

NAME: **FERGUSON**, Hugh William

### **QUALIFICATIONS**

Bachelor of Veterinary Medicine and Surgery (*BVM&S*). Royal (Dick) School of Veterinary Studies, University of Edinburgh. October 1967 - July 1972

Member of the Royal College of Veterinary Surgeons (*MRCVS*). 1972

Doctor of Philosophy (*PhD*). University of Stirling, Scotland. 1975

Diplomate American College of Veterinary Pathologists (*Dipl ACVP*). 1983

Fellow of the Royal College of Pathologists (*FRCPath*). 1995

### **APPOINTMENTS HELD**

September 1972 - April 1975. Research Fellow at the Institute of Aquaculture University of Stirling, funded by a Wellcome Research Fellowship.

May 1975 - January 1976. Senior Scientific Officer at the Fish Disease Laboratory, M.A.F.F., Weymouth, Dorset, England. Employed as Head of Pathology Department.

February 1976 - June 1979. Veterinary Research Officer in the Veterinary Research Laboratories, Stormont, Belfast. Employed as a Pathologist by the Department of Agriculture for Northern Ireland.

July 1979 - Aug. 1998. Professor in the Department of Pathology, Ontario Veterinary College, University of Guelph, Ontario, Canada. Status - Assistant Professor 1979-1983; Associate Professor 1983-1989. From 1989 to 1998, Full Professor with tenure.

Sept. 1998 - present time. Professor and Chair of Diagnostic Pathology and Microbiology, Institute of Aquaculture, University of Stirling, Scotland. Employed to co-ordinate delivery of veterinary diagnostic services.

## EXPERIENCE

- Laboratory diagnosis and disease investigation in all animals.
- Research, both basic and applied.
- Administration, advisory and consultancy work, usually on a fee-for-service basis.
- Teaching, discipline training, and continuing education of undergraduates and postgraduates.
- Problem solving, mainly in an aquatic context.

## RESEARCH

Fundamental research interests include comparative pathology, pathophysiology, and defence mechanisms in lower vertebrates, especially fish. Maintaining research relevance through close ties with industry has always been important; hence maintaining a strong presence in diagnostics, worldwide.

1972-75      PhD supervisors: Professor A.E. Stuart FRCPATH, formerly Reader in Pathology, Medical School, University of Edinburgh, and Professor R.J. Roberts FRCPATH, University of Stirling.

Mapping out the reticulo-endothelial system of teleost fish using different markers and different methods; a morphological and functional study.

Ultrastructure of the reticular organs of teleost fish in both normal animals and in those injected with markers.

Ultrastructure of the white blood cells of teleost fish.

Light and electron microscope study of acid and alkaline phosphatase and peroxidase activity in the liver and heart of cyprinid fish. (This work was carried out in the Department of Electron Microscopy, Medical School, University of Leiden, Holland.)

Kinetics of blood clearance of radio-isotope labelled bacteria in plaice. (This work was carried out in the Department of Veterinary Physiology, University of Glasgow).

Diagnostic investigation into the cause of mortality amongst intensively reared turbot (*Scophthalmus maximus*) at an atomic power station, resulting in the discovery of a new sporozoan parasite, *Haemogregarina sachai*.

1976-79      Studies into the pathology and virulence mechanism of *Aeromonas salmonicida* as it affects salmonids.

Studies on the pathology, pathogenesis, epidemiology and control of proliferative kidney disease (PKD) of rainbow trout.

Research into the possibilities of immunological sterilization and early spawning in rainbow trout.

Routine diagnosis of fish viral disease, specifically infectious pancreatic necrosis.

I was the pathologist on a large team involved in investigating the causes of bovine abortion in Northern Ireland.

Diagnostic investigations into dysentery in pigs.

1979-09

Investigating the effect of water temperature and temperature stress on the ability of the reticuloendothelial system of rainbow trout to clear bacteria.

Haematological and histopathological assessment of rainbow trout fed oxidized diets with varying levels of anti-oxidants.

Investigation into the cause of glomerulonephritis in a white perch population in the Great Lakes.

Ultrastructure of renal portal reticuloendothelial activity.

Assessment of water quality parameters as they relate to pathological changes in fish gills; specifically the effects of suspended solids and ammonia on trout gills.

Effects of vitamins A and D and selenium toxicity in rainbow trout.

Pathological assessment of a variety of fish species from several heavily polluted locations in the Great Lakes and associated tributaries, including Love Canal, high in dioxins (work in conjunction with Department of Fisheries and Oceans).

Chemotaxis in fish neutrophils.

Cell kinetics in fish gills.

Fixation methods for gills.

Pathology, pathogenesis, and microbiology of bacterial gill disease.

Use of erythromycin in the control of bacterial kidney disease.

Pathology and clinical chemistry of quaternary ammonium compounds in fish.

Pathology and clinical chemistry of "pancreas disease" in farmed salmon.

Pathology of "cardiomyopathy syndrome" in Norwegian salmon.

Investigations into an epizootic of hepatic carcinomas (probably aflatoxin-induced) in trout in Brasil.

Pharmacokinetics of oxytetracycline in trout.

Clinical chemistry of bacterial kidney disease in trout.

Pathology of experimentally induced bacterial gill disease, and the attachment mechanisms of the causative bacteria.

Immune mechanisms of mucosal diseases, especially the “yellow pigmented bacteria” such as *Flavobacterium branchiophilum*.

Pathology and pathogenesis of hemorrhagic kidney syndrome (ISA virus) in the Canadian Maritimes, Scotland and Norway.

Pathology and pathogenesis of several “new” bacterial diseases of farmed fish, notably *Pasteurella salmonicida* in Atlantic salmon and *Edwardsiella ictaluri* in *Pangasius* catfish in the Mekong delta.

Pathology and ultrastructure of iridoviral infections in several species of tropical fish.

Pathology of experimental “*Pasteurella salmonicida*” infection in salmon.

Diagnosis of *Piscirickettsia* infection in seabass.

Pathology of nodavirus in a range of species, including cod.

Pathology of reovirus infections in farmed halibut.

Pathology of *Pseudomonas anguilliseptica* in farmed cod.

Heart diseases of salmonids.

Pathology and pathogenesis of “strawberry disease” in trout.

Pathology and pathogenesis of “summer enteritis syndrome” in rainbow trout.

Pathology of light-induced retinopathy in salmon and cod.

Acute phase proteins in farmed tilapia.

Jellyfish as vectors of bacterial diseases for farmed fish.

## LABORATORY DIAGNOSIS AND DISEASE INVESTIGATION

- 1972-75 As a member of staff at the Unit of Aquatic Pathobiology, I was involved in the diagnosis of bacterial, viral and parasitic diseases and water quality problems associated with both freshwater and marine species of fish under both natural and farmed conditions. Similar work was performed at Fish Disease Laboratories (MAFF), Weymouth.
- 1976-09 The detailed post-mortem examination of farm livestock, small animals, laboratory animals, poultry, exotic species, wildlife and especially fish. Up until 1998 I was the Director of the Fish Pathology Laboratory (Ontario Veterinary College), and as such, screened all of the diagnostic material and checked diagnoses that funnelled through this service (see below). As Chair of Diagnostic Pathology & Microbiology I am presently responsible for co-ordinating the delivery of all veterinary diagnostic services for the Institute of Aquaculture.

The histopathological examination of tissue samples as an adjunct to diagnosis. The selection of material for further examination by other Departments as an aid to diagnosis. The collation of results and the preparation of reports.

Investigation of problems associated with the diagnosis, epidemiology and control of animal diseases in the field – farmed, wild, laboratory and aquarium animals all included.

## **ADMINISTRATION, FELLOWSHIPS, ADVISORY AND CONSULTANCY WORK**

- 1972-75      Research Fellowship from the Wellcome Foundation, investigating the reticulo-endothelial system of teleost fish. Based at the University of Stirling.
- 1976-79      Responsible for the health of fish stocks in Northern Ireland and as such, closely involved with water pollution, mortalities from disease in wild stocks and in farmed fish. Certification of stocks for export and general advice on the movement of stocks within Northern Ireland. There was close involvement with all aspects of the fish farming industry there, and as such, I attended meetings in London and liaised with English and Scottish scientists and administrators concerning a redrafting of the G.B. legislation on fish diseases. There was also close liaison with the Dublin government on fish disease matters of mutual interest. Frequent consultation by workers in other European countries led to co-operative diagnostic investigations, and to further work in the fields of bacteriology, virology and pathology.
- 1976-79      Pathology consultant for the Norwegian aquacultural industry through Dr. Tore Håstein, National Veterinary Institute, Oslo, Norway.
- 1979-98      Responsibility for supervising and directing the Fish Pathology Laboratory (OVC) on a day-to-day basis. The Fish Pathology Laboratory, which usually comprised at least 2 veterinarians, (graduate students) 1 post-doctoral fellow, 1 non-DVM graduate student and 1 technician, plus myself, was run on a cost-recovery basis with its own operating budget, and was involved in all aspects of fish disease diagnosis and research for the aquacultural and aquarium industries, as well as private owners, consulting firms and government agencies. Latterly we saw heavy commitment to environmental toxicology and carcinogenesis. Revenue from this service in 1998 was roughly \$160,000.00.
- 1983-1986      Consultant for the fish program at the Atlantic Veterinary College, Prince Edward Island, Canada. Advised on course content, equipment, and facilities. Responsible in the early planning phases for the overall concept of the fish program and facilities in this new veterinary college.
- 1989          Consultant for International Development and Research Council (IDRC) and Bureau of Fisheries and Aquatic Resources (BFAR), Manila, Philippines. Advising on current research, and discussion on long term goals, and advising on procedures for establishing diagnostic service.
- 1989          Consultant for Canadian Executive Service Organisation (CESO) in Lages, Santa Catarina, Southern Brasil. Advising the Agro.Vet. Centre, Universidade Para O Desenvolvimento do Estado de Santa Catarina on fish diagnostic procedures.

- 1990 Consultant for Canadian International Development Agency (CIDA) in San Jose, Costa Rica, visiting the veterinary school in Heredia, and the aquaculture industry throughout the country. Advising on disease problems in freshwater and saltwater systems, and the development of the veterinary curriculum to reflect the importance of aquaculture to the country as a whole.
- 1990 Consultant for Port Hardy Marine Resources Society (British Columbia) re the feasibility of setting up a diagnostic centre on Vancouver Island.
- 1990 Consultant for the Asian Development Bank/Network of Aquaculture Centres of Asia (NACA) concerning fish health matters in Asia.
- 1991 Elected to roster of consultants for the Consultative Group on International Agricultural Research (CGIAR - World Health Organization and World Bank).
- 1991 Consultant for IDRC, visiting Bureau of Fisheries and Aquacultural Resources (BFAR) in Manila, Philippines, and also South East Asian Fisheries Development Centre (SEAFDEC) Iloilo, Philippines, working with scientists from both institutions on their pathology and research programs involved with diseases of fish raised intensively and semi-intensively in freshwater, saltwater, and brackishwater systems.
- 1992 Fellowship from the Norwegian Government (NLVF) for 4 months (March to June) based at the National Veterinary Institute in Oslo, in the Department of Aquaculture and Fish Diseases. In addition to the research work, which involved investigating various aspects of the pathogenesis of "pancreas disease", a new bacterial eye disease, and systemic hexamitosis, I gave a series of lectures and "mystery slide" sessions on systemic pathology of fish, and helped to screen the diagnostic material coming through the laboratory.
- 1993 Consultant for Canadian International Development Agency (CIDA) concerning the development of fish disease pathology expertise in Colombia, visiting the veterinary school in the Universidad Nacional, plus several of the aquacultural facilities throughout Colombia, and discussing with faculty and students disease problems associated with farmed fish (salmonids, catfish, tilapia and red pacu or "cachama").
- 1993-94 Consultant for Paprican (Pulp and Paper Research Institute of Canada), advising on histopathology for some of their toxicology trials.
- 1994-98 Awarded Visiting Professorship in Queen's University of Belfast, Northern Ireland, UK (in the School of Agriculture and Food Science).
- 2000 Consultant for Ministry of Agriculture of Barbados, relating to *Streptococcus iniae* infection round this and other Caribbean islands.
- 2000-04 Consultant for OKIOC (Offshore Kazakhstan Oil Company) relating to fish pathology in the Caspian Sea, and the decline of the beluga sturgeon population.
- 2002-04 Consultant for Nippon Oil Corporation (feed additives).

- 2006 Consultant for University of Pennsylvania, regarding the future and importance of the aquatic animal programme within the Veterinary School.
- 2007-09 Consultant for the veterinary pathology program in the veterinary school, National University, Bogota, Colombia.

## **TEACHING**

- 1972-75 Involved with teaching post-graduate veterinary students and supervision of MSc. projects.
- 1978-79 Part-time lecturer in Loughry College of Agriculture, Northern Ireland, teaching poultry diseases.
- 1979-98 Helping to teach "General Pathology" to Doctor of Veterinary Medicine (DVM) undergraduates in the laboratory component. Solely responsible for teaching a course on Aquatic Animal Diseases, plus other teaching duties within the Pathology Department of OVC (eg. ultrastructural pathology) including supervision of undergraduate and graduate students in the general post-mortem room (including screening duties for all histopathological diagnoses) and teaching DVM undergraduate and graduates about aquatic pathology. I also co-ordinated an undergraduate course on aquaculture, involving many faculty in other Colleges.
- 1979-09 Presenter of many courses and workshops on diseases of aquatic animals. Many of these have been overseas assignments, and some have entailed working through interpreters.
- 1998-09 Involvement with teaching MSc students, and with supervision of research projects. Acting also as a resource for research projects in which pathology is a component. Presently I have 2 MSc students, 2 PhD students and 2 post-doctoral students, although I help and advise with many others.

## **MAJOR PRESENTATIONS/WORKSHOPS/COURSES**

- Feb 2009 Invited lectures on "Emerging Diseases of Farmed Fish" at Alagappa University, Namil Nadu, at Madras Veterinary College, Chennai, and at Aligarh Muslim University, India.
- Nov 2008 Invited series of lectures on systemic pathology of fish to in-service MSc students (roughly 25) at the Veterinary School, Karditsa, Greece.
- Aug 2008 Invited lectures and practical sessions in histopathology (2 days) at the Second International Conference in Fish Pathology, Nacional University, Bogota, Colombia.
- Mar 2008 Invited lectures and workshops on histopathology to faculty and students at the Veterinary School, University of Bologna, and in Cessanatico, Italy.
- Nov 2007 Invited lectures (3) at the Pan-Commonwealth Veterinary Association meeting, Barbados, West Indies.
- Jan 2007 Invited series of lectures on systemic pathology of fish to in-service MSc students

(roughly 25) at the Veterinary School, Karditsa, Greece.

- Aug 2006 Invited keynote address and lectures at 5 day Symposium and Course on Aquatic animal health and disease, "*I curso – seminario internacional de patologia y sanidad piscicola*", Veterinary School, National University, Bogota, Colombia.
- Nov 2005 Workshop (half-day) to American College Veterinary Pathologists' annual meeting in Boston, "*Systemic Pathology of Fish*". Co-presented with Dr E. Noga.
- July 2005 Presenter at European College of Veterinary Pathology (ECVP/ESVP) Marie Curie Training Course in Padova, Italy, on Fish Diseases. Over 100 attendees.
- June 2004 Invited plenary lecture "*Gill diseases of Fish*" to the 16<sup>th</sup> annual joint meeting of Portuguese and Spanish veterinary pathologists, Famalicao, Portugal.
- Apr. 2004 Invited paper to New England Farmed Fish Health Management workshop, on "*Eye Diseases of Fish*", University of Maine at Eastport.
- Apr. 2003 Invited paper to New England Farmed Fish Health Management workshop, on "*Emerging diseases in Scottish Aquaculture*", University of Maine at Machias.
- June 2002 Invited keynote address (*The Reg Thomson lecture*) on "*Gill Diseases of Fish*" presented to staff and students of the Atlantic Veterinary College, University of PEI, Canada.
- Mar. 2002 Invited seminar on "*Emerging Diseases of Fish*" to faculty and staff at Can-Tho University, Vietnam.
- Mar. 2002 Invited lecture on "*Musculo-skeletal diseases of Fish*" at the 10<sup>th</sup> annual meeting New England Farmed Fish workshop, Eastport, Maine, USA.
- Mar. 2002 Invited keynote address on "*Gill Pathology*" to the Association of Veterinary Teachers and Research Workers, Scarborough, UK.
- May 2001 Invited plenary speaker at the inauguration of the new specialization school, Institute of Pathology, Faculty of Veterinary Medicine, University of Padova, Italy. "*Pathology of the most important diseases in European Aquaculture: an update, with particular attention to zoonoses*".
- Apr. 2001 "*Emerging diseases worldwide*". Invited presentation to the 9<sup>th</sup> annual New England farmed fish health management workshop, University of Maine, USA.
- June 2000 "*Comparing diseases of fish in Scotland with those in the Maritimes*". Invited lecture in St Andrews, N. Brunswick, Canada, at the Annual Fish Farming Conference.
- May 2000 "Inaugural lecture" University of Stirling, on "*Systemic Pathology of Fish*".
- Nov. 1999 Invited workshop co-ordinator ("Fish Pathology") and co-presenter (along with Dr. G. Johnson, UPEI) at the 50<sup>th</sup> Anniversary Meeting of the American College Veterinary Pathologists, Chicago, Illinois, USA.

- Oct. 1999 Invited public lecture on the Caribbean Fish Kill, Barbados, West Indies, given at UWI, Cave Hill, Barbados.
- Sept. 1999 Invited talk to British Trout Farmers Annual Conference, Sparsholt, Hampshire, talking on "*Common Disease Problems in Ontario Trout Farms*".
- Apr. 1999 Invited lecture at the New England Farmed Fish Health Workshop, Eastport, Maine, USA, on "*Gill Diseases in Farmed Salmonids*".
- Sep. 1998 Seminar on ISA/HKS to Scottish Salmon Farmers and industry reps. Given at the University of Stirling, Scotland.
- Nov. 1997 Invited presentation in St. Andrew's, New Brunswick, on Hemorrhagic Kidney Syndrome in Atlantic Salmon - Definition of the Disease.
- Aug. 1997 Invited plenary lecture to European Society of Comparative Physiologists and Biochemists in Barcelona, Spain, on "*Gill diseases - lesions and consequences*".
- July 1997 Invited paper presented at the Institute of Aquaculture, University of Stirling on Emerging Diseases in Canadian Aquaculture.
- Mar. 1997 Invited presentation to the New England Salmon Farmers on "*Emerging Diseases of Farmed Fish*", Eastport, Maine, USA.
- Mar. 1997 Invited presentation to faculty and students at the Virginia/Maryland College of Veterinary Medicine, Blacksburg, Virginia. Talking on emerging diseases of farmed salmonids in Canada.
- Mar. 1997 Invited presentation to faculty and students at the College of Veterinary Medicine, North Carolina State University, Raleigh, N. Carolina. Talking on emerging diseases of farmed salmonids in Canada.
- Nov. 1996 Invited presentations at the Canadian/Caribbean Veterinary Association meeting in Barbados, W. Indies. 1. A major fish kill in Barbados. 2. Zoonoses associated with Fish. 3. Environmental Diseases of Fish.
- Apr. 1996 Invited presentation to fish farmers, fish scientists, "*Emerging Diseases of Salmonids*", at the New England salmon farmers annual meeting, Eastport, Maine.
- Feb. 1996 Invited course (3 days) to fishery biologists and farmers on "*Diseases of Wild Fish*" presented at the WCVM, Saskatchewan. Sponsored by the CCWHC.
- July 1995 Invited presentation to staff and students at the Royal (Dick) School of Veterinary Studies, University of Edinburgh, Scotland on "*Respiratory Disease in Fish*".
- Mar. 1995 Invited presentation at Bradan '95 (Irish salmon farmers meeting) "*Pancreas Disease - the early days*". Given at Clifden, Co. Mayo, Republic of Ireland.
- Feb. 1995 Invited presentation to researchers, administrators and fish farmers on "*The Impact of Aquaculture: Global trouble shooting from a Canadian base*". Given at the Veterinary Research Laboratories, Stormont, Belfast, U.K.

- Dec. 1994 Invited shortcourse (5 days) "*Approaches to disease diagnosis in aquatic animals*" given to faculty & staff of the University of W. Indies, and personnel from the Vet. Diagnostic Lab. (Ministry Ag. & Food) plus fish farmers. Given at the Bellairs Research Institute of McGill University, Holetown, Barbados, W. Indies.
- Oct. 1994 Invited presentations to veterinarians and other fish health personnel at an International Conference "*Pathology and Nutrition in the Development of Aquaculture: Keys to Success*". Topics covered included "Gill disease: diagnostic consequences and interaction with feeding practices" plus, "*Cardiomyopathy syndrome, Pancreas Disease, and the Differential Diagnosis of Liver disease*", plus "*Eye Disease*". Organized by Fundacion Chile and held in Puerto Montt, Chile.
- Aug. 1994 Invited presentation at "Envirovet" on "*Diagnostic criteria in aquaculture medicine*". 5-6 hours of lecture\laboratory at University of Michigan\University of Illinois, at Duluth, Minnesota, USA.
- May 1994 Invited presentation on "*Fish Pathology*" (4 hours) to veterinary pathologists at Charles Louis Davis Foundation course on fish and wildlife pathology at College of Veterinary Medicine, Blacksburg, Virginia, USA.
- Sep. 1993 Invited 1 day workshop on "*Histopathology of liver and heart*" at the European Association of Fish Pathologists' 6th International meeting in Brest, France.
- Aug. 1993 Invited presentation at "Envirovet" on "*Diagnostic criteria in aquaculture medicine*". 5-6 hours of lecture\laboratory at University of Michigan\University of Illinois, at Duluth, Minnesota, USA.
- Jun. 1993 Invited workshop (CIDA project) on pathophysiology of gill diseases, plus an overview of fish systemic pathology given to faculty, students and staff of the Universidad Nacional, Bogota, Colombia.
- Mar. 1993 Invited presentation "*Fish Diseases: Wild versus Cultured Fish*", given to fish farmers/fish health personnel, health management workshop, Maine, USA.
- Jun. 1992 Invited one day workshop on "*Gill diseases - diagnosis and treatment*", given to faculty from the University of Bergen, to personnel from the Fishery Institute, and from the veterinary diagnostic centre. Given in the Veterinary Diagnostic Centre, Bergen, Norway.
- Jun. 1992 Invited one day workshop (organized by Skretting, a fish feed company) on common diseases of farmed salmonids. Given to veterinary practitioners in Kristiansund, Norway.
- Jun. 1992 Invited lecture and seminar to faculty and students of the Veterinary Pathology Department, *Agricultural University of Uppsala*, Sweden.
- Apr. 1992 Invited seminar on "*Common diseases in Canadian Fish*", given to students and faculty of the Norwegian College of Fishery Science, University of Tromsø, and to members of the Veterinary Diagnostic Centre, Tromsø, Norway.
- Mar. 1992 Invited seminar (1 day) on gill diseases in fish - mechanisms and pathophysiology - to veterinarians from Norwegian veterinary diagnostic centres. Given in Na-

tional Veterinary Laboratory, Oslo, Norway.

- Oct. 1991 Invited 1 week course (IDRC project) on basic pathology and mechanisms of disease in fish. Given in Manila, Philippines. Given to scientists from government institutions (BFAR and SEAFDEC) and to faculty from University of the Philippines. Also seminar "*Gill Diseases of Fish*" to SEAFDEC, Iloilo, Philippines.
- Jun. 1991 Invited 2-day presentation on pathophysiology of aquatic animals, at "Envirovet", *University of Michigan\University of Illinois*, at Superior, Michigan, USA.
- Feb. 1991 Lecture tour of the United Kingdom, talking and lecturing about branchial pathology in fish. Institutions visited included University of Bristol (Dept. of Comparative Pathology), Plymouth Marine Laboratory, University of Stirling (Institute of Aquaculture), Veterinary Sciences Divn. of Dept. of Agriculture N. Ireland, and University of Aberdeen (Zoology Dept), Scotland.
- Oct. 1990 Invited lecture "*Overview of Fish Diseases in an Aquacultural Setting*" and international consultant at an *Asian Development Bank/NACA* workshop (10 days) on fish health control in Asia, at Pusan, South Korea.
- Jun. 1990 Invited lectures and labs. at "*Introduction to Aquaculture for Veterinarians*" held at *Atlantic Veterinary College*, University of P.E.I., Charlottetown, June 7-9th, 1990.
- Apr. 1990 Invited speaker at "Aquatech 90" in the University of Guelph on "*Major limitations on the expansion of Canadian Aquaculture: a review of current problems and early warnings*".
- Apr. 1990 One day workshop on diseases of fish in the tropics (CIDA project), given at the Veterinary School, *Universidad Nacional, Heredia*, Costa Rica.
- Jan. 1990 Seminar on Pancreas Disease and Cardiomyopathy Syndrome, at the Veterinary Research Laboratories, Stormont, Belfast, N. Ireland, UK.
- Jan. 1990 Seminar on "*Heart Disease in Fish*" at the Regional Veterinary Diagnostic Laboratory, Bergen, Norway.
- Dec. 1989 Invited seminar on "*Cardiac Diseases of Fish*" at Veterinary College, *University of California, Davis*, given to the Department of Medicine.
- Jul. 1989 Invited course (CESO funded) on fish diseases (4 days) to graduate extension veterinarians and faculty, at the Agro. Vet. Centre of the *Universidade Para O Desenvolvimento Do Estado De Santa Catarina*, Lages, Santa Catarina, Brasil.
- Jun. 1989 Invited speaker at World Association of Veterinary Laboratory Diagnosticians, Guelph, Ontario, speaking on "*Pathology of Fish Diseases - Current Developments*".
- Apr. 1989 Invited lecturer at Aquaculture shortcourse in Girona campus of the *University of Barcelona*, Spain; lectures and labs. on fish diseases.
- Mar. 1989 Keynote speaker at fish farming conference, St. Andrew's, New Brunswick, talk-

ing on "*Bacterial Diseases of Farmed Salmonids*".

- Mar. 1989 Invited shortcourse on fish diseases to students and fish farmers, at the Western College of Veterinary Medicine, *University of Saskatchewan*, Saskatoon.
- Feb. 1989 Invited shortcourse (IDRC funded) on "Pathology of Fish" to the Third Asian Fish Health meeting (joint International Development Research Council/UPM sponsorship) at *Universiti Pertanian Malaysia*, Malaysia.
- May 1988 Keynote speaker and course co-ordinator at Post-graduate Refresher course on Fish Diseases organized by the Post-Graduate Foundation Committee in Veterinary Science, *University of Sydney*, Australia.
- May 1988 Invited papers to salmon farmers in Hobart, Tasmania, and to students and faculty at the *Tasmanian State Institute of Technology*, Launceston, on "*Common diseases of cultured fish in Canada*".
- Nov. 1987 Invited paper (the *D.L.T. Smith* lecture) on "*The role of the Veterinarian in Fish Diseases*", at the Western College of Veterinary Medicine, Saskatoon, Saskatchewan. Also, "*Diseases of Aquarium Fish*" to the pathology department, WCVM.
- Sept. 1987 Invited workshop on "*Diseases of Aquarium Fish*" at 125th OVC celebrations, Guelph, Ontario.
- Aug. 1987 Invited paper on "*Common diseases of fish kept in the laboratory*" World Veterinary Congress, Montreal.
- Aug. 1987 Invited paper on "*Pancreas disease of Atlantic Salmon*". Pacific Biological Station, Nanaimo, B.C.
- Feb. 1987 Invited seminar on "*Common diseases of farmed salmonids*". Technical University of Nova Scotia workshop on fish farming in the Maritimes, Halifax, Nova Scotia.
- Feb. 1987 Invited seminar at Atlantic Veterinary College, U.P.E.I., on "*Interesting Protozoan diseases of Fish*".
- Nov. 1986 Invited papers on tropical aquaculture and diseases of aquarium fish. Joint Caribbean/Canadian Veterinary Association meeting in Barbados, W. Indies.
- Mar. 1986 Invited seminar on "*Pancreas disease of Atlantic salmon*" at Microbiology Dept., University of Galway, Republic of Ireland.
- Jan. 1986 Invited seminar on "*Important diseases of fish in Canadian Aquaculture*" at Institute of Aquaculture, University of Stirling, Scotland, UK.
- Oct. 1985 Invited paper on "*Important protozoal diseases of fish*" presented at annual Scottish Veterinary Investigation conference, Pitlochry, Scotland, UK.
- Sept. 1985 Invited 2 week course on fish diseases, presented in Wellington, N. Zealand, to Ministry of Agriculture veterinarians.

- Jan. 1985 Invited seminar to Department of Fisheries and Oceans, Halifax, Nova Scotia, on proliferative kidney disease.
- Nov. 1984 "*Veterinary involvement in aquaculture*". Invited presentation to the joint Canadian/Caribbean Veterinary Association, Trinidad, West Indies.
- July 1984 Invited seminar on "*Epidemiology and control of proliferative kidney disease in rainbow trout*" to American Fisheries Society, Fish Health Workshop, Arkansas, USA.
- June 1984 "*Renal phagocytosis in fish*". Agriculture Canada Animal Pathology Conference, Ottawa.
- May 1984 "*Intra-axonal protozoa in the common shiner *Notropis cornutus**" Mid-West Association of Veterinary Pathologists, Cincinnati, Ohio, USA.
- Feb. 1983 Invited seminar on "*Reactions of Fish Gills in Disease*" to the Division of Comparative Medicine, *Johns Hopkins University*, Baltimore, Maryland, USA.
- July 1981 Invited 3 day seminar/workshop on fish diseases at Western College of Veterinary Medicine, *University of Saskatoon*, Canada.
- July 1980 Invited one-day presentation (5 hours lectures) to the Canadian Association of Veterinary Pathologists on "*Diseases of Fish and Amphibia*" in Moncton, New Brunswick, Canada.
- June 1980 Paper presented to the Fish Health Section of the American Fisheries Society entitled "*Pathology and Control of Proliferative Kidney Disease in Rainbow Trout*" in Seattle, Washington, USA.
- Apr. 1978 Paper presented to the Association of Veterinary Teachers and Research Workers entitled "*Proliferative Kidney Disease*" in Scarborough, UK.
- Nov. 1977 "*Fish Disease in Northern Ireland*" presented at a meeting of Water Authorities and Veterinary Investigation Centres (MAFF) in Reading, UK.
- Apr. 1977 "*Furunculosis in Brown Trout*" presented at the OIE/EIFAC meeting on fish diseases in Brest, France. In addition, I chaired 2 sessions on kidney diseases and gave an additional paper on PKD in rainbow trout.
- Mar. 1976 "*Fish Diseases in Northern Ireland*" presented to the annual meeting of the Institute of Fisheries Management in Londonderry, Northern Ireland, UK.
- June 1975 "*Toxoplasma*-like organisms as the possible causative agents of a proliferative condition in farmed turbot (*Scophthalmus maximus*)". Joint paper presented at the Third International Wildlife Disease Conference, Munich, Germany.
- Apr. 1975 "*Relationship between ellipsoids and melano-macrophage centres in marine flatfish*" presented to British Society Immunology annual conference Brighton, UK.
- June 1974 "*A lymphomatous condition of farmed turbot in an atomic power station*", pre-

mented at a conference on Neoplasia in Aquatic Animals, Cork, Repub of Ireland.

### GRANTS RECEIVED IN AID OF RESEARCH

- 1980-81 Title. "***The effect of temperature on reticuloendothelial clearance in rainbow trout***". Amount \$6,000.00 from the Research Advisory Board of the University of Guelph.
- 1980-81 Title. "***The effect of temperature on reticuloendothelial clearance in rainbow trout***". Amount \$8,000.00 from the Natural Sciences and Engineering Research Council (NSERC), Canada.
- 1981-82 Title. "***The effect of pH and starvation on reticuloendothelial clearance in rainbow trout***". Amount \$18,000.00 from NSERC.
- 1982-83 Title. "***Ultrastructural localization of bacteria in the kidney of rainbow trout.***" Amount \$18,000.00 from NSERC.
- 1980-83 Title. "***Bacterial Gill Disease***". Amount \$60,000.00 from the Ontario Ministry of Agriculture and Food Lottery Fund.
- 1984-86 Title. "***Cell kinetics in fish gills***". Amount \$30,000.00 from OMAF.
- 1984-85 Title. "***Point-source mutagen pollution in Ontario***". Amount \$40,000.00 from Ontario Ministry of Environment.
- 1985-86 Sabbatical leave. Awarded Wellcome Travel Fellowship, and Bull Fellowship.
- 1986-87 Title. "***Disease of caged fish in British Columbia***". Amount \$8,600.00 from Agriculture Canada.
- Title. "***Significance of neoplasia in wild fish populations***". Amount \$48,000.00 from Wildlife Toxicology Fund. Co-recipient with Dr. M.A. Hayes.
- Title. "***Pathology of neoplastic diseases of feral fish***". Amount \$64,000.00 from Ontario Ministry of Environment. Amount \$64,000.00. Co-recipient with Dr. M.A. Hayes.
- Title. "***Carcinogenic responses of wild fish from polluted sites in Lake Ontario***". Amount \$61,000.00 from N.S.E.R.C. Co-recipient with Dr. M.A. Hayes.
- 1987-88 Title. "***Causes of pollution-associated neoplasms on fish in Lake Ontario***". Amount \$140,500.00 from Ontario Ministry of Environment. Co-recipient with Dr. M.A. Hayes.
- 1986-91 Ontario Ministry of Agriculture and Food (OMAF) supports the fish disease research programme in Pathology at the level of \$157,665.00 per annum in 1990 dollars.
- 1990-93 Title. "***Impact of chemotherapeutic agents and aquacultural pollutants on fish: assessment using immune response in gills***". Amount \$77,500.00 from OMAF.

- 1991-1995 Ontario Ministry of Agriculture and Food support for fish disease work in the Pathology Dept. Amount roughly \$151,000.00 per annum after overhead.
- 1995-1998 Title. "***Indicators of Resistance to Bacterial Diseases of Salmonids***". Amount \$90,000.00 per annum for each of 3 years from NSERC as a Strategic Grant. Co-recipient with Dr. M.A. Hayes.
- 1996-1997 Title. "***Use of hydrogen peroxide in treating fish disease***". \$21,000.00 contract from Eko-Nobel, USA.
- 1997-2001 "***Sequential pathology of Hemorrhagic Kidney Disease in Atlantic salmon***". \$55,000.00 grant-in-aid of research from Salmon Health Consortium, New Brunswick, Canada.
- 2000-01 £5,000.00 from DFID (Department for International Development) UK. "***Investigation of a fish mortality problem affecting fish farmers in the Mekong delta, Vietnam***". Co-recipient with Drs. Crumlish, Turnbull, Shinn and Thompson.
- 2002 £160,000.00 equipment grant from Wellcome Trust (UK) for purchase of a confocal microscope. Co-recipient with Drs. Richards, Teale, and Sommerville.
- 2001-03 £150,000.00 from DFID (UK). ***Risk issues and management strategies for Bacterial Necrosis Disease (BNP) and other factors for Pangasius spp. farming in the Mekong Delta, Vietnam.*** Co-recipient with Drs. Crumlish, Turnbull, Shinn and Thompson.
- 2005-07 £94,000.00 from SARF for research into cardiomyopathy syndrome (CMS) and other heart diseases in Atlantic salmon. Co-recipient with Prof. A. Adams.
- 2005-2008 £100,000.00 for research into summer enteritis syndrome of rainbow trout. Co-recipient with Drs. J. Turnbull and M. Crumlish.
- 2007-2008 £54,000.00 from industry sources for research into Red Mark Syndrome/Strawberry Disease in rainbow trout.
- 2008-2011 NK6,000,000.00 from Norwegian research council plus industry sources (*Marine Harvest*). ***Cardiomyopathy syndrome: A multi-task approach to reduce losses and improve knowledge.*** Co-recipient (as named collaborator) with various researchers in Norwegian Veterinary College, and other Norwegian institutions.
- 1998-09 The Veterinary Diagnostic Service of the Institute of Aquaculture presently earns roughly £150,000.00 per annum, providing diagnostic services/investigations primarily for the European aquaculture industry, and referral fish pathology globally, as well as support pathology for other contract and research activities within the Institute. This money is used to support diagnostic investigations.

## PUBLICATIONS

Ph.D. Thesis. The reticulo-endothelial system of teleost fish with special reference to the plaice (*Pleuronectes platessa*).

### BOOKS and BOOK CHAPTERS

1. Ferguson, H.W. 1991. *Overview of finfish diseases in an aquacultural setting*. pp 283-345. in Fish Health Management in Asia-Pacific. Asian Development Bank ADB Agriculture Dept. Report Series No. 1. June 1991.
2. Ferguson, H.W. 1989. *Systemic Pathology of Fish : A text and atlas of comparative tissue responses in diseases of teleosts*. Iowa State University Press, Ames. Second Printing. Both English and Chinese editions (Chinese version through Yi Hsien Publishing Co., Box 13-193, Taipei, Taiwan, Republic of China).
3. Ferguson, H.W. 2006. *Systemic Pathology of Fish: a text and atlas of normal tissues in teleosts and their responses in disease*. Second Edition, Scotian Press, London.
4. Ferguson, H.W. 1988. *Fish Diseases - Refresher Course for Veterinarians*. Proc. 106, Post Graduate Committee in Veterinary Science, University of Sydney, pp. 27-93.
5. Ferguson, H.W. 1984. *Fish. Guide to the care and use of experimental animals*. Vol. 2. Canadian Council of Animal Care, Ottawa, Canada.
6. Sippell, A.J. and H.W. Ferguson. 1983. *Proliferative kidney disease of salmonids*. In "A Guide To Integrated Fish Health Management In The Great Lakes Basin". eds. F.P. Meyer, J.W. Warren, T.G. Carey. Special Publication 83-2 Great Lakes Fishery Commission Ann Arbor, Michigan, USA.

### PAPERS and PUBLISHED ABSTRACTS

7. Ferguson, H.W. and Roberts, R.J. 1975. Myeloid leucosis associated with sporozoan infection in cultured turbot (*Scophthalmus maximus*). J. Comp. Path. 85: 317.
8. Ferguson, H.W. 1975. Phagocytosis by the endocardial lining cells of the atrium of plaice (*Pleuronectes platessa*). J. Comp. Path. 85: 561.
9. Ferguson, H.W. and Roberts, R.J. 1976. A condition simulating lymphoma, associated with sporozoan infection in cultured turbot (*Scophthalmus maximus*). Prog. Exp. Tum. Res. 20: 212.
10. Ferguson, H.W. 1976. The ultrastructure of plaice (*Pleuronectes platessa*) leucocytes. J. Fish. Biol. 8: 139.
11. Kirmse, P. and Ferguson, H.W. 1976. *Toxoplasma*-like organisms as the possible causative agents of a proliferative condition in farmed turbot (*Scophthalmus maximus*) in Wild-life Diseases, ed. L.A. Page. Plenum Pub. Corp. New York.
12. Ferguson, H.W. 1976. The relationship between ellipsoids and melanomacrophage centres in the spleen of turbot (*Scophthalmus maximus*). J. Comp. Path. 86: 377.

13. Ferguson, H.W. 1977. Furunculosis in brown trout. Bull. Off. Int. Epiz. 87 (5-6): 465-467.
14. Ferguson, H.W. and Adair, B. McC. 1977. Protozoa associated with proliferative kidney disease in rainbow trout (*Salmo gairdneri*). Vet. Rec. 199: 158.
15. Ellis, W.A., Neill, S.D., O'Brien, J.J., Ferguson, H.W. and Hanna, J. 1977. Isolation of *Spirillum/Vibrio*-like organisms from bovine fetuses. Vet. Rec. 100: 451.
16. Ferguson, H.W. 1977. Columnaris disease in rainbow trout (*Salmo gairdneri*) in Northern Ireland. Vet. Rec. 101: 55.
17. Ferguson, H.W. and Needham, E.A. 1978. Proliferative kidney disease in rainbow trout (*Salmo gairdneri*). J. Fish. Dis. 1: 91.
18. Ferguson, H.W. and McCarthy, D.H. 1978. Histopathology of furunculosis in brown trout (*Salmo trutta*). J. Fish Dis. 1: 165-174.
19. Ferguson, H.W. 1979. Scanning and transmission electron microscopical observations on *Hexamita salmonis* related to mortalities in rainbow trout fry (*Salmo gairdneri*). J. Fish Dis. 2: 57-67.
20. Ferguson, H.W., Campbell, J.M., Ghittino, P. and Andruetto, S. 1978. Ultrastructure of an amoeba associated with proliferative kidney disease in rainbow trout (*Salmo gairdneri*). Riv. Ital. Pisc. Ittiop. 13: 79-82.
21. Ball, H., Neill, S.D., Ellis, W.A., O'Brien, J.J. and Ferguson, H.W. 1978. The isolation of mycoplasmas from bovine fetuses and their dams. Br. Vet. J. 134: 584-589.
22. Ellis, W.A., Logan, E., O'Brien, J.J., Neill, S.D., Ferguson, H.W. and Hanna, J. 1978. Antibodies to *Leptospira* in the sera of aborted bovine fetuses. Vet. Rec. 103: 237-239.
23. Ferguson, H.W. and Ellis, W.A. 1979. Case report - Toxoplasmosis in a calf. Vet. Rec. 104: 392-393.
24. Ferguson, H.W. and Ball, H. 1979. Epidemiological aspects of proliferative kidney disease amongst rainbow trout *Salmo gairdneri* Richardson in N. Ireland. J. Fish. Dis. 2: 210-225.
25. Ferguson, H.W. and Rice, D.A. 1980. Case report - post spawning mortalities in brown trout *Salmo trutta*. J. Fish. Dis. 3: 153-160.
26. Ferguson, H.W., Neill, S.D. and Pearson, G.R. 1980. Dysentery in pigs associated with cystic enlargement of sub-mucosal glands in the large intestine. Can. J. Comp. Med. 44:109-114.
27. Ferguson, H.W. and Moccia, R.D. 1980. Disseminated hexamitiasis in Siamese fighting fish *Betta splendens*. J.A.V.M.A. 177: 854-857.
28. Adair, B. McC. and Ferguson, H.W. 1981. Isolation of infectious pancreatic necrosis (IPN) virus from non-salmonids. J. Fish. Dis. 4: 69-76.

29. Ferguson, H.W. 1981. The effects of water temperature on the development of proliferative kidney disease in rainbow trout *Salmo gairdneri* Richardson. J. Fish. Dis. 4: 175-177.
30. Hoover, D.M., Hoerr, F.J., Carlton, W.W., Hinsman, E.J. & Ferguson, H.W. 1981. Enteric cryptosporidiosis in a Naso Tang (*Naso literatus*, Bloch & Schneider). J. Fish Dis. 4: 425-28.
31. Logan, E.F., O'Brien, J.J., Neil, S.P., Ferguson, H.W. and Ellis, W.A. 1981. Immunoglobulins in abomasal fluids of aborted and unaborted fetuses. Res. Vet. Sci. 31: 161-163.
32. Hilton, J.W. and Ferguson, H.W. 1982. The effect of excess vitamin D on calcium metabolism in rainbow trout. Proc. Can. Fed. Biol. Soc. No. 86.
33. Hilton, H.W. and Ferguson, H.W. 1982. Effect of excess Vitamin D3 on calcium metabolism in rainbow trout (*Salmo gairdneri* R.). J. Fish. Biol. 20: 87-91.
34. Kumaruguru, A.K., Beamish, F.W.H. and Ferguson, H.W. 1982. Direct and circulatory paths of Permethrin (NRDC-143) causing histopathological changes in the gills of rainbow trout, *Salmo gairdneri* Richardson. J. Fish. Biol. 20: 87-91.
35. Ferguson, H.W., Claxton, M.J., Moccia, R.D. & Wilkie, E.J. 1982. The quantitative clearance of bacteria from the bloodstream of rainbow trout (*S. gairdneri*). Vet. Path 19:687-699.
36. Ferguson, H.W., Moccia, R.D. and Down, N.E. 1982. An epizootic of diffuse glomerulonephritis in white perch (*Roccus americanus*) from a heavily polluted industrial basin in Lake Ontario. Vet. Path. 19:638-645.
37. Daoust, P.-Y. and Ferguson, H.W. 1983. Gill diseases of cultured salmonids in Ontario. Can. J. comp. Med. 47: 358-362.
38. Hathaway, S.C., Ellis, W.A., Little, T.W.A., Stevens, A.E. and Ferguson, H.W. 1983. *Leptospira interrogans* serovar *hardjo* in pigs: A new host-parasite relationship in the United Kingdom. Vet. Rec. 113: 153-154.
39. Daoust, P.-Y. and Ferguson, H.W. 1984. The pathology of chronic ammonia toxicity in rainbow trout. J. Fish. Dis. 7: 199-206.
40. Ferguson, H.W., Claxton, M.J. and Lesperance, J. 1984. The effect of temperature and starvation on the clearance of bacteria from the bloodstream of rainbow trout (*Salmo gairdneri*). J. Leuk. Biol. 35: 209-216.
41. Moccia, R.D., Hung, S.O., Slinger, S.J. and Ferguson, H.W. 1984. Effect of oxidized fish oil, Vitamin E and ethoxyquin on the histopathology and haematology of rainbow trout. J. Fish. Dis. 7: 269-282.
42. Smith, C.E., Morrison, J.K., Ramsey, H.W. and Ferguson, H.W. 1984. Proliferative Kidney Disease (PKD): First reported outbreak in North America. J. Fish Dis. 207-216.
43. Hicks, B.D., Ferguson, H.W. and Hilton, J.W. 1984. Influence of dietary selenium on the occurrence of nephrocalcinosis in rainbow trout *Salmo gairdneri*. J. Fish. Dis. 7: 379-389.

44. Ferguson, H.W., Lom, J. and Smith, I. 1984. Intra-axonal protozoa in the common shiner - ultrastructural features. *Vet. Path.* 22: 194-196.
45. Smith, I.R., B.D. Hicks and H.W. Ferguson. 1984. Carcinogenesis in wild fish populations. *Can. Tech. Rep. Fish. Aquat. Sci.* 1480: 129.
46. Ferguson, H.W. 1984. Renal portal phagocytosis of bacteria in rainbow trout (*Salmo gairdneri* Richardson): ultrastructural observations. *Can. J. Zool.* 62: 2505-2511.
47. Ferguson, H.W., Rosendal, S. and Groom, S. 1985. Necrotic gastritis in a Lake Tanganyika cichlid *Tropheus duboisi*. *Vet. Rec.* 116: 687-689.
48. Smith, I.R. and H.W. Ferguson. 1985. The assessment of a point source discharge of suspected mutagenic and carcinogenic contaminants: an epidemiological approach. *Proc. Ont. Min. Env. Tech. Transfer Conf.* 6: 285-332.
49. Daoust, P.-Y. and Ferguson, H.W. 1985. Nodular gill disease - a unique form of proliferative gill disease in rainbow trout (*Salmo gairdneri* R.). *J. Fish. Dis.* 8: 511-522.
50. Smith, I.R., V.E. Valli, G.R. Craig, D.A. Rokosh and H.W. Ferguson. 1985. Ethyl methanesulphonate genotoxicity in *Brachydanio rerio* embryos. *Can. Tech. Rep. Fish. Aquat. Sci.* 1368: 345-350.
51. Smith, I.R., H.W. Ferguson, D.A. Rokosh and M.A. Hayes. 1986. Papillomatosis and cholangiocellular neoplasia in fish from a Lake Ontario (Hamilton) harbour. *Proc. 7th meeting Soc. Env. Tox. and Chem. Toronto*, Nov. 2-5.
52. Ferguson, H.W., Roberts, R.J., Richards, R.H., Collins, R.O. and Rice, D.A. 1986. Severe degenerative cardiomyopathy associated with pancreas disease in Atlantic salmon, *Salmo salar* L. *J. Fish Dis.* 9: 95-98.
53. Smith, I.R., V.E. Valli, D.A. Rokosh & H.W. Ferguson. 1986. Acute and delayed effects of the mutagen ethyl methanesulphonate on *Brachydanio rerio*. *Can. Tech. Rep. Fish. Aquat. Sci.* 1430: 103.
54. Goldes, S., H.W. Ferguson, P.-Y. Daoust and R.D. Moccia. 1986. Phagocytosis of kaolin by fish gills. *J. Fish. Dis.* 9: 147-151.
55. Smith, I.R., H.W. Ferguson, D.A. Rokosh and M.A. Hayes. 1986. Papillomatosis and cholangiocellular neoplasia in fish from Hamilton Harbour, Lake Ontario. *Can. Tech. Rep. Fish. Aquat. Sci.* 1575: 108.
56. Ferguson, H.W., D.A. Rice and J.K. Lynas. 1986. Clinical pathology of myodegeneration ("pancreas disease") in Atlantic salmon (*Salmo salar*). *Vet. Rec.* 119: 297-299.
57. Daoust, P.-Y. and H.W. Ferguson. 1986. Potential for recovery in nodular gill disease of rainbow trout *Salmo gairdneri* Richardson. *J. Fish. Dis.* 9: 313-318.
58. Zenker, W.G.E., H.W. Ferguson, I.K. Barker and B. Woodward. 1986. Epithelial and pillar cell replacement in gills of juvenile trout *Salmo gairdneri* Richardson. *Comp. Biochem. Physiol.* 86A: 423-428.

59. Ferguson, H.W., B.D. Hicks, D.H. Lynn, V.E. Ostland and J. Bailey. 1987. Cranial ulceration in Atlantic salmon (*Salmo salar* L.) associated with *Tetrahymena* sp. Dis. Aquatic Orgs. 2: 191-195.
60. Ostland, V.E., H.W. Ferguson, R.D. Armstrong, A. Asselin, and R. Hall. 1987. Case report: Granulomatous peritonitis in fish associated with *Fusarium solani*. Vet. Rec. 121: 595-596.
61. Hayes, M.A., I.R. Smith, and H.W. Ferguson. 1987. Pathogenesis of neoplastic diseases afflicting feral fish. Proc. Ontario Ministry of the Environment Technology Transfer Conference, Nov.30 -Dec.1.
62. Ostland, V. and H.W. Ferguson. 1987. Diseases common to both salmonids and non-salmonids. Proc. 4th annual meeting Aqua. Assoc. Can., Quebec.
63. Lall, S.P., G. Olivier, J.A. Hines, and H.W. Ferguson. 1987. The role of vitamin E in Atlantic salmon (*Salmo salar*) nutrition and immune response. Proc. Int. Symp. on Feeding and Nutrition in Fish, Bergen, Norway.
64. Goldes, S.A., H.W. Ferguson, R.D. Moccia, and P.-Y. Daoust. 1988. Histological effects of the inert suspended clay kaolin on the gills of juvenile rainbow trout, *Salmo gairdneri* Richardson. J. Fish Dis. 11: 23-33.
65. Kocal, T., B.A. Quinn, I.R. Smith, H.W. Ferguson and M.A. Hayes. 1988. Use of trout serum to prepare primary attached monolayer cultures of hepatocytes from rainbow trout. In Vitro Cell Dev. Biol. 24: 304-308.
66. Kocal, T.E., T.L. Crane, B.A. Quinn, H.W. Ferguson, and M.A. Hayes. 1988. Degradation of extracellular thymidine by cultured hepatocytes from rainbow trout (*Salmo gairdneri*). Comp. Biochem. Physiol. 91B: 557-561.
67. Ferguson, H.W., T. Poppe and D. Speare. 1988. Severe heart disease in Norwegian Atlantic salmon. Am. Fish. Soc. Fish Health Section, Proc. annual meeting Vancouver, July.
68. Speare, D.J., H.W. Ferguson, and J. Brackett. 1988. Gill disease associated with a combined diatom and microsporidian infection of coho smolts in British Columbia. Am. Fish. Soc. Fish Health Section, Proc. annual meeting, Vancouver, July.
69. Ostland, V.E., H.W. Ferguson, R. Stevenson, J. Daly. 1988. Visceral necrosis of goldfish - a new bacterial disease. Am. Fish. Soc. Fish Health Section Proc. annual meeting, Vancouver, July.
70. Lall, S.P., G. Olivier, J.A. Hines, and H.W. Ferguson. 1988. The role of vitamin E in nutrition and immune response of Atlantic salmon (*Salmo salar*). Proc. 11th Atlantic Regional Fish Health Workshop. In Bull. Aquacult. Assoc. Can., 88-2:76-78.
71. Smith, I.R., B.A. Zajdlik, H.W. Ferguson, and M.A. Hayes. 1988. Regression and development of skin papillomas affecting white suckers (*Catostomus commersoni*) from polluted areas in Lake Ontario. Can. Tech. Rep. Fish. Aquat. Sci. 1607:177.

72. Smith, I.R., B.A. Zajdlik, H.W. Ferguson and M.A. Hayes. 1988. Alterations in serum chemistry in rainbow trout (*Salmo gairdneri*) with liver degeneration after partial hepatectomy or treatment with carbon tetrachloride or alphanaphthylisocyanate. Can. Tech. Rep. Fish. Aquat. Sci. 1607:136.
73. Kirby, G.M., I.R. Smith, C. Thorn, H.W. Ferguson and M. A. Hayes. 1988. Potential role of polycyclic aromatic hydrocarbons in the development of tumors in fish from polluted sites in Lake Ontario. Proc. Tech. Transfer Conf., Ontario Ministry of the Environment, Ontario.
74. Smith, I.R., K.W. Baker, M.A. Hayes, and H.W. Ferguson. 1989. Ultrastructure of malpighian and inflammatory cells in epidermal papillomas of white suckers (*Catostomus commersoni*). Dis. Aq. Orgs. 6: 17-26.
75. Armstrong, R.D., T.P.T. Evelyn, S.W. Martin, W. Dorward, and H.W. Ferguson. 1989. Erythromycin levels within eggs and alevins derived from spawning broodstock chinook salmon (*Oncorhynchus tshawytscha*) injected with the drug. Dis. Aquat. Orgs. 6: 33-36.
76. Speare, D. and H.W. Ferguson. 1989. Fixation artifacts in rainbow trout (*Salmo gairdneri*) gills: a morphometric evaluation. Can. J. Fish. Aquat. Sci. 46:780-785.
77. Ferguson, H.W., V.E. Ostland, R. Stevenson, and J. Daly. 1989. Visceral necrosis of goldfish - a new bacterial disease. J. Fish Dis. 12: 249-256.
78. Smith, I.R., H.W. Ferguson, and M.A. Hayes. 1989. Histopathology and prevalence of epidermal papillomas epidemic in brown bullhead, *Ictalurus nebulosus* (Leseur), and white sucker, *Catostomus commersoni* (Lacepede), populations from Ontario, Canada. J. Fish Dis. 12: 373-388.
79. Speare, D.J., J. Brackett, and H.W. Ferguson. 1989. Sequential pathology of the gills of Coho salmon with a combined diatom and microsporidian gill infection. Can. Vet. J. 30: 571-575.
80. Ostland, V.E., Stevenson, R. and H.W. Ferguson. 1989. Case report: bacterial gill disease in goldfish *Carassias auratus*. Dis. Aquat. Orgs. 6:179-184.
81. Byrne, P., D. Speare, and H.W. Ferguson. 1989. Effects of a cationic detergent on the gills and blood chemistry of rainbow trout *Salmo gairdneri*. Dis. Aquat. Orgs. 6: 185-196.
82. Speare, D.J. and H.W. Ferguson. 1989. Clinical features of bacterial gill disease of salmonids in Ontario. Can. Vet. J. 30:882-887.
83. Kirby, G.M., I.R. Smith, J.R. Bend, H.W. Ferguson and M.A. Hayes. 1989. Hepatic metabolism of benzo(a)pyrene in white suckers (*Catostomus commersoni*) from polluted sites in the Great Lakes: Role of glutathione-S-transferase. Proceedings of Technology Transfer Conference, Ministry of Environment, Toronto, Ontario 311-320.
84. Black, W.D. and H.W. Ferguson. 1989. Pharmacokinetic study of oxytetracycline in rainbow trout. 70th conf. Res. Work. in Animal Sci., Chicago, Michigan.
85. Armstrong, R.D. and H.W. Ferguson. 1990. Systemic viral disease of the chromide cichlid, *Etroplus maculatus* Bloch. Dis. Aquat. Orgs. 7:155-157.

86. Armstrong, R., S.W. Martin, T.P.T. Evelyn, B.D. Hicks, W.D. Dorward, and H.W. Ferguson. 1990. A field evaluation of an IFAT-based broodstock screening test designed to control the vertical transmission of *Renibacterium salmoninarum*. *Can. J. Vet. Res.* 53: 385-389.
87. Hayes, M.A., I.R. Smith, T. Crane, T.H. Rushmore, T.E. Kocal, & H.W. Ferguson. 1990. Pathogenesis of skin and liver neoplasms in white suckers (*Catostomus commersoni*) from polluted areas in Lake Ontario. In: *Science of the Total Environment*, 94:105-123. Special Issue of "Chemical Contaminants and Fish Tumors" ed. C. Metcalfe, Elsevier, Amsterdam.
88. Ferguson, H.W., T. Poppe, and D.J. Speare. 1990. Cardiomyopathy syndrome in farmed Norwegian salmon *Salmo salar*. *Dis. Aquat. Orgs.* 8:225-231.
89. Ostland, V.E., H.W. Ferguson, J. Prescott, R. Stevenson, and I.K. Barker. 1990. Bacterial gill disease of salmonids: relationship between the severity of gill lesions and bacterial recovery. *Dis. Aquat. Orgs.* 9:5-14.
90. Kirby, G.M., Stalker, M.J., Hendricks J., Metcalf, C., Ferguson, H.W., and Hayes, M.A. 1990. Glutathione-S-transferase expression in hepatic neoplasms induced by aflatoxin B1 and DMBA in rainbow trout. *The Toxicologist* 10:581.
91. Kirby, G.M., Stalker, M.J., Smith, I.R., Ferguson, H.W., and Hayes, M.A. 1990. Involvement of bile duct disease and loss of resistance to chemical carcinogens in the pathogenesis of liver neoplasms in benthic fish from Lake Ontario. *International Symposium on Aquatic Ecosystem Health, Waterloo, Ontario, July, 1990.*
92. Stalker, M.J., Kirby, G.M., Kocal, T.E., Ferguson, H.W., and Hayes, M.A. 1990. Loss of glutathione-S-transferases in pollution-associated liver neoplasms in white suckers (*Catostomus commersoni*) from Lake Ontario. *International Symposium on Aquatic Ecosystem Health, Waterloo, Ontario, July, 1990.*
93. Backman, S., B.P. Wilcock, J. Prescott, and H.W. Ferguson. 1990. Progressive panophthalmitis in chinook salmon (*Oncorhynchus tshawytscha*) in Ontario: a case report. *J. Fish Dis.* 13:345-353.
94. Kirby, G.M., M. Stalker, C. Metcalfe, T. Kocal, H.W. Ferguson and M.A. Hayes. 1990. Expression of immunoreactive glutathione S-transferases in hepatic neoplasms induced by aflatoxin B1 or dimethylbenzanthracene in rainbow trout (*Oncorhynchus mykiss*). *Carcinogenesis* 11:2255-2257.
95. Speare, D.J., H.W. Ferguson, J. Yager, T. Yamashiro, and F.W. Beamish. 1991. Ultrastructure of bacterial gill disease in rainbow trout. Part 1. Range of lesions in natural outbreaks of disease. *J. Fish Dis.* 14:1-20.
96. Speare, D.J., H.W. Ferguson, J. Yager, T. Yamashiro, and F.W. Beamish. 1991. Ultrastructure of bacterial gill disease in rainbow trout. Part 2. Sequential development. *J. Fish Dis.* 14:21-32.
97. Ostland, V.E. and Ferguson, H.W. Experimental production of bacterial gill disease among salmonids. *Proc Eastern Fish Dis Mting, Kearneysville, W. Virginia, June 1991.*

98. Servos, M., Carey, J., Ferguson, M., Van Der Kraak, G., Parrott, J., Gorman, K., Cowling, R., and Ferguson, H.W. Impact of a modern bleached kraft mill on white sucker populations in the Spanish River. SETAC 12th Annual Meeting, Nov 3-7, 1991.
99. Hayes, M.A., Kirby, G.M., Byrne, P.J., Quinn, B.A., Stalker, M.J., and Ferguson, H.W. 1991. Multifactorial causes of pollution-associated neoplasms in fish in Lake Ontario. Proceedings Technology Transfer Conference, Ontario Ministry of Environment, Toronto.
100. Byrne, P., Ferguson, H.W., Ostland, V.E. and Lumsden, J.S. 1991. Clinical chemistry of bacterial gill disease in brook trout *Salvelinus fontinalis*. Dis. Aquat. Orgs. 10:1-6.
101. Ferguson, H.W., Ostland, V.E., Byrne, P., and Lumsden, J.S. 1991. Experimental production of bacterial gill disease in trout by horizontal transmission and by bath challenge. J. Aquat. An. Health 3:118-123.
102. Speare, D.J., Ostland, V.E., and Ferguson, H.W. 1991. Meningoencephalitis associated with bacterial kidney disease in salmonids. Can. Vet. J. 32:117
103. Choo, P-S, Smith, T.K., Cho, C.Y. and H.W. Ferguson. 1991. Dietary excesses of leucine influence growth and body composition of rainbow trout. J. Nutrition 121:1932-1939.
104. Black, W., H.W. Ferguson, H.W., J. Claxton, and P. Byrne. 1991. Pharmacokinetic study of oxytetracycline in trout following IV bolus administration. Vet. Pharm & Therap.14:351-358.
105. O'Brien, P.J., Shen, H., McCutcheon, L.J., O'Grady, M., Byrne, P.J., Mirsalimi, M.S., Julian, R.J., Sargeant, J.M., Tremblay, R.M., Blackwell, T.E. and Ferguson, H.W. 1992. Rapid, simple and sensitive microassay for skeletal and cardiac muscle myoglobin and hemoglobin: use in various animals indicates functional role of myohemocytes. Molecular and Cellular Biochemistry 112:45-52.
106. Ferguson, H.W., Morrison, D., Ostland, V.E., Lumsden, J., and Byrne, P. 1992. Responses of mucus-producing cells in gill disease of rainbow trout (*Oncorhynchus mykiss*). J. Comp. Pathol. 106:255-265.
107. Speare, D.J., Ostland, V.E. and Ferguson, H.W. 1993. Pathology associated with meningoencephalitis during bacterial kidney disease of salmonids. Res. Vet. Sci. 54:25-31.
108. O'Brien, G.M., Ostland, V.E. and Ferguson, H.W. 1993. *Spiroplasma*-associated necrotic enteritis in angelfish (*Pterophyllum scalare*): a case report. Can. Vet J. 34:301-303.
109. Smith, I.R., Kirby, G.M., Ferguson, H.W. & M.A. Hayes. 1993. Benzo(a)pyrene metabolism and excretion in white suckers with chronic liver diseases. Env. Tox. & Chem. 12:897-901.
110. Lumsden, J.S., Ostland, V.O., Byrne, P.J. and Ferguson, H.W. 1993. Detection of a distinct gill surface antibody response following horizontal infection and bath challenge of brook trout (*Salvelinus fontinalis*) with *Flavobacterium branchiophilum*, the causative agent of bacterial gill disease. Dis. Aquat. Orgs. 16:21-27.

111. Lumsden, J.S, V.E. Ostland, D.D. MacPhee and H.W. Ferguson. 1993. Demonstration of protection of rainbow trout (*Oncorhynchus mykiss*) from experimentally induced bacterial gill disease caused by *Flavobacterium branchiophilum*. Proc. Int. Wild. Dis. Assoc., Guelph, Ontario, Canada.
112. Lumsden, J.S., Wright, P., Derksen, J., Byrne, P.J., and Ferguson, H.W. 1993. Paralysis in farmed Arctic charr (*Salvelinus alpinus* L) associated with ammonia toxicity: a case report. Vet. Rec. 133:422-423.
113. Lumsden, J.S., Ferguson, H.W., Ostland, V.E., Byrne, P.J. 1994. Detection of a layer of mucus covering lamellae of unstressed rainbow trout. Cell and Tissue Research, 275:187-193.
114. Lumsden, J.S. and H.W. Ferguson. 1994. Isolation and partial characterization of rainbow trout (*Oncorhynchus mykiss*) gill mucin. Fish Physiology and Biochemistry, 12:387-398.
115. Ostland, V.E., Lumsden, J.S., MacPhee, D.D., and H.W. Ferguson. 1994. Characteristics of *Flavobacterium branchiophilum* the cause of salmonid bacterial gill disease in Ontario, Canada. J. Aquat. An. Health. 6:13-26.
116. Ferguson, H.W., J.S. Lumsden, D.D. MacPhee, and V.E. Ostland. 1994. Gill diseases of fish in Ontario farms. OMAF special publication.
117. Lumsden, J.S., Ostland, V.E., Byrne, P.J. and Ferguson, H.W. Isolation of a soluble gill-associated immunoglobulin-like molecule from rainbow trout (*Oncorhynchus mykiss*). Proc. Am. Fish Soc. Fish Health Meeting, Seattle, 1994.
118. Lumsden, J.S., Ostland, V.E., MacPhee, D.D. & Ferguson, H.W. Production of gill-associated and serum antibody by rainbow trout following graded bath immersions with acetone-killed *Flavobacterium branchiophilum*, and the relationship to protection from experimental challenge. Proc Am Fish Soc Fish Health Mt'ng, Seattle, 1994
119. Ferguson, H.W., J.A. Morales, and V.E. Ostland. 1994. Streptococcosis in aquarium fish. Dis. Aquat. Orgs. 19:1-6.
120. Lumsden, J.S., Ostland, V.E., MacPhee, D.D., Derksen, J., and Ferguson, H.W. 1994. Protection of rainbow trout (*Oncorhynchus mykiss*) from experimentally induced bacterial gill disease caused by *Flavobacterium branchiophilum*. J. Aquat. An. Health. 6:292-302.
121. Ferguson, H.W., Ostland, V.E., MacPhee, D.D., Lumsden, J.S., Byrne, P.J., Speare, D.J. 1995. "No mucus skin disease" of rainbow trout (*Oncorhynchus mykiss*): a case report. J. Fish Diseases 18:49-57.
122. MacPhee, D.D., Ostland, V.E., Lumsden, J.S. and H.W. Ferguson. 1995. Development of an enzyme-linked immunosorbent assay (ELISA) to estimate the quantity of *Flavobacterium branchiophilum* on the gills of rainbow trout (*Oncorhynchus mykiss*). Dis Aquat. Orgs. 21:13-23.
123. MacPhee, D.D., Ostland, V.E., Lumsden, J.S., Derksen, J., and H.W. Ferguson. 1995. Influence of feeding on the development of bacterial gill disease in rainbow trout (*Oncorhynchus mykiss*). Dis. Aquat. Orgs. 21:163-170.

124. Lumsden, J.S., Ostland, V.E., MacPhee, D.D. & Ferguson, H.W. 1995. Production of gill-associated and serum antibody by rainbow trout (*Oncorhynchus mykiss*) following graded bath immersions with acetone-killed *Flavobacterium branchiophilum* and the relationship to protection from experimental challenge. *Fish & Shellfish Immunol.* 5:151-165.
125. Ostland, V.E., Byrne, P.J., Speare, D.J., Thorburn M.A., Cook A., Morrison, D. and H.W. Ferguson. 1995. Comparison of formaldehyde and chloramine-T for control of a mixed gill infection (bacterial gill disease and ichthyobodiasis) in rainbow trout. *J. Aquat. An. Health.* 7:118-123.
126. Ostland, V.E., MacPhee, D.D., Lumsden, J.S. & Ferguson, H.W. 1995. Virulence of *Flavobacterium branchiophilum* in experimentally infected salmonids. *J. Fish Dis.* 18:249-262.
127. Taksdal, T., Poppe, T.T., Sivertsen, T., & Ferguson, H.W. 1995. Low levels of vitamin E in plasma from Atlantic salmon (*Salmo salar* L.) with acute infectious pancreatic necrosis (IPN). *Dis. Aquat. Orgs.* 22:33-37.
128. Byrne, P.J. Ostland, V.E., Lumsden, J.S., MacPhee, D.D and Ferguson, H.W. 1995. Blood chemistry and acid-base balance in rainbow trout *Onchorynchus mykiss* with experimentally-induced acute bacterial gill disease. *Fish Physiol. Biochem.* 14:509-518.
129. Lumsden, J.S., Ostland, V.E., & Ferguson, H.W. 1996. Necrotic myositis in rainbow trout: a new disease of cage-reared fish associated with *Flexibacter psychrophilus*. *J. Fish Dis.* 19:113-119.
130. Ostland, V.E., Lumsden, J.S., MacPhee, D.D., Derksen, J.A., & Ferguson, H.W. 1997. Inhibition of attachment of *Flavobacterium branchiophilum* to the gills of rainbow trout. *J. Fish Dis.* 20:109-117.
131. Ostland, V.E, McGrogan, D.G. and H.W. Ferguson. 1997. Cephalic osteochondritis and necrotic scleritis in intensively reared salmonids associated with *Flexibacter psychrophilus*. *J. Fish Dis.* 20:443-452.
132. Derksen, J.A., Ostland, V.E., and H.W. Ferguson. 1998. Particle clearance from the gills of rainbow trout *Oncorhynchus mykiss*. *J. Comparative Pathology* 118:245-256.
133. McGrogan, D., Ostland, V.E. and H.W. Ferguson. 1998. Systemic iridovirus disease in tilapia. *J. Fish Diseases* 21:149-52.
134. Lumsden, J.S., Ostland, V.E and H.W. Ferguson. 1998. Use of hydrogen peroxide to treat experimentally-produced bacterial gill disease in rainbow trout (*Oncorhynchus mykiss*). *J. Aquatic Animal Health,* 10:230-240.
135. Byrne, P.B., Ostland, V.E., Johnson, G., MacPhee, D.D. and H.W. Ferguson. 1998. Haemorrhagic kidney syndrome, a new disease of sea-caged Atlantic salmon (*Salmo salar* L). *J. Fish Diseases* 21:81-92.
136. Hoover, G.J., El-Mowafi, A., Simko, E., Kocal, T., Ferguson, H.W. and M.A. Hayes 1998. Plasma proteins of rainbow trout (*Oncorhynchus mykiss*) isolated by binding to lipopolysaccharide from *A. salmonicida*. *Comp. Biochem. Physiol. B* 120:559-69.

137. Hoover, G.J., Kocal, T.E., Lamarre, J., Ferguson, H.W. and M.A. Hayes. 1998. Lipopolysaccharide-binding lectins and pentraxins in plasma of salmonids genetically resistant to *Aeromonas salmonicida*. *The FASEB Journal Abstracts*, Abstract # 4678.
138. Brown, L.L., MacKinnon, A.M. & H.W. Ferguson. 1998. Infectious salmon anaemia virus: pathology and transmission in fresh and salt water. Proc. Third Int. Symp. On Aquatic Animal Health, Baltimore, USA.
139. Derksen, J.A., Ostland, V.E. & H.W. Ferguson. 1998. Effects of hydrogen peroxide on clearance of formalin-killed *Flavobacterium branchiophilum* from the gills of rainbow trout *Oncorhynchus mykiss* Walbaum. *J. Fish Diseases* 22:1-9.
140. Simko, E., A. El-Mowafi, W.J. Bettger, V.E. Ostland, H.W. Ferguson, & Hayes, M.A. 1999. Alterations in iron, zinc and major plasma proteins of rainbow trout and brook trout with sterile peritonitis induced by oil-adjuvanted multivalent bacterin vaccination. *J. Fish Diseases* 22:81-90.
141. Simko, E., Kocal, T.E., Quinn, B.A., Ostland, V.E., Ferguson, H.W., and Hayes, M.A. 1999. Influences of *Aeromonas salmonicida* lipopolysaccharide, prednisolone, and water temperature on plasma protein composition in salmonids. *J. Fish Diseases* 22: 91-100.
142. Ostland, V.E., LaTrace, C., Morrison, D. & H.W. Ferguson. 1999. *Flexibacter maritimus* associated with a filamentous bacterial stomatitis in netpen-reared Atlantic salmon smolts in British Columbia. *J. Aq. Anim. Health* 11:35-44.
143. Ostland, V.E., Byrne, P.J., Lumsden, J.S., MacPhee, D.D., Derksen, J.A., Haulena, M., Skar, K., Mhyr, E., & H.W. Ferguson. 1999. Atypical bacterial gill disease: a new form of bacterial gill disease affecting intensively reared salmonids. *J. Fish Diseases* 22: 351-358
144. Lowartz, S.M., Holmberg, D.L., Ferguson, H.W., and Beamish, F.W.H. 1999. Healing of abdominal incisions in sea lamprey larvae: a comparison of three wound closure techniques. *J. Fish Biol.* 54:616-626.
145. Simko, E., Brown, L., Byrne, P.J., McKinnon, M-A., Ostland, V.E. & H.W. Ferguson. 2000. Experimental infection of Atlantic salmon (*Salmo salar* L.) with infectious salmon anaemia virus: a histopathological study. *J. Fish Diseases* 23:27-32.
146. Valheim, M., Hoyel, S., Hastein, T., Myhr, E., Speilberg, L. and Ferguson, H.W. (2000). Varracalbmi: a new bacterial panophthalmitis in farmed Atlantic salmon (*Salmo salar* L.). *J. Fish Diseases* 23, 61-70.
147. Ferguson, H.W., St John, V.S., Roach, C.J., Willoughby, S., Parker, C. & Ryan, R. (2000). Caribbean reef fish mortality associated with *Streptococcus iniae*. *Vet Rec.* 147: 662-664.
148. Ostland, V.E., Byrne, P.J., Hoover, G. & Ferguson, H.W. (2000). Necrotic myositis of rainbow trout: proteolytic characteristics of a crude extracellular preparation from *Flavobacterium psychrophilum*. *J. Fish Diseases*, 23:329-336.

149. Starkey, W.G., Ireland, J.H., Muir, K.F., Shinn, A.P., Richards, R.H. & Ferguson, H.W. (2000). Isolation of nodavirus from Scottish farmed halibut, *Hippoglossus hippoglossus* (L). *J. Fish Diseases*, 23: 419-422.
150. R.R. Cusack, C.E. Carver, H.W. Ferguson, A.D. Cembella, M.A. Quilliam, J. Jellett Mortality of Farmed Atlantic Salmon (*Salmo salar* L) Associated with *Alexandrium tamarense*, the Marine Dinoflagellate Responsible for Paralytic Shellfish Poisoning. Canadian Aquaculture Association meeting, May 2001.
152. Starkey, W., Muir, F., Ireland, J., Jenkins, M., Richards, R.H., & Ferguson, H.W. Virological and molecular diagnostic procedures for piscine nodaviruses. EU Workshop on viral diseases of fish in Mediterranean aquaculture, and quality assurance in fish pathology laboratories. IZSV, Padova, Italy, June 11th-14th, 2001
153. Falk, K., Johansen, M.B., Ferguson, H.W., V. Aspehaug, B. Krossøy, E. Biering, T. Poppe. Immunohistochemical detection of infectious salmon anaemia virus (ISAV). Abstract presented at EAAP Conference, Dublin, September 2001.
154. Starkey, W.G., Ireland, J.H., Muir, K.F., Jenkins, M.E., Richards, R.H. and Ferguson, H.W. Nodavirus infection of cod, halibut, and Dover sole in the United Kingdom. Abstract presented at EAAP Conference, Dublin, September 2001.
155. Simko, E., K.Falk, T.T.Poppe & H.W.Ferguson. 2001. Plasma protein changes in Atlantic salmon, *Salmo salar* L., with infectious salmon anaemia. *J. Fish Diseases*, 24, 293-298.
156. Ferguson, H.W., Turnbull, J.F., Shinn, A., Thompson, K., Dung, T.T., & Crumlish, M. 2001. Bacillary necrosis in farmed *Pangasius* from the Mekong delta. *J. Fish Dis.* 24: 509-514
157. Starkey, W.G., J.H. Ireland, K.F. Muir, M.E. Jenkins, W. Roy, R.H. Richards & Ferguson, H.W. 2001. Nodavirus infection of farmed cod and Dover sole in the United Kingdom. *Veterinary Record*, 149, 179-181.
158. Crumlish, M., T.T. Dung, J.F. Turnbull, N.T.N. Ngoc & Ferguson, H.W. 2002. Identification of *Edwardsiella ictaluri* from diseased *Pangasius hypophthalmus* cultured in Mekong delta Vietnam. *J. Fish diseases*, 25: 733-736.
159. Stone, J., W.J. Roy, I.H. Sutherland, H. W. Ferguson, C. Sommerville, R. Endris. (2002). Safety and efficacy of emamectin benzoate administered in feed to Atlantic salmon, *Salmo salar* L., smolts in freshwater, as a preventative treatment against infestations of sea lice, *Lepeophtheirus salmonis* (Krøyer). *Aquaculture*, 210: 21-34
160. Gibson-Kueh, S., G. H. Ngoh-Lim, P. Netto, S. F. Chang, L. L. Ho, Q. W. Qin, F. H. C. Chua, A. Adams, M. L. Ng & Ferguson, H.W. Diagnosis of systemic iridoviral disease in fish. Abstract for AAAP, Australia, Nov. 2002.
161. Crumlish, M., Dung, T.T., Turnbull J.F., Ngoc, N.T.N., and Ferguson, H.W. Isolation and Identification of *Edwardsiella ictaluri* from diseased *Pangasius hypophthalmus* (Sauvage) cultured in Vietnam. Abstract for AAAP, Australia, November 2002.

162. Steiropoulos, N.A., Yuksel, S.A., Thompson, K.D., Adams, A., & Ferguson, H.W. 2002. Detection of *Rickettsia*-like organisms (RLOs) in European sea bass (*Dicentrarchus labrax* L.) by immunohistochemistry. *Bull. Eur. Ass. Fish Pathol.*: 22, 338
163. Gibson-Kueh, M. L. Ng, G. H. Ngoh-Lim, P. Netto, S. F., Chang, F. H. C. Chua, L. L. Ho, & H.W. Ferguson. 2003. Pathology of systemic iridovirus infections in fish. *J. Comp. Path.* 129, 111-119.
164. Foyle, L., T. Turnbull, A. Ellis, A. Barnes, A. Adams, and H.W. Ferguson. 2003. Pasteurellosis in Atlantic salmon, *Salmo salar* L: Immunohistochemistry of the naturally-occurring disease. *J. Fish Diseases*, 26: 373-376.
165. Ferguson, H.W., Millar, S.D and Kibenge, F.S.B. 2003. Reovirus-like hepatitis in farmed halibut (*Hippoglossus hippoglossus*). *Veterinary Record*: 153, 86-87.
166. Ostland, V.E., Hedrick, R., Ferguson, H.W., Westerman, M., Stannard, J., Carlberg, J. and Van Olst, J. A piscirickettsia-like organism associated with mortality in intensively-reared hybrid striped bass. Annual Meeting AFS/FHS, July 13-17, Seattle, Washington, 2003.
167. Ferguson, H.W., MacPhee, D.D., Hawkins, L., & Bouchard, D. 2004. Choroiditis and cataract in Atlantic salmon (*Salmo salar* L) recovering from sub-zero water temperatures. *Veterinary Record* **155**: 333-334.
168. Poynton, S.L., Fard, M. R. S., Jenkins, J., & Ferguson, H.W. 2004. Ultrastructure of pathogenic diplomonad flagellates from fish: characterization of *Spironucleus salmonis* n. comb. from Northern Irish rainbow trout *Oncorhynchus mykiss*, and a diagnostic guide for recognition of species. *Diseases of Aquatic Organisms* **60**:49-64
169. Ferguson, H.W., Collins, R.O., Moore, M., Cole, M., & MacPhee, D.D. 2004. *Pseudomonas anguilliseptica* infection in farmed cod (*Gadus morhua*). *J Fish Diseases* **27**:249-253.
170. Gibson-Kueh, S., Crumlish, M. & Ferguson, H.W. 2004. A novel “skinny pot-belly disease” in Asian seabass fry, *Lates calcarifer* Bloch. *J. Fish Diseases* **27**, 731-735.
171. Bailey, J., Turnbull, J., & Ferguson, H.W. 2005. The pathology of chronic erosive dermatopathy in Murray cod (*Maccullochella peelii peelii*). *J. Fish Diseases* **28**: 3-12.
172. McCarthy, U., Steiropoulos, N.A., Thopson, K.D., Adams, A., Ellis, A.E, & Ferguson, H.W. 2005. Confirmation of *Piscirickettsia salmonis* as a pathogen in European seabass (*Dicentrarchus labrax*) and phylogenetic comparison with salmonid strains. *Diseases of Aquatic Organisms* **64**:107-119.
173. Ferguson, H.W., Kongtorp, R.T., Taksdal, T., Graham, D. & Falk, K. 2005. An outbreak of disease resembling heart and skeletal muscle inflammation (HSMI) in Scottish farmed salmon (*Salmo salar* L) with observations on myocardial regeneration. *J. Fish Diseases* **2**: 1-5.
174. Pourahmad, F., Thompson, K.D., Adams, A., Richards, R.H. and Ferguson, H.W. Experimental mycobacteriosis in Atlantic salmon *Salmo salar* and rainbow trout *Oncorhynchus mykiss*. 2005 EAAP meeting in Copenhagen.

175. Morris, D., Ferguson, H.W. & Adams, A. (2005) Severe, chronic PKD induced in rainbow trout *Oncorhynchus mykiss* held at a constant 18<sup>0</sup>C. *Diseases Aquatic Organisms* 66: 221-226.
176. Monette, S., Dallaire, A.D., Mingelbier, M., Groman, D., Uhland, C., Richard, J-P., Paillard, G., Johannson, L., Chivers, D.P., Ferguson, H.W., Leighton, F.A. and Simko, E. 2006. Massive mortality of common carp (*Cyprinus carpio carpio*) in the Saint Lawrence. *Vet Path*, 43: 302-310.
177. Ferguson, H.W., Girons, A., Rizgalla, G., LaPatra, S., Branson, E., McKenzie, K., Davies, M., Collins, R.O., Diab, A., & Crumlish, M. 2006. Strawberry disease in cage-reared rainbow trout (*Oncorhynchus mykiss*) in Scotland: pathological description and association with *Flavobacterium psychrophilum*. *Veterinary Record* 158:630-631
178. Crumlish, M., Diab, A.M., George, S. and Ferguson, H.W. 2007. Detection of the bacterium *Flavobacterium psychrophilum* from a natural infection in rainbow trout (*Oncorhynchus mykiss*, Walbaum) using formalin-fixed, wax embedded fish tissues. *Journal of Fish Diseases* 30:37-41.
179. Ostland, V.E., Stannard, J.A., Creek, J.J., Hedrick, R.P., Ferguson, H.W., Carlberg, J.M. and Westerman, M.E. 2006. Aquatic *Francisella*-like Bacterium Associated With Mortality of Intensively-Cultured Hybrid Striped Bass (*Morone chrysops* x *M. saxatilis*). *Diseases Aquatic Organisms* 72:135-145.
180. Costa, J.Z., J.B. Bron, K.D. Thompson, A. Adams, I. R. Bricknel & Ferguson, H.W. Apoptosis detection during a salmon alphavirus (SAV) *in vivo* study. EAAP, Sept. 2007.
181. Maira, C., M. Crumlish, H.W. Ferguson & N. Anja. Experimental reproduction of *Francisella* spp. infections in tilapia. EAAP, Sept. 2007.
182. Balboa, S., Ferguson, H.W. & Romalde, J.L. 2007 Phenotypic, Serological and Genetic Characterization of *Pseudomonas anguilliseptica* Strains isolated from cod (*Gadus morhua*) in Northern Europe. *J. Fish Diseases* 30:657-664.
183. Migaud, H., Cowan, M., Taylor, J. & Ferguson, H.W. 2007. The effect of spectral composition and light intensity on melatonin, stress and retinal damage in post-smolt Atlantic salmon *Salmo salar*. *Aquaculture* 270 390–404.
184. Stone, D. M, Ferguson, H. W., Tyson P. A., Savage J., Wood G. , Dodge M. J., Woolford G., Dixon P. F., Feist S.W. & Way, K. 2008. The First Report of Viral Haemorrhagic Septicaemia in Farmed Rainbow Trout *Oncorhynchus mykiss* in the United Kingdom. *J. Fish Diseases* 31: 775-784.
185. Lumsden, J.S., S. Russell, P. Huber, B. Wybourne, V.E. Ostland, M. Minamikawa & Ferguson, H.W. 2008. An immune-complex glomerulonephritis of Chinook salmon (*Oncorhynchus tshawytscha*). *J. Fish Diseases* 31:889-898.
186. Rey, A., Verján, N., Ferguson, H.W. & Iregui, C. 2009. Pathogenesis of *Aeromonas hydrophila* strain KJ99 infection and its extracellular products in two species of fish., *Veterinary Record* 164:493-499.

187. Del-Pozo, J., Crumlish, M., Turnbull, J. F. & Ferguson, H.W. A Retrospective Cross-sectional Study on "Candidatus arthromitus" associated with rainbow trout gastroenteritis (RTGE) in the UK Aquaculture. *In press, Aquaculture.*
188. Byrne, P.J., Ferguson, H.W. Rainbow trout with bacterial gill disease respond to vasoactive mediators to reveal a possible prostanoid-dependent mechanism. *In prep.*
189. Del-Pozo, J., Crumlish, M., Turnbull, J. F. & Ferguson, H.W. A Study of Gross, Histological and Blood Biochemical Changes in Rainbow Trout (*Oncorhynchus mykiss* W.) with Rainbow Trout Gastroenteritis (RTGE). *In press, J. Fish Diseases.*
190. Del-Pozo, J., Crumlish, M., Ferguson, H.W. & Turnbull, J. F. A prospective epidemiological study of "Candidatus arthromitus"-associated rainbow trout gastroenteritis (RTGE) in the UK. *Submitted, J. Fish Diseases.*
191. Del-Pozo, J., Crumlish, M., Turnbull, J. F. & Ferguson, H.W. The histopathology and ultrastructure of rainbow trout gastroenteritis (RTGE). *In press, Vet Pathology.*
192. Del-Pozo, J., Turnbull, J. F., Ferguson, H.W. & Crumlish, M. A comparative molecular study of the presence of segmented filamentous bacteria "Candidatus Arthromitus" in the digestive system of healthy rainbow trout *Oncorhynchus mykiss* (Walbaum) and those affected with rainbow trout gastroenteritis (RTGE). *In press, J. Fish Diseases.*
193. Ferguson, H.W., Delannoy, C.M.J., Hay, S., Nicolson, J., Sutherland, D. & Crumlish, M. Jellyfish as vectors of bacterial disease for farmed salmon (*Salmo salar*). *In press, J. Vet. Diagn. Invest, Vol. 22, Number 3, May 2010.*