

# Résumé

29 September 2010

**NAME:** Hargreaves, Norris Brent

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**BUSINESS ADDRESS**

Fisheries and Oceans Canada  
Fisheries and Aquaculture Management Branch  
200-401 Burrard Street  
Vancouver, B.C. V6C 3S4  
Office: 604-658-2842

Not Relevant

Fax: 604-666-9136

Not Relevant

## ACADEMIC EDUCATION AND AWARDED DEGREES

Diploma/Degree	Discipline	Institution/Department	Location	Date
Ph.D.	Biological Oceanography	Dalhousie University	Halifax, Nova Scotia, Canada	1982
B.Sc.	Biology (Honors)	Dalhousie University	Halifax, Nova Scotia, Canada	1978

## ADDITIONAL PROFESSIONAL QUALIFICATIONS AND TRAINING

Certifications	Conditions	Institution/Agency	Location	Date
Master Limited 60 ton (ship skipper) certification	Valid for all B.C. Coastal waters. Expires December 2012	Transport Canada	Nanaimo, B.C.	2006
Wilderness First Aid	Valid until September 2013	St. Johns Ambulance	Nanaimo, B.C.	2009
DFO Rigid Hull Inflatable Operator Training	No expiry date	DFO/CCG Rigid Hull Inflatable Operator Training (RHIOT) School	Bamfield, B.C.	2004
Marine Emergency Duties (MEDS A, A2)	No expiry date	Transport Canada	Port Moody, B.C.	2003
Marine Radio Operator (Commercial)	DSC endorsement No expiry date	Transport Canada	Vancouver, B.C.	2003
Dealing with Interpersonal Conflict	None	Justice Institute of B.C.	Vancouver, B.C.	2001
Conflict Resolution: Negotiation Skills Level 1	None	Justice Institute of B.C.	Vancouver, B.C.	2001
Conflict Resolution: Dealing With Anger	None	Justice Institute of B.C.	Vancouver, B.C.	2001
Conflict Resolution: Shifting From Positions to Interests	None	Justice Institute of B.C.	Vancouver, B.C.	2001
DFO Senior Management Course	None	Management Training School	Cornwall, Ontario	1997
P.A.D.I. SCUBA diving	No expiry date	P.A.D.I. Canada	Halifax, Nova Scotia	1976

## FEDERAL GOVERNMENT EMPLOYMENT POSITIONS

Position	Organization/Department	Location	Month-Year
A/Lead, Salmon Team Pacific Region	Fisheries and Oceans Canada Fisheries and Aquaculture Management Branch	Regional Headquarters, Vancouver, B.C.	04/2010- currently
Research Scientist	Fisheries and Oceans Canada Science Branch	Pacific Biological Station, Nanaimo, B.C.	09/2000-04/2010
Chief, Salmon Operations	Fisheries and Oceans Canada Resource Management Branch	Vancouver, B.C.	01/1999-08/2000
Research Scientist	Fisheries and Oceans Canada Science Branch	Pacific Biological Station, Nanaimo, B.C.	01/1983-12/1998
Correctional Officer (CX-1 level)	Canadian Penitentiary Service, Solicitor General Department	Drumheller Correctional Institute	1973-1974

## PROFESSIONAL AWARDS

Award Name	Awarding Organization	Reason	Date(s)
DFO "Instant Award"	Department of Fisheries and Oceans	Outstanding performance in delivery of the first year of the Broughton Sea Lice Monitoring Program	2003
Deputy Minister's Prix d'Excellence Award	Department of Fisheries and Oceans	For outstanding performance as Chair, Regional Coho Response Team	1999
Killiam Post-Doctorate Fellowship	Izaak Walton Killiam Memorial Scholarship Foundation	For recognition of outstanding performance in graduate studies, potential for career in research, and to provide financial support for post-doctoral research.	1981-1982 1982-1983 1983-1984
NSERC Post-Doctoral Fellowship	National Science and Engineering Research Council of Canada, Ottawa, Ontario	For recognition of outstanding potential for post-doctorate research, and to provide financial support for post-doctoral research.	1981-1982 1982-1983 1983-1984

## ACADEMIC, RESEARCH AND INDUSTRIAL EXPERIENCE

### 1. Employment History:

April 2010 – Present: Acting Assignment as Lead, Salmon Team, Pacific Region, Fisheries and Aquaculture Management Branch, DFO Pacific Region Headquarters, Vancouver, B.C. Under a formal agreement between DFO Science Branch and DFO Fisheries and Aquaculture Management (FAM) Branch, from April 2010 until March 2011 I am working 70% of my time in FAM (as Lead, Salmon Team), and 30% of my time in my substantive position as a Research Scientist in Science Branch.

2005 – 2010: Research Scientist. Fisheries and Oceans Canada, Science Branch, Salmon and Freshwater Ecology (SAFE) Division, Pacific Biological Station, Nanaimo, B.C. Under a formal agreement between DFO Science Branch and DFO Fisheries and Aquaculture Management Branch, from April 2010 until March 2011 I am continuing to work 30% of my time in this position in Science Branch, and the remaining 70% of my time in FAM (as Lead, Salmon Team).

2001– 2005: Research Scientist, Fisheries and Oceans Canada, Science Branch, Salmon Section, Stock Assessment Division, Salmon Section, Pacific Biological Station, Nanaimo, B.C.

1999-2000: Chief, Salmon Operations (Salmon Commercial Fisheries Coordinator), Pacific and Yukon Region, Fisheries and Oceans Canada, Fisheries Management Branch, Vancouver, B.C.

1998-1999: Chair, Regional Coho Response Team, Pacific Region, Fisheries and Oceans Canada (16 month full-time secondment).

1997: Associate Head, Stock Assessment Division, Science Branch, Fisheries and Oceans Canada, Nanaimo, B.C.

1996-1997: Head, Chinook and Coho Salmon Section, Pacific Region, Fisheries and Oceans Canada, Science Branch, Pacific Biological Station, Nanaimo, B.C.

1995-1996: Pacific Region Coordinator, Fraser River Sockeye Public Review Board Response, Fisheries and Oceans Canada (two-year full-time secondment).

1995: Research Scientist, and Head of West Coast of Vancouver Island Chinook Salmon Unit, South Coast B.C. Section, Stock Assessment Division, Fisheries and Oceans Canada, Nanaimo, B.C.

1982-1994: Research Scientist, and Head of Ocean Salmon Program, Department of Fisheries and Oceans, Biological Sciences Branch, Salmon Section, Pacific Biological Station, Nanaimo, B.C.

1979-1981. Natural Science and Engineering Research Council (NSERC) and Killiam Memorial Post-Doctorate Fellow, University of British Columbia, Oceanography Department, Vancouver, B.C.

## **2. Relevant Highlights of Professional Service and Experience:**

March 2010 – March 2011: A/Lead, Salmon Team, Pacific Region, Fisheries and Aquaculture Management Branch, Fisheries and Oceans Canada, Pacific Region Headquarters, Vancouver, B.C. I currently am on an Acting Assignment in FAM. This is an EX-01 equivalent (BI-05) level position, reporting directly to the Regional Director, FAM. The initial duration of this assignment is for 1 year, but this may be extended contingent on requirements for the Cohen Inquiry on the Decline of Fraser River Sockeye. My duties include developing long term planning and strategic direction of salmon resource management for the Pacific Region, and managing and directing the development and implementation of strategic regional salmon fishery management, policy, and program frameworks and recommending to senior management the adoption of these plans. I am also responsible for directing and managing the development of both the Southern B.C. and Northern B.C. Integrated Fishery Management Plans (IFMP) for salmon to ensure resource management sustainability and economic viability of salmon resources, and managing the development, implementation and review of demonstration fisheries to meet requirements of the Pacific Integrated Commercial Fisheries Initiatives (PCIFI) in ensuring environmentally sustainable and economically viable commercial salmon fisheries. I develop long-term strategic plans for conservation units (CU) under the Wild Salmon Policy and supporting resource managers. I manage the financial, human and material resources allocated to the organization. I provide authoritative information, interpretation, advice, and recommendations respecting policies, science-based regulatory standards, integrated resource management strategies, and international treaty obligations to senior management, program managers, policy advisors and national and international client groups.

2001-2009: Canadian Co-Chair, Selective Fisheries Evaluation Committee (SFEC), Pacific Salmon Commission (PSC). This joint bi-lateral (Canada-USA) committee provides technical support and scientific advice to the Canadian and USA Commissioners, and to the staff of the PSC, regarding potential impacts of salmon mass marking programs and mark-selective salmon fisheries conducted in Canada and the USA. As Canadian Co-Chair, I shared responsibility with the USA Co-Chair for overall leadership of this bi-lateral group, which includes 6 Canadian members and 13 USA members. One of the main tasks of the SFEC is to annually request and reviews proposals from Canada and all USA fisheries agencies for mass marking and mark selective fisheries. The SFEC provides summaries of proposals, advice and recommendations directly to PSC Commissioners and senior managers in both Canada and the USA regarding implications of proposed mass marking programs and mark-selective fishery regimes, which is required for management and conservation of Canadian and USA salmon resources in British Columbia and the Yukon, and in the USA states of California, Oregon, Washington, Idaho and Alaska.

2009-2010: Lead research scientist and current DFO representative on Broughton Archipelago Monitoring Program (BAMP). In 2009 I successfully negotiated a formal agreement to transition responsibility and most of the associated costs to Industry for continuing the annual marine monitoring program to assess sea lice on juvenile wild salmon in the Broughton region of B.C. Under this new agreement, in 2010 all three commercial salmon farm companies that operate in this area of B.C. cooperated with interested conservation groups and DFO to conduct the marine sampling program that DFO previously conducted each year from 2003 – 2009. Transitioning this program to Industry resulted in substantial savings to DFO (e.g. about 250K per year of DFO O/M and salary costs).

2003 – 2008. Lead research scientist, marine monitoring program, for the *Pink Salmon Action Plan* initiated by Fisheries and Oceans Canada in the Pacific Region in 2003. As the lead DFO scientist for this program I was responsible for designing and conducting an annual sampling program to assess infection by sea lice of juvenile salmon in the Broughton and Knight Inlet, B.C. This was a major and complex DFO program involving sampling juvenile pink and chum salmon and numerous other fish species during 10-12 days every month from March to July. This marine sampling program was conducted over a large geographic area in a remote part of the B.C. mainland coast with only small local human population and very limited services available. As program leader, I personally designed the sampling program, developed and obtained senior DFO management approval of the required staff, assets, resources and budgets. As part of this program I directly managed an annual budget of 1.2 Million (2003), 160K (2004), and 200K (2005-09) per year. I also served each year as the Master (skipper) of one of the two larger (44 foot) DFO research vessels that have been used to conduct this sampling program. In this role I was responsible for all aspects of the maintenance and operation of this vessel, including safe navigation night and day in very hazardous coastal waters, fishing operations, and personally supervising all the elements of the scientific research and sampling program. Both of the research vessels used in this program are classed by DFO and CCG as “Program Operated” vessels, so I also personally recruited, contracted, trained and directly supervised the crew of 5-7 people that are required work on these two DFO vessels to conduct this sampling program. While at sea I was responsible daily for making decisions that affect the scientific and political outcome of this program, and also the health and safety of both the crews and DFO vessels. As lead scientist for this program I established and maintained effective relationships and partnerships with other federal departments and central agencies, other levels of government (including Provincial government and municipal government), industry (including commercial and recreational salmon fishery organizations, and commercial salmon farms), and non-government organizations (including the B.C. Pacific Salmon Forum, Pacific Fisheries Resource and Conservation Council, and ENGO organizations such as Raincoast Research).

1990-Present: Member, Center for Scientific Advice Pacific (CSAP; formerly called Pacific Scientific Advice and Review Committee (PSARC)), Fisheries and Oceans Canada. This is a standing DFO peer review committee that provides scientific advice to DFO senior managers regarding the status of salmon stocks, forecasting of adult salmon returns, and fisheries management and conservation in British Columbia and the Yukon. As a member of the PSARC Salmon Sub-Committee for the past 19 years, I have peer reviewed more than 120 PSARC Working Papers, and contributed directly and substantially to the advice provided to the DFO Regional Management Executive Committee and other DFO senior managers, regarding management and conservation of B.C. salmon resources. I have also been invited to serve as primary peer reviewer for 9 PSARC Working Papers, providing a written critical review and advice to both the Salmon Sub-Committee and the authors of the Working Papers.

1989 – Present: Member, Pacific Scientific Advice and Review Committee (PSARC), Fisheries and Oceanography Working Group (FOWG), Fisheries and Oceans Canada. This is a standing DFO peer review committee that provides scientific advice to DFO senior managers. The annual report produced by this Working Group summarizes the state of physical, biological, and selected fishery resources of Canadian Pacific region marine ecosystems.

1999-2000: Canadian Co-Chair, Fraser River Panel, Pacific Salmon Commission (PSC). This bi-lateral

(Canada-USA) panel provides advice and effectively manages Fraser River sockeye and pink stocks in Canada and U.S.A. marine areas. The Fraser River Panel functionally has delegated authority to approve pre-season forecasts and escapement targets, decide allowable in-season catch levels, and authorizes fishery openings and closures, for all fisheries that target or impact on Fraser River sockeye and pink salmon stocks. As Canadian Co-Chair, I was responsible for reviewing and synthesizing the scientific information and technical advice provided by the PSC staff, and by the bi-lateral Fraser Panel Technical Committee (which supports and reports to the Fraser Panel). I also was responsible for leading the Canadian members of the Fraser Panel and DFO resource managers throughout the Pacific Region to achieve agreement or consensus on Canada's approach to management of domestic salmon fisheries, and Canada's negotiating positions with the USA. As Canadian Co-Chair I also led Canada's bi-lateral negotiations with the USA members of the Fraser Panel to achieve Canada's objectives for in-season fisheries management and conservation of Fraser River salmon stocks. The Canadian and USA members of the Fraser River Panel included representatives from all the domestic commercial salmon sectors, the recreational salmon fishing sector, the First Nations salmon fishery sector, and the commercial industry processing and sales sector. With the diverse interests of these various stakeholders and interest groups, and large economic value associated of the various outcomes (many millions of dollars in salmon catch each year), both the domestic and bi-lateral negotiations were often very difficult, laborious, and controversial.

1999-2000: Chief, Salmon Operations (Salmon Coordinator), Pacific and Yukon Region, Fisheries and Oceans Canada, Fisheries Management Branch, Vancouver, B.C. This was a two year Assignment that I accepted at the request of the Regional Director, Fisheries Management Branch (Mr. Terry Tebb). In this position I was responsible for coordinating all the commercial salmon fisheries in the Pacific Region. I led the annual consultation processes with salmon stakeholder groups, and personally chaired more than 40 DFO consultation meetings with industry, First Nations, NGO, and the public during 1999-2000. I also developed and coordinated the implementation of the first Integrated Fisheries Management Plan (IFMP) for all five species of salmon in the Pacific Region.

1998-1999: Chair, Coho Response Team, Pacific Region, Fisheries and Oceans Canada. This team included 13 middle manager DFO staff from all affected DFO branches in the Pacific Region, and was tasked to assess and provide recommendations and advice on the status, management and conservation of coho salmon stocks throughout BC and the Yukon. As Chair, I reported directly to a senior manager Steering Committee, comprised of the Regional Director General and Regional Directors of Science, Fisheries Management, Salmonid Enhancement, Finance and Communications. The Coho Response Team conducted an extensive review that lasted 5 months, and provided a final report to DFO senior managers that subsequently was released to the public. This review process and report led DFO to immediately declare two key coho salmon (upper Skeena River and Thomson River) stocks effectively as "endangered". The direct result was the immediate coast-wide closure of most directed coho fisheries, and the closure or restriction of many other fisheries in the Pacific Region in 1998 that might impact these coho salmon stocks. These changes also signaled a dramatic shift to the "precautionary approach" for DFO management in all BC salmon fisheries in 1998, which has continued to the current day. As the Chair of the Coho Response Team, I was responsible for planning and delivery of all aspects of the review, and for leading the consultation process. This included personally coordinating the preparation of all the materials (PowerPoint "deck") used in the 27 public consultation meetings that were held throughout British Columbia, personally chairing 11 of these public meeting. I also planned and coordinated more than 40 additional meetings, and chaired 14 of these meetings, with other levels of government, First Nations, stakeholders, ENGOs and other clients. I was also the primary author and editor of the Coho Response Team final report. The extensive review process and final report of the Coho Response Team explored and provided advice to the DFO Minister, and other senior DFO managers that ultimately resolved a host of very complex, sensitive, and controversial issues in the Pacific Region.

1996-1997: Canadian Representative, Coastal Ecosystems (REX) Scientific Sub-Committee, Implementation Panel of the international PICES-GLOBEC "Climate Change and Carrying Capacity

(CCCC) Program. This was the first cooperative international scientific research program approved by the new international North Pacific Marine Science Organization (PICES). As one of three Canadian representatives on this sub-committee, I assisted with developing Canada's position and research program within this international cooperative research program. I also coordinated the input provided to this sub-committee by many other Canadian scientists, both within DFO and other federal agencies, and from non-government agencies including universities.

1994-2001: Canadian Delegate and Member, Chinook Technical Committee, Pacific Salmon Commission (PSC). This bi-lateral (Canada-USA) committee provides technical support and scientific advice to the Canadian and USA Commissioners and staff of the PSC regarding the status of chinook salmon stocks and fisheries management and conservation in the eastern North Pacific Ocean. As a member of this PSC committee for 7 years, I directly contributed to the annual assessment of chinook stocks in Canada and the USA, and provided advice and recommendations to fisheries managers and senior DFO managers that substantially affected the management of chinook and other salmon fisheries, and conservations actions required to protect chinook stocks throughout the Pacific Region. This work directly affected annual fishery allocation and management decisions and the advice this Committee provided frequently was controversial and came under intense scrutiny by industry, stakeholder, First Nation and ENGO groups. The advice provided by the Chinook Technical Committee also played a major role in the successful re-negotiation of the Pacific Salmon Treaty between Canada and the USA.

1995-1996. Pacific Region Science Branch Coordinator, Fraser River Sockeye Public Review Board Response, Fisheries and Oceans Canada. In 1994 a public enquiry was held to investigate the "missing salmon" that had occurred in the adult sockeye escapements in the Fraser River. DFO subsequently accepted all 35 recommendations identified in the final report of the Fraser River Sockeye Public Review Board (FRSPRB) titled "Fraser River Sockeye 1994: Problems and Discrepancies". I was assigned by the Regional Director General, Pacific Region to be responsible for coordinating all Science aspects of the DFO response and implementation program. The annual budget for this was \$7.0 million in 1995/96, \$6.8 million in 1996/97, and \$5.8 million in 1997/98, including \$4.2 million annually provided from the Deputy Minister Reserve. I was responsible for working with senior and middle DFO managers to identify science activities and programs that would address the recommendations of the FRSPRB. I was also responsible for preparation of the overall budget submission to Treasury Board, and the annual budget submissions which were used to allocate the funding to individual programs throughout the Pacific Region. I provided strong leadership and effectively planned, coordinated and administered the funding for all the new research projects that were initiated by DFO (27 new projects in 1995/96, 31 projects in 1996/97 and 23 projects in 1997/98). In this role I had only general guidelines and substantial discretion for deciding how to best achieve the implementation of all the FRSPRB recommendations. I was delegated full signing authority by the RD, Science Branch for all research projects, and was responsible for the management and fiscal oversight of all the science programs that were conducted each year as part of the FRSPRB Response. I also kept senior DFO managers informed of the progress and issues by frequent direct contact with all the managers of the various programs funded under the Response. I prepared the numerous program activity and budget summaries that were requested by the RDG, Pacific Region, the Assistant Deputy Minister of Science, the Assistant Deputy Minister of Fisheries Management, and Deputy Minister of Fisheries and Oceans, to support continuation of the funding for the Response. During the second year of the Response, I prepared numerous progress summaries, continuing "needs" documents and budget proposals to support continuation of many of the critical Response programs beyond the original "sunset" date. This subsequently resulted in a substantial portion (\$4.2 million per year) of the original 3-year special funding for the Response being allocated as a permanent increment to the annual "A-base" funding to DFO, Pacific Region.

1993-1994: Chair, Steering Committee for international PICES-GLOBEC "Carrying Capacity and Climate Change (CCCC) program in the North Pacific Ocean. This was the first international scientific research program developed and implemented by the new North Pacific Marine Science Organization (PICES). As invited Chair of this steering committee, I recruited 13 additional members from Canada,

USA, Japan, Korea and Russia. Over a period of 2 years this Steering Committee developed a plan for a new international research program that incorporated the interests and priorities of all the member countries of PICES. This was a very difficult process, requiring protracted and difficult negotiations (most conducted by telephone, email and written documents), because there was considerable uncertainty and lack of trust between the governments of each country concerning what PICES could (or should) try to accomplish. As Chair I was responsible for negotiating and ultimately successfully delivering the proposal for a major new international research program that was unanimously accepted and approved by all the PICES countries as the first international research program approved, supported and implemented by PICES. Subsequently in 1995 and 1996 I also provided effective leadership in the development and preparation of funding proposals to NHQ and NSERC to support the initiation of the Canadian PICES-GLOBEC research program. This was Canada's main contribution to the PICES CCCC international research program. Initial federal funding for this Canadian PICES-GLOBEC program was approved at \$800K in 1996.

1993-1994: Co-Chair, Sub-Arctic Gyre Working Group, North Pacific Marine Science Organization (PICES). The members of this working group in 1993 and 1994 included 21 scientists from Canada, U.S.A., Japan, China, and Russia.

1990-1993: Member of the Joint Bi-lateral Transboundary Technical Committee (TTC) of the Pacific Salmon Commission.

1984-1990: Canadian member and delegate to the International North Pacific Fisheries Commission.

### **3: Publications**

#### **Peer Refereed Publications and Conference Proceedings:**

B. M. Connors, N.B. Hargreaves, S.R.M Jones and L. M. Dill. Trophic transmission up a salmonid food chain. (accepted by Proc. National Academy Sciences, USA).

Jones, S.R.M. and N.B. Hargreaves. 2009. Infection threshold to estimate *Lepeophtheirus* Salmonis-associated mortality among juvenile pink salmon. *Dis. Aquat. Org.* 84:131-137.

Jones, S.R.M. and N.B. Hargreaves. 2007. The abundance and distribution of *Lepeophtheirus salmonis* (Copepoda: Caligidae) on pink (*Oncorhynchus gorbuscha*) and chum (*O. keta*) salmon in coastal British Columbia. *J. Parasitol.*, 93(6): 1324–1331.

Jones, S.R.M., G. Prosperi-Porta, E. Kim, P. Callow and N.B. Hargreaves. 2006. The occurrence of *Lepeophtheirus salmonis* and *Caligus clemensi* (Copepoda: Caligidae) on threespine stickleback *Gasterosteus aculeatus* in coastal British Columbia. *Journal of Parasitology. J. Parasitol.*, 92(3): 473–480.

Hargreaves, N. B. and C. Tovey. 2001. Mortality Rates of Coho Salmon Caught by Commercial Salmon Gillnets and the Effectiveness of Revival Tanks and Reduced Soak Time for Decreasing Coho Mortality Rates. Canadian Science Advisory Secretariat. Research Document 2001/154. 56 p. ISSN 1480-4883.

Chen, D.G., N. B. Hargreaves, D. M. Ware, and Y. Liu. 2000. A fuzzy logic model with genetic algorithm for analyzing fish stock-recruitment relationships. *Can. J. Fish. Aquat. Sci.* 57: 1878-1887.

Logerwell, E. A. and N. B. Hargreaves. 1996. The distribution of seabirds relative to their fish prey off Vancouver Island: opposing results at large and small scales. *Fish. Oceanogr.* 5:3/4, 163-175.

Perry, R. I., N. B. Hargreaves, B. J. Waddell, and D. L. Mackas. 1996. Spatial variations in feeding and condition of juvenile pink and chum salmon off Vancouver Island, British Columbia. *Fish. Oceanogr.* 5:2, 73-88.

Hargreaves, N. B., D. M. Ware, and G. A. McFarlane. 1994. Return of sardine (*Sardinops sagax*) to the British Columbia coast in 1992. *Can. J. Fish. Aquat. Sci.* 51(2):460-463.

Ware, D. M. and N. B. Hargreaves. 1994. Occurrence of Pacific (Chub) mackerel off the B.C. coast: 1993. *PICES Press* 2(1): 12-13.

Wood, C. C., N. B. Hargreaves, D. T. Rutherford, and B. T. Emmet. 1993. Downstream and early marine migratory behavior of sockeye salmon (*Oncorhynchus nerka*) smolts entering Barkley Sound, Vancouver Island. *Can. J. Fish. Aquat. Sci.* 50(6):1329-1337.

Hargreaves, N. B. 1992. An electronic hot-branding device for marking fish. *Prog. Fish-Cult.* 54(2):99-10.

Hargreaves, N. B. 1988. A field method for determining prey preference of predators. *Fish. Bulletin.* 86:763-771.

Hargreaves, N. B. and R. J. LeBrasseur. 1986. Size Selectivity of coho salmon (*Oncorhynchus kitsutch*) preying on juvenile chum salmon (*O. keta*). *Can. J. Fish. Aquat. Sci.* 43: 581-586.

Hargreaves, N. B. and R. J. LeBrasseur. 1985. Species selective predation on juvenile pink salmon (*Oncorhynchus gorbuscha*) and chum salmon (*O. keta*) by coho salmon (*O. kisutch*). *Can. J. Fish. Aquat. Sci.* 42: 659-668.

Hargreaves, N.B. 1984. Commentary: The Alaska coastal current as a feeding habitat for juvenile salmon. P. 269-272. IN: W.G. Pearcy (ed.) *The influence of ocean conditions on the production of salmonids in the North Pacific*. Oregon State Univ. Press. Publ. ORESU-W-83-001.

Fournier, R.O., M. Van Det, N. B. Hargreaves and J. S. Wilson. 1984. Physical factors controlling summer distribution of chlorophyll A off southwestern Nova Scotia. *Limnol. Oceanogr.* 29: 517-526.

Fournier, R.O., R. Ernst, N. B. Hargreaves, M. Van Det and D. Douglas. 1984. Variability of chlorophyll A off southwestern Nova Scotia in the late fall and its relationship to water column stability. *Can. J. Fish. Aquat. Sci.* 41: 1730-1738

Fournier, R.O., M. Van Det, J.S. Wilson, and N.B. Hargreaves. 1979. Influence of the shelf-break front off Nova Scotia on phytoplankton standing stock in winter. *J. Fish. Res. Board Can.* 1228-1237.

### **Selected Other Publications and Reports**

Hargreaves, N. B., W. Luedke, and J. Till. 2001. Application of otolith thermal marking in British Columbia, Canada. Technical Report 3: Workshop on Salmonid Otolith Marking. North Pacific Anadromous Fish Commission, Vancouver, B.C.

Hargreaves, N. B. 1997. Early ocean survival of salmon off British Columbia and impacts of the 1983 and 1991-1995 El Nino Events. *In: Proceedings of the Workshop on Estuarine and Ocean Survival of Pacific Salmonids*. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NWFSC-29, 93 p.

Hargreaves, N. B. and D. M. Ware. 1997. *Seasons in the Sea*. Copyright © 1997 jointly by Parks Canada and Fisheries and Oceans Canada. 28 minute duration. Distribution copies available from Fisheries and Oceans Canada, Communications Branch, Vancouver, B.C. Canada. (Note: Professional television broadcast quality video production illustrating the changes in marine biology and physical oceanography in the ocean in Pacific Rim National Park, Tofino, B.C. Canada. Broadcast many times on public television by the Knowledge Network in 1997 and subsequently included as one of the Knowledge Network "Best of B.C. Moments" series).

Hargreaves, N. B. 1996. Report of the PICES-GLOBEC International Program on Climate Change and Carrying Capacity. Science Plan. pp. 1-17. *In: PICES Scientific Report No. 4* 64 p. (Note: this international science plan included an extensive review of the existing knowledge and scientific hypotheses for biology-ocean climate interactions in the North Pacific Ocean).



Hargreaves N. B. and D. Ware. 1996. Pacific Herring: Sustaining a Renewable Resource". Copyright © 1996 jointly by Parks Canada and Fisheries and Oceans Canada. Distribution copies available from Fisheries and Oceans Canada, Pacific Biological Station, Nanaimo, B.C. Canada. (Note: Professional television broadcast quality video production, 12 minute duration; broadcast many times on public television by the Knowledge Network and won a 1996 public broadcasting award for excellence. Subsequently included as one of the Knowledge Network "Best of B.C. Moments" series).

Hargreaves, N. B. and N. Williscroft. 1996. 1996/97 Business Plan for Implementation of the Fraser River Sockeye Public Review Board Recommendations. DFO internal confidential (Protected) document submitted to the Deputy Minister, Fisheries and Oceans Canada, Ottawa. June 13, 1996. 57 pp.

Hargreaves, N. B. and B. Turris. 1995. Action Plan Response and Associated Costs to the Fraser River Sockeye Public Review Board Report. DFO internal confidential (Protected) document submitted to the Assistant Deputy Minister Science and Assistant Deputy Minister Fisheries Branch, and Deputy Minister, Fisheries and Oceans Canada, Ottawa. April 26, 1995. 28 pp.

Hargreaves, N. B. and R. M. Hungar. 1995. Robertson Creek chinook assessment and forecast for 1995. Part B: Early Marine Mortality. Pacific Stock Assessment Review Committee (PSARC) Technical Working Paper S95-01, Salmon Subcommittee, Department of Fisheries and Oceans, Pacific Biological Station. Nanaimo, B.C. April 1995. 56 p.

Hargreaves, N. B., R. M. Hungar, and B. A. Patten. 1990. Juvenile salmon abundance, distribution and predation mortality in Alberni Inlet and Barkley Sound, B.C. pp. 3-13. *In*: Marine Survival of Salmon Program Outline and Investigators Summaries for 1989/90. Department of Fisheries and Oceans Canada. 70 p.

Hargreaves, N. B., B. A. Patten, and R. J. LeBrasseur. 1988. Beach seine catches of juvenile salmon and other fish in Masset Inlet, Masset Sound, and Jaskatla Inlet, B.C. in 1983. *Can. Data Rep. Fish. Aquat. Sci.* 683: 267 p.

Hargreaves, N. B., B. A. Patten, E. W. Carter, and R. J. LeBrasseur. 1988. Two-boat trawl, gillnet, purse seine, angling, fish trap, and fry trap catches of salmonids and other fishes captured in Masset Inlet, B.C. in 1983, 1984, and 1985. *Can. Data Rep. Fish. Aquat. Sci.* 687: 177 p.

Hargreaves, N. B., B. A. Patten, and R. J. LeBrasseur. 1988. Stomach contents of salmonids and other fishes captured in Masset Inlet, B.C. in 1983, 1984, and 1985. *Can. Data Rep. Fish. Aquat. Sci.* 693: 116 p.

Hargreaves, N. B. 1988. Salmonid catches and related observations aboard the Japanese research vessel HOKKO MARU, 1-22 June 1987. International North Pacific Fisheries Commission (I.N.P.F.C.). Document No. 3220. 14 p.

Hargreaves, N. B. 1988. Incidence of lost or discarded drift nets recovered in Canadian waters during 1986, and preliminary observations for 1987. International North Pacific Fisheries Commission (I.N.P.F.C.). Document No. 3215. 10 p.

LeBrasseur, R.J., N. B. Hargreaves, and T. Gjemes. 1988. Canadian Mid-Ocean Salmon Studies, W.E. Ricker, 1 June-12 July, 1988. International North Pacific Fisheries Commission (I.N.P.F.C.) Document No. 3337. 19 p.

Hargreaves, N. B. 1985. Characteristics of coho predation on pink and chum salmon during early sea life. p. 48-57. *In*: B.G. Shepard (Rapporteur). Proceedings of the 1985 Northeast Pacific Pink and Chum Salmon Workshop. Dept. Fisheries and Oceans, 1090 West Pender Street, Vancouver, B.C. 212 p.

Hargreaves, N. B. 1984. Processes controlling behaviour and mortality of salmonids during the early sea life period in the ocean. *Nordic Journal of Freshwater Research* 69:96-97.

### **Selected Invited International Lectures and Presentations**

Hargreaves, N. B. 2001. Invited lecture "Development and implementation of selective fishing methods and policy for management of Pacific salmon in British Columbia, Canada". 2001 Pacific Rim Wild Salmon and Steelhead Conference, 5-6 November 2001. Portland, Oregon, USA. All travel costs were paid by the Wild Salmon Centre.

Hargreaves, N. B. 1996. Invited lecture "Mortality of juvenile chinook salmon in Barkley Sound, B.C. resulting from predation by the exotic predator Pacific mackerel during the 1992 and 1993 El Nino events", and invited Chair of a Discussion Session at the workshop "Estuarine and Ocean Survival of Pacific Salmonids", held during 20-22 March 1996 in Newport, Oregon. All travel costs were paid by the National Marine Fisheries Agency, U.S.A.

Hargreaves, N. B. 1996. Invited lecture and panel discussion with two other fishery scientists and 24 Japanese fishermen titled "What does the future hold for salmon fishermen in the North Pacific?" on 26 June 1996 during the PICES sponsored Modelling Workshop in Nemuro, Hokkaido, Japan.

Hargreaves, N. B. 1996. Two invited lectures titled "Relationships between Physical Oceanographic Conditions and Juvenile Salmon Abundance, Growth and Migration Routes in British Columbia Coastal Waters" and "Effects of predation by Pacific hake and Pacific Mackerel on survival of juvenile salmon in Barkley Sound, British Columbia in 1992 and 1993", during 12-18 August 1996 at the University of Tokyo, Japan, and the Hokkaido Fisheries Research laboratory in Kushiro, Hokkaido, Japan. All travel costs were paid by Japan.

Hargreaves, N. B. 1994. Invited speaker and session chair of international workshop "Airborne Fishery Technology", 21-24 March 1994. Boulder, Colorado, U.S.A. All travel expenses paid by U.S.A.

Hargreaves, N. B. 1994. Invited speaker and discussion leader at international "CAEC CHAOS WORKSHOP: Predicting Ocean Survival For Pacific Salmon Using Chaos-Based Models", 4-5 April 1994. Portland, Oregon, U.S.A. All travel expenses paid by U.S.A.

Hargreaves, N. B. 1994. Invited speech "Science Plan for the PICES-GLOBEC Climate Change and Carrying Capacity (CCCC) Program", presented at PICES-STA Workshop on Monitoring in the Subarctic North Pacific, October 23, 1994, Nemuro, Japan. All travel costs were paid by PICES.

Hargreaves, N. B. 1993. Invited lecture "Processes controlling behaviour and mortality of salmonids during the early sea life period in British Columbia coastal waters", presented at National Research Institute of Far Seas Fisheries in Shimizu, Japan, on 28 March 1993. All travel expenses paid by Japan.

Hargreaves, N. B. 1993. Invited lecture "Interannual variation in distribution of juvenile salmon (genus *Oncorhynchus*) and ocean conditions along the west coast of Vancouver Island, British Columbia", presented at Nemuro Workshop on Western Subarctic Circulation '93. 19-23 Sept. 1993, Nemuro, Japan. All travel expenses paid by Japan.

Hargreaves, N. B. 1993. Invited Keynote Speaker and public address, given at Memorial Reception, 19 Sept. 1993, Nemuro, Japan, on behalf of all Canadian scientists and delegates attending the Nemuro Workshop on Western Subarctic Circulation '93.

Hargreaves, N. B. 1993. Presented scientific paper "Interannual and decadal variation in abundance of Pacific hake and Pacific mackerel in Barkley Sound, B.C., and effects on mortality of juvenile salmon", presented at second annual meeting of North Pacific Marine Science Organization (PICES), 25-30 October 1993, Seattle, WA. U.S.A.

Hargreaves, N. B. 1992. Invited keynote paper "Oceanographic and biological factors affecting migrations and survival of salmonids in the ocean", presented at the Pacific Coast Steelhead Management Meeting, 9-11 March 1992, Portland, Oregon, U.S.A. Travel expenses paid by U.S.A.

Hargreaves, N. B. 1992. Invited Keynote Speech "Processes controlling behaviour and mortality of salmonids during the early sea life period in the ocean", presented at international symposium "Post-Smolt Biology of Salmonids in Ranching Systems", 10-12 November 1992, Umea, Sweden. All travel expenses were paid by Sweden.