

c.v. Peter S. Ross

Peter S. Ross is an environmental toxicologist based at the Institute of Ocean Sciences (Fisheries and Oceans Canada) in British Columbia, Canada. He has been carrying out research on environmental contaminants and their effects in marine mammals, fish, and their habitat for over 20 years. He holds Adjunct Professorships at Simon Fraser University and the University of Victoria. He obtained his PhD from the University of Utrecht in the Netherlands (1995), his MSc from Dalhousie University in Halifax, Nova Scotia (1990), and his BSc (Honours) from Trent University in Peterborough, Ontario (1985). He has published over 100 international scientific articles and book chapters. He has provided advice to conservation teams in different parts of the world on several endangered marine mammals, including the Mediterranean monk seal, the northern right whale, California sea otters, Galapagos sea lions, Indo-Pacific humpback dolphins, and NE Pacific killer whales. Dr Ross also engages First Nations communities on issues surrounding safe traditional seafoods, through consultations, collaborative research and outreach efforts.

Employment/affiliations

1999 to present: Research Scientist, Fisheries and Oceans Canada, Institute of Ocean Sciences, Sidney BC.

2004 to present: Associate Professor, School for Earth and Ocean Sciences, University of Victoria.

1999 to present: Adjunct Professor, School for Resource and Environmental Management, Simon Fraser University.

Education

1995 Ph.D., Faculty of Veterinary Sciences, University of Utrecht, Utrecht, The Netherlands.

1990 M.Sc., Biology, Dalhousie University, Halifax, Nova Scotia.

1985 B.Sc. (Honours), Biology, Trent University, Peterborough, Ontario.

Professional memberships

Society of Environmental Toxicology and Chemistry (1996 to present).

Society for Marine Mammalogy (1996 to present).

Centre for Earth and Ocean Research (2005 to present).

Awards

2005 *J.C. Stevenson Memorial Award* for outstanding young scientist in Canadian Fisheries and Aquatic Sciences Research.

2001 *Excellence in Science Communication Award*, International Society for Marine Mammalogy.

2000 *R.E. Foerster Award - Honourable mention* for published paper.

1998 *Best Paper*, Marine Environmental Quality (MEQ) session, North Pacific Marine Sciences Organization (PICES), Fairbanks, Alaska.

1996 *Student/postdoctoral award* for oral presentation at the Society of Toxicology (SOT) annual meeting in Anaheim, California, U.S.A.

1991	<i>Best Doctoral presentation:</i> 9th biennial Conference on the Biology of Marine Mammals, Chicago, U.S.A.
1990	<i>Natural Sciences and Engineering Research Council (NSERC) Postgraduate Scholarship for Ph.D.</i>
1990	<i>Commonwealth Scholarship</i> to the United Kingdom (declined).
1988	<i>Natural Sciences and Engineering Research Council (NSERC) Postgraduate Scholarship for M.Sc.</i>
1985	<i>Department of Biology Prize</i> (Trent University)
1984	<i>Trent University Scholarship</i>
1981	<i>Trent University Scholarship</i>

Work experience

June 1999-	<i>Research Scientist</i> , Institute of Ocean Sciences, Fisheries and Oceans Canada, Sidney BC. Research into the levels and patterns of environmental contaminants in marine mammals and effects of these on immune and endocrine systems. Working on the role of marine mammals as sentinels of ecosystem health and contamination in BC, Washington, the Arctic and elsewhere. Working with WHO, OECD and USEPA on integrating human and ecological risk assessments. Supervising graduate students, technicians and co-op students in lab and field studies.
May 1996-	<i>NSERC Visiting Fellow</i> , Institute of Ocean Sciences, Sidney, BC. Carried out laboratory and field research to assess levels and possible effects of anthropogenic chemicals on immune and endocrine systems of harbour seals and other marine mammals.
June 1999	
June 1993-	<i>Research Associate</i> , Seal Rehabilitation and Research Centre, Pieterburen, The Netherlands. Carried out scientific research related to harbour seal immunology, toxicology, virology, as well as conservation, policy and management issues in Canada, the Netherlands, Greece, Morocco and Mauritania.
April 1996	

Graduate students and Post-Doctoral Fellows

Simms, W.	MSc (2000)	University of Victoria (Biology): <i>supervisor</i>
Mos, L.	MSc (2002)	University of Wageningen (Toxicology): <i>supervisor</i>
Assunção, M.	MSc (2003)	University of Porto (Biology): <i>supervisor</i>
Miller, K.	MSc (2003)	UBC (Pharmaceutical Sciences): <i>supervisor</i>
Hoelzema, C.	MSc (2005)	University of Wageningen (NL): <i>thesis supervisor</i>
Morin, A.	MSc (2003)	Simon Fraser University (SREM): <i>committee member</i>
Kelly, B.	PhD (2006)	SFU (SREM): <i>committee member</i>
Tabuchi, M.	MSc (2006)	University of Victoria (Biochem / Microbio): <i>supervisor</i>
Condon, C.	MEM (2006)	SFU (SREM); <i>committee member</i>
Mos, L.	PhD (2007)	University of Victoria (Biology): <i>supervisor</i>
Van der Ploeg, M.	MSc (2007)	University of Groningen (NL): <i>thesis supervisor</i>
Natale, D.	MEM (2007)	SFU (SREM); <i>committee member</i>
Shrubsole, A.	MSc (2007)	Western College of Veterinary Medicine (SK); <i>co-supervisor</i>
Tierney, K.	PhD (2007)	Simon Fraser University (SREM): <i>co-supervisor</i>
Christensen, J.	PhD (2008)	University of Victoria (SEOS): <i>supervisor</i>
Lachmuth, C.	MSc (2009)	University of British Columbia; <i>committee member</i>
Leung, Walter	MET (2009)	Simon Fraser University; <i>co-supervisor</i>
Buckman, Andrea	(2007 to 2009)	NSERC Visiting Fellow
Loseto, Lisa	(2007 to 2010)	NSERC Post-Doctoral Fellow University of Victoria
Brewis, Molly	MET (2010)	SFU SREM, <i>co-supervisor</i>
Cullon, D.	PhD (2010)	University of Victoria (SEOS): <i>supervisor</i>
Harris, Kate	MSc (2010)	University of Victoria (SEOS); <i>supervisor</i>

Child, Tom	MSc (in progress)	University of Victoria (Biology): <i>co-supervisor</i>
Desforages, J-Pierre	MSc (in progress)	University of Victoria (SEOS); <i>co-supervisor</i>
Rear, Lisa	MET (in progress)	SFU (Biological Sciences); <i>co-supervisor</i>
Alava, Juan	PhD (in progress)	SFU (SREM); <i>co-supervisor</i>
Noel, Marie	PhD (in progress)	University of Victoria (SEOS); <i>supervisor</i>
Shelley, Leslie	PhD (in progress)	Simon Fraser University; <i>co-supervisor</i>
Dinn, Pam	MSc (in progress)	University of Victoria (SEOS); <i>committee member</i>
Frouin, Heloise	(in progress)	Post-Doctoral Fellow

Scientific articles:

Ross,P.S., Barlow,J., Jefferson,T.A., Hickie,B.E., Lee,T., MacFarquhar,C., Parsons,E.C.M., Riehl,K., Rose,N., Simpkins,M., Slooten,E., Tsai,J., Wang,J.Y., Wright,A., and Yang,S.-C. 2011. Ten guiding principles for the delineation of priority habitat for coastal cetaceans. *Marine Policy* **in press**.

Ross,P.S., Dungan,S.Z., Hung,S.K., Jefferson,T.A., MacFarquhar,C., Perrin,W.F., Riehl,K., Slooten,E., Wang,J.Y., White,B.N., Wursig,B., Yang,S.-C., and Reeves,R.R. 2010. Averting the Baiji syndrome: Characterising habitat for critically endangered dolphins in eastern Taiwan Strait. *Aquatic Conservation: Marine and Freshwater Ecosystems* **20**: 685-694.

Ross, P. S.; Couillard, C. M.; Ikonou, M. G.; Johannessen, S. C.; Lebeuf, M.; Macdonald, R. W.; Tomy, G. T. Large and growing environmental reservoirs of Deca-BDE present an emerging health risk for fish and marine mammals. *Mar. Pollut. Bull.* **2009**, *58*, 7-10.

Ross,P.S. 2006. Fireproof killer whales: Flame retardant chemicals and the conservation imperative in the charismatic icon of British Columbia. *Can.J.Fish.Aquat.Sci.* **63**: 224-234.

Ross,P.S., Jeffries,S.J., Yunker,M.B., Addison,R.F., Ikonou,M.G., and Calambokidis,J.C. 2004. Harbor seals (*Phoca vitulina*) in British Columbia, Canada, and Washington State, USA, reveal a combination of local and global polychlorinated biphenyl, dioxin, and furan signals. *Environ.Toxicol.Chem.* **23**: 157-165.

Ross,P.S. 2004. Body condition, rather than contaminants, likely explains health effects observed in first-born northern fur seal pups. *Mar. Pollut. Bull.* **48**: 806-807.

Ross,P.S. and Birnbaum,L.S. 2003. Integrated human and ecological risk assessment: A case study of persistent organic pollutants (POPs) in humans and wildlife. *HERA* **9(1)**: 303-324.

Ross,P.S. 2002. The role of immunotoxic environmental contaminants in facilitating the emergence of infectious diseases in marine mammals. *HERA* **8(2)**: 277-292.

Ross,P.S. 2000. Marine mammals as sentinels in ecological risk assessment. *HERA* **6**: 29-46.

Ross,P.S., Ellis,G.M., Ikonou,M.G., Barrett-Lennard,L.G., and Addison,R.F. 2000a. High PCB concentrations in free-ranging Pacific killer whales, *Orcinus orca*: effects of age, sex and dietary preference. *Mar. Pollut. Bull.* **40**: 504-515.

Ross,P.S., Vos,J.G., Birnbaum,L.S., and Osterhaus,A.D.M.E. 2000b. PCBs are a health risk for humans and wildlife. *Science* **289**: 1878-1879.

Ross,P.S., De Swart,R.L., Van der Vliet,H., Willemsen,L., De Klerk,A., Van Amerongen,G., Groen,J., Brouwer,A., Schipholt,I., Morse,D.C., Van Loveren,H., Osterhaus,A.D.M.E., and Vos,J.G. 1997. Impaired cellular immune response in rats exposed perinatally to Baltic Sea herring oil or 2,3,7,8-TCDD. *Arch. Toxicol.* **17**: 563-574.

- Ross,P.S., Van Loveren,H., De Swart,R.L., Van der Vliet,H., De Klerk,A., Timmerman,H.H., Van Binnendijk,R.S., Brouwer,A., Vos,J.G., and Osterhaus,A.D.M.E. 1996. Host resistance to rat cytomegalovirus (RCMV) and immune function in adult PVG rats fed herring from the contaminated Baltic Sea. *Arch. Toxicol.* **70**: 661-671.
- Ross,P.S., De Swart,R.L., Addison,R.F., Van Loveren,H., Vos,J.G., and Osterhaus,A.D.M.E. 1996. Contaminant-induced immunotoxicity in harbour seals: wildlife at risk? *Toxicology* **112**: 157-169.
- Ross,P.S., De Swart,R.L., Timmerman,H.H., Reijnders,P.J.H., Vos,J.G., Van Loveren,H., and Osterhaus,A.D.M.E. 1996. Suppression of natural killer cell activity in harbour seals (*Phoca vitulina*) fed Baltic Sea herring. *Aquat. Toxicol.* **34**: 71-84.
- Ross,P.S., De Swart,R.L., Van Loveren,H., Osterhaus,A.D.M.E., and Vos,J.G. 1996. The immunotoxicity of environmental contaminants to marine wildlife: A review. *Ann. Rev. Fish Dis.* **6**: 151-165.
- Ross,P.S., De Swart,R.L., Reijnders,P.J.H., Van Loveren,H., Vos,J.G., and Osterhaus,A.D.M.E. 1995. Contaminant-related suppression of delayed-type hypersensitivity and antibody responses in harbor seals fed herring from the Baltic Sea. *Environ. Health Perspect.* **103**: 162-167.
- Ross,P.S., De Swart,R.L., Visser,I.K.G., Murk,W., Bowen,W.D., and Osterhaus,A.D.M.E. 1994. Relative immunocompetence of the newborn harbour seal, *Phoca vitulina*. *Vet. Immunol. Immunopathol.* **42**: 331-348.
- Ross,P.S., Pohajdak,B., Bowen,W.D., and Addison,R.F. 1993. Immune function in free-ranging harbor seal (*Phoca vitulina*) mothers and their pups during lactation. *J. Wildlife. Dis.* **29**: 21-29.
- Ross,P.S., Visser,I.K.G., Broeders,H.W.J., Van de Bildt,M.W.G., Bowen,W.D., and Osterhaus,A.D.M.E. 1992. Antibodies to phocine distemper virus in Canadian seals. *Vet. Rec.* **130**: 514-516.
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- Alava,J.J., Salazar,S., Cruz,M., Jimenez-Uzcategui,G., Villegas-Amtmann,S., Paez-Rosas,D., Costa,A.N., Ross,P.S., Ikonomou,M.G., and Gobas,F. 2011. DDT strikes back: Galapagos sea lions face increasing health risks. *Ambio* **in press**.
- Alava,J.J., Ikonomou,M.G., Ross,P.S., Costa,D., Salazar,S., Auriolles-Gamboa,D., and Gobas,F.A.P.C. 2009. Polychlorinated biphenyls and polybrominated diphenyl ethers in Galapagos sea lions (*Zalophus wollebaeki*). *Environ.Toxicol.Chem.* **28**: 2271-2282.
- Assunção,M.G.L., Miller,K.A., Dangerfield,N., Bandiera,S.M., and Ross,P.S. 2007. Cytochrome P450 1A expression and organochlorine contaminants in harbour seals (*Phoca vitulina*): evaluating a biopsy approach. *Comparative Biochemistry and Physiology* **145**: 256-264.
- Bennett,E.R., Ross,P.S., Huff,D., Alae,M., and Letcher,R.J. 2009. Chlorinated and brominated organic contaminants and metabolites in the plasma and diet of a captive killer whale (*Orcinus orca*). *Mar.Pollut.Bull.* **58**: 1078-1095.
- Buckles,E.L., Gulland,F.M., Aldridge,B.M., Gelatt,T.S., Ross,P.S., Haulena,M., and Lowenstine,L.J. 2006. *Fetus-In-Fetu* in a Harbor Seal (*Phoca vitulina richardsi*): Histopathological, genetic and contaminant analysis. *Vet.Pathol.* **43**: 541-544.

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- Christensen, J.R., MacDuffee, M., Yunker, M.B., and Ross, P.S. 2007. Hibernation-associated changes in persistent organic pollutant (POP) levels and patterns in British Columbia grizzly bears. *Environ.Sci.Technol.* **41**: 1834-1840.
- Christensen, J.R., MacDuffee, M., Macdonald, R.W., Whitticar, M., and Ross, P.S. 2005. Persistent organic pollutants in British Columbia grizzly bears: Consequence of divergent diets. *Environ.Sci.Technol.* **39**: 6952-6960.
- Christensen, J.R., Letcher, J.R., and Ross, P.S. 2009. Persistent or not persistent? Polychlorinated biphenyls are readily depurated by grizzly bears (*Ursus arctos horribilis*). *Environ.Toxicol.Chem.* **28**: 2206-2215.
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- Cullon, D.L., Yunker, M.B., Alleyne, C., Dangerfield, N., O'Neil, S., Whitticar, M.J. and Ross, P.S. (2008) Persistent organic pollutants (POPs) in chinook salmon (*Oncorhynchus tshawytscha*): Implications for northeastern Pacific resident killer whales. *Environmental Toxicology and Chemistry*, in press.
- Cullon, D.L., Jeffries, S.J., and Ross, P.S. 2005. Persistent Organic Pollutants (POPs) in the diet of harbour seals (*Phoca vitulina*) inhabiting Puget Sound, Washington (USA) and the Strait of Georgia, British Columbia (Canada): A food basket approach. *Environmental Toxicology and Chemistry* **24**: 2562-2572.
- De Guise, S., Ross, P.S., Osterhaus, A.D.M.E., Martineau, D., Beland, P., and Fournier, M. 1997. Immune functions in beluga whales (*Delphinapterus leucas*): evaluation of natural killer cell activity. *Vet. Immunol. Immunopathol.* **58**: 345-354.
- De Swart, R.L., Harder, T.C., Ross, P.S., Vos, H.W., and Osterhaus, A.D.M.E. 1995a. Morbilliviruses and morbillivirus diseases of marine mammals. *Infect. Agent. Dis.* **4**: 125-130.
- De Swart, R.L., Ross, P.S., Timmerman, H.H., Hijman, W.C., De Ruiter, E., Liem, A.K.D., Brouwer, A., Van Loveren, H., Reijnders, P.J.H., Vos, J.G., and Osterhaus, A.D.M.E. 1995b. Short-term fasting does not aggravate immunosuppression in harbour seals (*Phoca vitulina*) with high body burdens of organochlorines. *Chemosphere* **31**: 4289-4306.
- De Swart, R.L., Ross, P.S., Timmerman, H.H., Vos, H.W., Reijnders, P.J.H., Vos, J.G., and Osterhaus, A.D.M.E. 1995c. Impaired cellular immune response in harbour seals (*Phoca vitulina*) feeding on environmentally contaminated herring. *Clin. Exp. Immunol.* **101**: 480-486.
- De Swart, R.L., Ross, P.S., Vedder, L.J., Boink, F.B.T.J., Reijnders, P.J.H., Mulder, P.G.H., and Osterhaus, A.D.M.E. 1995d. Haematology and clinical chemistry values for harbour seals (*Phoca vitulina*) fed environmentally contaminated herring remain within normal ranges. *Can. J. Zool.* **73**: 2035-2043.
- De Swart, R.L., Ross, P.S., Vedder, L.J., Timmerman, H.H., Heisterkamp, S.H., Van Loveren, H., Vos, J.G., Reijnders, P.J.H., and Osterhaus, A.D.M.E. 1994. Impairment of immune function in harbor seals (*Phoca vitulina*) feeding on fish from polluted waters. *Ambio* **23**: 155-159.

- De Swart,R.L., Ross,P.S., Vos,J.G., and Osterhaus,A.D.M.E. 1996a. Impaired immunity in harbour seals (*Phoca vitulina*) exposed to bioaccumulated environmental contaminants: review of a long-term study. *Environ. Health Perspect.* **104 (suppl. 4)**: 823-828.
- De Swart,R.L., Ross,P.S., Vos,J.G., and Osterhaus,A.D.M.E. 1996b. Impaired immunity in harbour seals (*Phoca vitulina*) fed environmentally contaminated herring. *Vet. Quart.* **18**: s127-s128.
- Debier,C., Le Boeuf,B.J., Ikonomou,M.G., De Tillesse,T., Larondelle,Y., and Ross,P.S. 2005. Polychlorinated biphenyls, dioxins and furans in weaned, free-ranging northern elephant seal pups from Central California, U.S.A. *Environ. Toxicol. Chem.* **24**: 629-633.
- Grant,P.B.C., Johannessen,S.C., Dangerfield,N., Wright,C.A., Macdonald,R.W., and Ross,P.S. 2008. PCB and PBDE concentrations and profiles in Strait of Georgia sediments. submitted.
- Harris,K.A., Dangerfield,N., Woudneh,M., Brown,T.G., Verrin,S. and Ross,P.S. (2008) Partitioning of current-use and legacy pesticides in salmon habitat in British Columbia, Canada. *Environmental Toxicology and Chemistry*, **27**: 2253-2262.
- Hickie,B.E., Ross,P.S., Macdonald,R.W., and Ford,J.K.B. 2007. Killer whales (*Orcinus orca*) face protracted health risks associated with lifetime exposure to PCBs. *Environ.Sci.Technol.* **41**: 6613-6619.
- Krahn,M.M., Hanson,M.B., Baird,R.W., Boyer,R.H., Burrows,D.G., Emmons,C.K., Ford,J.K.B., Jones,L.L., Noren,D.P., Ross,P.S., Schorr,G.S., and Collier,T.K. 2007. Persistent organic pollutants and stable isotopes in biopsy samples (2004/2006) from Southern Resident killer whales. *Mar.Pollut.Bull.* **54**: 1903-1911.
- Levin,M.J., De Guise,S., and Ross,P.S. 2005. Lymphocyte proliferation is associated with PCBs in free-ranging harbour seal (*Phoca vitulina*) pups from British Columbia, Canada. *Environ. Toxicol. Chem.* **24**: 1247-1252.
- Lichota,G.B., McAdie,M., and Ross,P.S. 2004. Endangered Vancouver Island marmots (*Marmota vanouverensis*): Sentinels of atmospherically delivered contaminants to British Columbia, Canada. *Environ. Toxicol. Chem.* **23**: 402-407.
- Luebke,R.W., Hodson,P.V., Faisal,M., Ross,P.S., Grasman,K.A., and Zelikoff,J.T. 1997. Aquatic pollution-induced immunotoxicity in wildlife species. *Fundam. Appl. Toxicol.* **37**: 1-15.
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- Mos,L., Cameron,M., Jeffries,S.J., Koop,B.F., and Ross,P.S. 2010. Risk-based analysis of PCB toxicity in harbor seals. *Integrated Environmental Assessment and Management* **6**: 631-640.
- Mos,L., Morsey,B., Jeffries,S.J., Yunker,M., Raverty,S., De Guise,S., and Ross,P.S. 2006. Both chemical and biological pollution contribute to immunological profiles of free-ranging harbor seals. *Environ.Toxicol.Chem.* **25**: 3110-3117.
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Presentations:

Results of research have been presented to dozens of international scientific conferences and workshops, as well as to numerous public audiences in North America. In addition, over 200 media interviews have been provided to local, national and international newspaper, magazine, TV and radio (including *NBC Nightly News*, *CBC The National*, *CTV Newsnet*, *PBS The News Hour*, *National Geographic TV and magazine*, *Discover Magazine*, *Washington Post*, *New York Times*, *Los Angeles Times*, *Globe and Mail*, *National Post*, *Vancouver Sun*, *Seattle Times*, *Seattle P.I.*, *CBC Radio*, *PBS Radio*, *BBC Radio*, *PBS Frontline*, *Jean-Michel Cousteau's Ocean Adventures*).

Training

Transport of Dangerous Goods (Road) (Feb 2008)

Rigid Hull Inflatable Operator's Training (RHOT) (May 2007)

Workplace Hazardous Materials Information System (WHMIS) (2007)

Occupational Health and Safety for Managers (Modules 1 & 2; Nov 2005)

Occupational Health and Safety for Managers (Modules 3, 4, 5 & 6; Oct 2008)

Small Craft Operator's Licence (June 2003)

Marine Radio Operator's Licence (June 2003)

Marine Emergency Duties (MED) A-1 (July 2000)

Occupational First Aid (valid until Feb 2008)

Basic Training and Infantry Trade Qualifications (TQ1) Governor General's Foot Guards

Activities

2009- Member, Marine Monitoring Advisory Group, Capital Regional District, British Columbia present

2008- Chairman, Eastern Taiwan Strait Sousa Technical Advisory Working Group (ETSSTAWG) present

2004- Member, Scientific working group to develop Conservation Plan for Taiwan's Indo-Pacific humpback dolphin population

2007- Member, Humpback Whale Recovery Team (DFO-SARA) present

2007- Grey whale, harbour porpoise and Steller sea lion Management Team (DFO-SARA)

present

2006- Expert Witness, Marine Mammals, U.S. Department of Justice, Exxon Valdez Oil Spill

present

2000- Marine Mammal and Seabird Representative (Canada) for the North Pacific Marine Science Organization (PICES).

2001- Member, Central Coast Integrated Management MEQ Subcommittee (DFO)

2005

2001- Member Scientific Panel, Head Veterinary Panel, A73 and L98 killer whale orphan committees.

present

2001- Member, Pacific Scientific Assessment Review Committee (Fisheries and Oceans Canada).

2005

2003- Member, Resident killer whale Recovery Team (DFO-Species at Risk).

present

1998- Member, Georgia Basin-Puget Sound Indicators working group.

present

1998- Member, WHO/OECD/USEPA working group on integrated human and ecological risk assessment.

1998 Organized and co-chaired workshop on "Environmental contaminants and marine mammal health: Research applications" at the Institute of Ocean Sciences, Sidney, BC, 17-19 April.

1995 Co-established rehabilitation and conservation project for endangered Mediterranean Monk seal (*Monachus monachus*) in Mauritania and Morocco.

1994 Member, WHO Task Group on "Principles and Methods for Assessing Direct Immunotoxicity Associated with Exposure to Chemicals", World Health Organization, Geneva, 10-14 October.

1994 Member, UNEP Meeting of experts on the evaluation of the implementation of the Action Plan for the Management of the Mediterranean Monk seal, United Nations Environment Programme, Rabat, Morocco, 5-9 October.

1993 Initiator and facilitator, bilateral meeting between Canada and The Netherlands on "Indicators in Ecotoxicology": June 12-14. A scientific working group under the context of the Canada-The Netherlands Memorandum of Understanding on environmental cooperation.

1987 Observer, Canadian Delegation to the United Nations (New York).

1987 Member-at-Large, Executive, Committee of Parliamentarians, Scientists and Engineers (COPSE), Ottawa.

1987 Organized national conference on "Resolving Global Problems into the 21st Century: How can Science Help?". Carleton University, Ottawa.

1986 Member, Consultative Group Delegation to the United Nations (Department of External Affairs; to New York).

1985- Member, Consultative Group on Arms Control and Disarmament, Department of

1987 External Affairs, Ottawa.

1985 Organized and chaired symposium at Trent University entitled "Global Issues and the Future".