapers, free postal delivery, 18 churches, a public and separate school system, a business college, and an agricultural college. The city owned its own utilities, street railway system and fire fighting force and had a varied industrial base of almost 100 industries.

From the gently rolling hills that surround it, to the downtown blend of heritage buildings and modern new facilities, the city of Guelph has become a vibrant community of 115,000 people. With a leading research university, diverse manufacturing, high technology enterprises, a thriving arts scene, and a dynamic cultural core, it is one of the fastest growing regions in Canada.

*(Image from: <http://www.uoguelph.ca/campus/city.shtml>)*

## The University of Guelph

Guelph's university history dates back to 1874 when the Ontario government bought a five hundred acre farm and the School of Agriculture opened with an enrolment of 28 students. Its intent was to "teach students how to perform farm work in the best manner" and to give them "scientific instruction necessary to their thorough understanding of the facts and principles on which such operations are based." In 1880, the school's name was changed to the Ontario Agricultural College (OAC) and by 1891, the degree program was fully running and short courses were offered to the general public.

The OAC was only one of the three founding colleges of the University of Guelph. The second was the Macdonald Institute (Mac). In 1903, using a \$175,000 donation from Sir William C. Macdonald, the Institute was set up to educate young women. The Department of Domestic Science, Nature Study and Manual Training was created with the intent to improve social and economic conditions in rural Canada. The Institute was "aimed at teaching farmers' daughters how to take back some of the new knowledge about homes and good nutrition and hygiene in the hope that they would marry farmers and upgrade the quality of rural life." However, it soon became obvious that many young women had other expectations and, by 1948, a 4-year degree program was offered.

The University of Guelph's third founding college, the Ontario Veterinary College (OVC), North America's oldest veterinary school, moved to Guelph from Toronto in 1922. The OVC's move made possible a closer relationship with the OAC and created the basis for the deep involvement in life science research that now characterizes the University of Guelph.



# Guelph and Area

## The University of Guelph (cont.)

OAC, Mac, and the OVC amalgamated in 1964, gaining official University status. Today, covering 1,017 acres, the campus is an attractive blend of historic architecture, brick walkways, and green space. While maintaining its connections to agricultural and rural life, the University of Guelph also influences the arts, culture and all domains of science. In fact, the University is now regularly ranked as the top comprehensive university in Canada. With an undergraduate enrolment of about 15,000 students, it makes a serious contribution to the national educational system. With an annual research budget in excess of \$50M and more than 2000 graduate students, Guelph is also one of the most research intensive universities in Canada.

(Image from: <http://www.uoguelph.ca/campus/map/johnston.shtml>)

## The Elora Mill

In 1833, using locally quarried limestone, the Elora Mill was built along the Grand River by Captain William Gilkinson. The river and the falls were of great value to the growth of Elora, providing power for the Mill and giving the town a focal point. Rising high above the Grand, the Mill was the largest flour mill west of Montreal and Elora soon became a major agricultural market. By the end of the 1870's, the development of factories, distilleries, and additional mills also established the town as a significant manufacturing centre.

Elora was a place of natural beauty, home first to the Six Nations Indians and later to pioneer settlers. But, with the rise of industry, local residents were alarmed by the pollution of the River and Gorge and by the end of the 1800's, clean-up committees were being mounted. Word of Elora's beauty spread and railways began to bring weekend sightseers to the area. By the mid 1900's, crafts people and artisans moved to town.

Today, Elora is a recreational destination for kayakers, hikers, and skiers as well as day visitors who wander the shops and studios located in the restored buildings of its early years. The Elora Mill is one of the few early Ontario flour mills still in existence, operating today as The Elora Inn and Restaurant.

(Image from: <http://www.eloramews.com/downloads.html>)



## The Millcroft Inn and Spa

In the 19th century, a community's location was dependent upon water which was essential for early industry. And so, in 1834, the town of Alton was first settled by Thomas Russell and his family along Shaw's Creek, a tributary of the Credit River.

Over the years, several frame mills were built on the site, but in 1875, Benjamin Ward began construction of a four-storey stone mill. Combining wood beams of Georgia pine with stone from nearby quarries and mortar from the Alton lime kilns, the Millcroft Inn was established as a knitting mill in 1881. It was later purchased by Ward's son-in-law, John Dods, becoming known as the Upper Mill and then eventually, Dods Knitting Mill. In 1917, the Mill was destroyed by fire. It was rebuilt and, producing woollen long underwear, became a renowned, supplier of a clothing staple in this frigid land. The mill itself was vital to development of Alton.

Throughout its years of operation, the Mill's ownership passed hands several times until 1965 when production stopped and the contents of the Mill were sold. Today, the original stone mill is home to the Millcroft Inn and Spa.

(Image from: [http://www.millcroft.com/photo\\_gallery.cfm](http://www.millcroft.com/photo_gallery.cfm))

